GUJARAT TECHNOLOGICAL UNIVERSITY

Minor Degree : Solar Energy Systems
Subject Code: 114AJ01
Semester – IV
Subject Name: Solar Energy System-I

Prerequisite: Basic Electrical Engineering, Basic Electronics, Fundamental of Physics

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	0	30	0	100

Content:

Unit No	Course Content	No of Hours
1	Historical Growth of Photovoltaic, Growth Potential of Photovoltaic, PV Growth: India Case Study, Applications of PV	06
2	PV financial models: Net metering, PV financial models: PPAs, Leasing, The Terminology of PV, Fundamentals of PV	08
3	Introduction: The Sun, The Solar Spectrum**,** Insolation and irradiance, insolation variation with time**,** Insolation on horizontal flat plane and Energy on horizontal flat plane**,** Working principles of Solar Cells, Recent development on solar material	08
4	Introduction: The IV-curve**,** The Maximum Power Point**,** The Non-ideal Diode Equation, Electrical Cell Interconnection	12
5	Mismatch Losses and Bypass Diodes**,** Bypass diodes vs. blocking diodes**,** Module Components**,** The PV Circuit, Measuring power in a PV circuit**,** Data Sheet Reading of PV Module**,** Introduction to the tools of the solar PV system	08
	Total Hrs.	**42**

Suggested Specification table (Theory):

Distribution of Theory Marks (%)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
25	30	15	10	10	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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Reference Books:

1. Deutsche Gesellschaft für Sonnenenergie (DGS). *Planning and installing photovoltaic systems: a guide for installers, architects and engineers*. Routledge, 2013.
2. Solanki, Chetan Singh. *Solar photovoltaics: fundamentals, technologies and applications*. Phi learning pvt. Ltd., 2015.
3. Solanki, Chetan Singh. *Solar photovoltaic technology and systems: a manual for technicians, trainers and engineers*. PHI Learning Pvt. Ltd., 2013.
4. https://nptel.ac.in/courses/117/108/117108141/

Course Outcomes: Upon completion of this course students should be able to:

No	Course Outcomes	% weightage
01	Understand ongoing growth of solar PV systems	30
02	Analyze financial model of PV systems	20
03	Describe the solar energy system	20
04	Analyze PV and IV characteristic of PV	15
05	Evaluate PV power with the change in irradiance and temperature	15

List of Practical:

1.To demonstrate the I-V and P-V characteristics of PV module with varying radiation and Temperature level.
2.To simulate solar PV model with MATLAB.
3. Hands on practice on voltage and current measurement of solar PV system.
4. To measure temperature of solar cell with thermography.
3. To find IV and PV characteristic of series connected PV Modules.
4. To find IV and PV characteristic of parallel connected PV Modules.
5. To demonstrate the working of diode as bypass diode and blocking diode.
6. To understand the growth of the solar PV system with the data available on GEDA and MNRE in terms of the growth of solar PV systems.