



**KILIMANJARO INTERNATIONAL INSTITUTE FOR TELECOMMUNICATIONS,
ELECTRONICS AND COMPUTERS**

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Course Title: Solar PV Systems for Designers and Installers

Duration: 5 – Days

Dates: 27th April to 2nd May 2020

Tuition Fees: Tanzania shillings four hundred thousand (TZS400,000) per participant and is inclusive of Tea/Coffee and lunch

About the course:

The fast growth of solar photovoltaics (PV) has created a high demand for skilled engineers and technicians in the design, installation, commissioning and maintenance of PV systems. Choosing the right PV designer and installer plays a significant part to ensure the quality and performance of the system.

Installation of PV systems is a complex task from the technical point of view where installers must have knowledge not only in DC/AC electricity and electrical safety, but also in roofing skills and design rules.

KIITEC addresses this critical need for high-quality training in solar PV design, installation and related skills by organizing this course. The course will provide a thorough understanding of the unique aspects of solar PV system design and installation. It is designed to provide participants with both theoretical and technical knowledge in designing and installing solar PV systems with an emphasis on **BEST PRACTICES**.

Course Objective:

The goal of this intensive 5-day course is not only to give participants an in-depth exposure to essential considerations involved in the design and how to produce good system designs, but also to offer hands-on training of actual installation in a realistic setting.

This course will focus on **OFF-GRID AND GRID-TIED** systems and constitute both fundamental and practical hands-on sessions, ending with a competency assessment.

Who should attend.

Those who want to have a good understanding of PV systems, especially electrical engineers & technicians; electrical and general contractors, consultants and professionals who want to further their knowledge of solar design.

Course Outline

DAY	SESSION TOPIC	CONTENTS	MIN PRACTICAL
1	<i>1. Solar Basics</i>	1.1.Types of energy from the sun	
		1.2.Types of solar PV systems	
		1.3. Basic terminology	
	<i>2. Basics of Electricity</i>	2.1. How energy and power are related	
		2.2. AC and DC electricity	
		2.3. Current, voltage, resistance, power, energy	

		2.4. Ohm's law and Kirchoff's law	
	3. PV Modules	3.1. Types of PV modules and how they're made	Recognize different types of panels
		3.2. I-V and P-V curve and how they're measured	Draw Curve V/I and P/V Measurement with multi meter
		3.3. Differences between Voc/Vmp and Isc/Imp	Obstacle / Shadow
		3.4. Variables affecting output such as temperature, light intensity and shadow	
		3.5. PV module components: 3.5.1. Cells, 3.5.2. Busbars, 3.5.3. Bypass diodes, 3.5.4. Blocking diodes	
2	4. Solar Charge Controller	4.1. Function of a charge controller	Recognize the two types
		4.2. Types of a charge controller	
		4.3. Load control via charge control and how to integrate a battery Inverter	
	5. Batteries	5.1. Definition of a battery	How to connect a solar PV and batteries to a solar charge controller
		5.2. Different commercial battery types	Electrolyte filling in batteries
		5.3. Lifetime cost analysis	

		5.4. Variables affecting lifetime	Performing charging and Discharging of battery and draw curves for each.
		5.5. SOC & DOD	
3	6. <i>Inverter</i>	6.1. Types of battery inverters	Performing necessary parameter settings for Inverter charger and Grid Tie Inverter
		6.7. Functions from different type	
		6.8. Pure sine wave vs modified sine wave	
		6.7. Inverter/charger vs solar charge controllers	Performing single phase AC system and three phase system configuration
		6.8. Grid inverter vs battery inverter	
		6.9. Why a grid inverter	
	7. <i>Electrical safety and protection of solar system</i>	7.1. Risks of electricity	
		7.2. General safety rules on solar system	
		7.3. Solar cables	
		7.4. Solar connections	
		7.5. Protection devices	
		7.6. DC protection on solar system	
		7.8. Choice of protection device	
		7.9. Grounding system	
		7.10. Lightning protection	
8. <i>PV System Sizing</i>		8.1. Load survey and calculation	

4		8.2. Calculating solar PV capacity	
		8.3. Calculating battery capacity	
		8.4. Calculating charge controller	
		8.5. Cable size calculation	
		8.6. Calculation Voltage Drop	
		8.7 Inverter sizing	
		8.8. Circuit breaker/fuse sizing	
5	9. <i>Commissioning and Performance Verification</i>	9.1. Basic commissioning procedures	
		9.2. Basic performance verification	
		9.3. Commissioning checklist	
		9.4.	
	10. Maintenance	10.1. Preventive maintenance procedures	Practicing with Solar generator 30 KWp
		10.2. Regular maintenance checklists	
		10.3. Regular data logging	