UNIVERSITY OF MAURITIUS

MQA Approved

Photovoltaic Energy Systems – Advanced Short Course

Advance Your Solar Expertise

Step into the future of clean energy with the Photovoltaic Energy Systems – Advanced course. Designed for engineers, researchers, and energy professionals, this hands-on program takes you through advanced system design and simulation using PVSyst. This course builds up on the Photovoltaic Energy Systems short course offered by the University of Mauritius.

Learn how to design, optimise, and evaluate both grid-tied and standalone solar systems, assess technical and financial performance, and carry out economic and CO_2 savings analysis. Through real-world case studies ranging from SSDG (<50 kW), MSDG (50kW – 2 MW) to LSDG (>2 MW), you'll gain the skills to deliver impactful renewable energy projects.

Why This Course?

As the world transitions towards sustainable energy, the demand for skilled professionals in solar photovoltaic (PV) systems is rapidly growing and capacity gaps must be addressed throughout the supply chain.

The MQA Approved Photovoltaic Energy Systems – Advanced course is designed for engineers, researchers, and energy practitioners who want to deepen their expertise in solar technology, system design, and simulation. This course builds up on the Photovoltaic Energy Systems short course offered by the University of Mauritius.

The course will be conducted in the Innovative Solar Energy Laboratory (i-SOL) of the Electrical and Electronic Engineering Department of the Faculty of Engineering. i-SOL contains state of the art grid-connected, off-grid and hybrid PV kits, research grade measurement infrastructure and IT infrastructure equipped with simulation tools such as SAM and PVSyst. The PV kits and data may be accessed via online platforms and may be remotely accessed from anywhere across the globe.

Through a practical, hands-on approach, participants will master the fundamentals of PV science, explore the latest technologies, and gain in-depth knowledge of systematic design, financial appraisal, regulatory frameworks, and risk management. With a strong focus on PVSyst simulation software, the course equips learners with the ability to model, optimise, and evaluate grid-tied, standalone and hybrid solar systems.

From understanding core PV concepts to tackling real-world projects ranging from small-scale SSDG (<50 kW) to large-scale LSDG (>2 MW), this course bridges theory with application. By the end, participants will not only be proficient in technical design but also be capable of performing economic evaluations, CO_2 savings analysis, and system optimisation.

Whether you aim to lead renewable energy projects, enhance your professional profile, or contribute to global sustainability goals, this course provides the tools and insights to help you shine in the solar energy sector.

Note: Participants must have followed and completed the MQA Approved Photovoltaic Energy Systems Short Course prior to joining the Photovoltaic Energy Systems – Advanced Short Course.

MQA Approved

Photovoltaic Energy Systems – Advanced Short Course

Module 1: Introduction to Course (3 hrs)

This opening module introduces learners to the fundamentals of renewable energy, with a particular emphasis on solar photovoltaic energy. It explores global trends, cost comparisons, and installed capacity growth. Participants become familiar with different solar cell technologies and learn how performance is assessed using IV and PV curves. Additional coverage includes an overview of solar cell manufacturing processes, system configurations (cell, string, module, array, and system), and solar engineering concepts. By the end, learners will appreciate the significance of solar energy, understand solar PV operations, and distinguish among different technologies.

Module 2: Familiarisation with Solar PV Technology (3 hrs)

This module focuses on the different types of solar PV systems, including grid-tied, off-grid, and hybrid configurations. It introduces the main system components—such as inverters, charge controllers, batteries, and balance-of-system (BoS) parts—while providing practical guidance on how to read and interpret datasheets for solar modules, inverters, and controllers. Emphasis is also placed on relevant IEC standards that govern design and integration of PV systems. Learners will come away familiar with system architectures, component functions, and regulatory frameworks that underpin safe and effective deployment.

Module 3: Systematic Design Process (3 hrs)

Learners are introduced to the structured approach required for PV system design. The module begins with defining the problem statement and objectives before moving into load surveys, demand forecasting, and estimation of system requirements. Site-specific considerations such as physical characteristics, weather data acquisition (from ground-based or satellite sources), and quality control of insolation data are addressed. The module also reviews methods of resource assessment and adaptation, and considers enabling frameworks such as grid codes, regulatory requirements, and renewable energy promotion policies. By the end, learners will understand the systematic methodology for designing PV systems and the critical steps involved.

MQA Approved

Photovoltaic Energy Systems – Advanced Short Course

Module 4: System Design Parameters (3 hrs)

This module provides a deeper dive into design parameters that influence PV performance. It covers optimal selection of azimuth, tilt angle, and row spacing, and guides participants through system sizing, cabling, and switchgear considerations. Learners gain experience in system modelling and simulation, identifying sources of system losses, and evaluating lifetime production and performance indicators. Financial appraisal is included, with emphasis on CAPEX, OPEX, and expected revenues, as well as risk assessment and occupational health and safety management. The session also introduces maintenance strategies, including reactive, preventive, and predictive approaches. Learners will be able to perform complete technical and financial analyses of PV projects.

Module 5: Introduction to PVSyst (3 hrs)

This module introduces PVSyst, one of the most widely used tools for PV system simulation and design. Learners explore why PVSyst is preferred compared to other tools such as SAM, and examine its software requirements and functionalities. A walkthrough of the main blocks, settings, and features is provided, along with tips for beginners. The module also covers the importance of meteorological data, including database use, geographical site creation, data import, and validation. Through guided exercises, learners gain familiarity with PVSyst and learn how to generate reports for simulated systems.

Module 6: Components and Systems – PVSyst (3 hrs)

In this session, the focus shifts to PVSyst's component database, where learners explore modules, inverters, charge controllers, and batteries. The training

includes importing PAN and OND files, as well as creating new components when files are unavailable. Participants then implement the design methodology through case studies, applying project settings and exploring system variants.

Module 7: Project A – Grid Tied System - SSDG and Hybrid Systems (<50 kW, Mono-facial) (3 hrs)

Learners undertake a hands-on project in designing and simulating a grid-tied mono-facial SSDG system. Project A involves the design of a small-scale distributed generation (SSDG) grid-tied system under 50 kW, where participants test different orientations and configurations. This practical approach reinforces systematic design principles and enhances technical familiarity with system variants. The project involves configuring system design rules accounting for self consumption and storage with a focus on detailed loss assessments. Advanced analysis includes far and near shading through 3D modelling, energy management simulations (P50–P90), and variability assessments. Participants interpret hourly simulation results, conduct economic evaluations, and perform CO_2 emissions balance studies. By engaging in this project, learners gain applied skills in system optimisation, financial analysis, and environmental impact assessment.

Module 8-9: Case Studies for Grid-Tied Systems (6 hrs)

This extended module presents comparative case studies that demonstrate how different grid-tied PV systems behave under varying configurations. Project B explores bifacial SSDG systems under 50 kW, while Project C examines multi-orientation bifacial setups. Project D focuses on

MQA Approved

Photovoltaic Energy Systems – Advanced Short Course

medium-scale distributed generation (50–500 kW & 500kW – 2MW), and Project E considers large-scale distributed generation systems above 2 MW. Learners simulate and compare system behaviours, evaluate the role of transformers, and apply design rules to progressively larger projects. This provides insights into scalability and system performance under diverse conditions.

Module 10: Case Studies for Stand-Alone Systems (3 hrs)

The final module examines standalone solar PV systems. Learners apply systematic design methodologies to configure systems for off-grid use, including battery energy storage sizing, charge controller selection, and load scheduling. Simulations allow participants to assess system performance, optimise design parameters, and interpret results. This module helps learners understand the practical differences between grid-tied and standalone systems and equips them with the knowledge to design resilient, independent energy solutions.

Venue:
Innovative Solar Energy Laboratory, University of Mauritius

Course Fee: MUR 30,000

Duration: 30 hrs conducted over 10 sessions from 0900 – 1230 on Saturdays.

Resource Persons:
Assoc. Prof. (Dr.) Yatindra K. RAMGOLAM
Mr Kaviraj Bangarigadu

Contact Details:
Assoc. Prof. (Dr.) Yatindra K. RAMGOLAM
Tel: (+230) 403 7865
Email: y.ramgolam@uom.ac.mu

Certificate:
A Certificate of Attendance issued by the University of Mauritius will be awarded to participants having completed at least 80% of the course.

Link for Application:

https://forms.gle/dZ9FcDji7R85FLAb9