

COURSE TITLE	ROOFTOP SOLAR GRID ENGINEER
COURSE CODE	01EE1409
COURSE CREDITS	1

Objective:

- 1 To provide knowledge on various aspects of solar PV systems, including grid integration and rooftop installation.

Course Outcomes: After completion of this course, student will be able to:

- 1 Determine the characteristics of solar PV panel
- 2 Perform pre-commissioning Inspection of the Grid Connected Rooftop Solar PV Power Plant
- 3 Design a basic rooftop solar PV system including array sizing and inverter selection using real data.
- 4 Perform post-commissioning Testing of the Grid Connected Rooftop Solar PV Power Plant

Pre-requisite of course: Basic Electrical Engineering, Basic Electronics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	2	0	0	0	25	25

Contents : Unit	Topics	Contact Hours
1	Overview of Solar Rooftop Systems Overview of solar PV adoption in India, types of rooftop solar PV systems, working principles of rooftop systems: components and their operation, metering arrangements, policy and regulatory framework	4
2	Pre-commissioning Inspection of the Grid Connected Rooftop Solar System Key regulatory parameters for interconnection, metering arrangement including power quality of the grid at the project site, System capacity as per relevant policy/regulation, Preparation of required documentation for grid connection, Components overview (inverters, panels, protection devices), Earthing, and lightning protection safety	10
3	Design of Rooftop Solar System Estimating connected load and solar potential, collecting real-time data for system sizing, series-parallel configuration of PV modules, basics of maximum power point tracking (MPPT), inverter selection based on ratings and features, designing for unity power factor and oversizing considerations	6

Contents : Unit	Topics	Contact Hours
4	Post-commissioning Testing of the Grid Connected Rooftop Solar System Testing and verification of the installed solar metering system (import/export of energy), inverter operation including anti-islanding, power quality at the time of interconnection (harmonics, voltage/frequency), testing power factor and phase imbalance, verifying overall system safety, and ensuring safety during testing and troubleshooting	8
Total Hours		28

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment No. 01 To study and analyse the solar rooftop systems in India	2
2	Experiment No. 02 Identify components and working principles of a solar rooftop plant	2
3	Experiment No. 03 Collect and analyse real-time data to estimate the size of a rooftop solar PV system	2
4	Experiment No. 04 Plot IV and PV curve of photovoltaic module for various irradiance and temperature.	2
5	Experiment No. 05 To study impact of shading on PV array performance	2
6	Experiment No. 06 Design of array configuration (series-parallel) and component sizing	2
7	Experiment No. 07 Selection and design of Solar rooftop inverter	2
8	Experiment No. 08 Grid integration of solar rooftop system as per IEEE standards	2
9	Experiment No. 09 Performance evaluation of a Grid-Connected Solar Rooftop System for various load conditions	2
10	Experiment No. 10 Performance evaluation of a Grid-Connected Solar Rooftop System for various PV generation conditions	2
11	Experiment No. 11 To analyse power quality parameters like power factor, harmonics & phase imbalance of solar rooftop system	2
12	Experiment No. 12 To test solar rooftop inverter for Anti-Islanding Protection	2
Total Hours		24

Textbook :

- 1 Grid Integration of Solar Photovoltaic Systems, Majid Jamil, M. Rizwan, and D. P. Kothari, CRC Press, 2017
- 2 Interconnection and Inspection of Grid Connected Rooftop Solar Photovoltaic Systems, Tanmay Bishnoi, Ronnie Khanna, Arvind Karandikar, and Deepanker Bishnoi, Routledge, 2021

References:

- 1 Large-Scale Solar Power System Design: An Engineering Guide for Grid-Connected Solar Power Generation, Large-Scale Solar Power System Design: An Engineering Guide for Grid-Connected Solar Power Generation, Peter Gevorkia, McGraw-Hill, 2011

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
0.00	30.00	20.00	25.00	25.00	0.00

Supplementary Resources:

- 1 https://onlinecourses.nptel.ac.in/noc23_ge41/preview