GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Bachelor of Vocation (B.Voc), 6th Semester
Branch: Solar and Renewable Energy
Subject Name: Solar Panel Installation Technician
Subject Code: 1160707

Type of course: Elective

Prerequisite: None

Rationale: Fundamentals of PV Solar Systems: Ensuring Effective Functioning of Solar Energy System for Installation

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
0	0	30	15	0	0	100	100	200

Content:

Sr. No.	Topic	No. of hours	% Weightage
1.	**Solar PV Essentials** Overview Global overview of Power Development. Global overview of Renewable. Energy Development including Solar. National overview of Power Development. National overview of Renewable Energy Development including Solar. The Need of Solar Power, Benefits, Application of Solar Energy. Solar Power Myths. Basics on solar energy and power generation systems. Basic principles of Solar Power (Solar Photovoltaic, Solar Thermal, Dish Type, and Solar Tower).Manufacturing process for Solar Photovoltaic and Solar thermal equipment. Use and handling procedure of solar panels, energy storage, control and Conversion. Basic electrical system and functioning of various electrical devices. AC and DC Supply essentials .Components of Solar Systems mechanical equipment and its Functioning. Maintenance procedure of equipment site survey, design and evaluation of various parameters tools involved in installation of system quality and process standards occupational health and safety standards waste management and disposal procedures and standards importance of wearing protective clothing and other safety gear while carrying out installation precautions to be taken while handling different electrical and mechanical products.	40	20%
2.	**Core and Generic skills** Read product and equipment manuals, installation manuals, etc. Read warnings, instructions and other text material on product labels, components, etc. Fill in job completion form after installation activities have been completed To clearly communicate installation and design instructions to team. To	20	10%

	clearly communicate customer's requirements. To communicate the constraints and quality requirements to team		
3.	**Installing the panel and connecting the system and check for functioning** Remove packaging of the solar panel carefully. Handle the panels carefully without damaging the material. Take safety measures and wear protection gear such as gloves to avoid shock / injuries while handling modules. Cover the module with opaque material while installing to avoid any current generation. Ensure that junction box in covered. Do not disturb or disassemble any part of the module part during Installation. Take necessary precautions for fire resistance of modules. Use recommended material of solar cable and plugs for electrical connection. Install spare fuse to avoid any short circuits as per company policy. Mount the module on the fixture with the mounting rails using bolts and nuts. Ensure that the panels are mounted firmly To be competent, the user/ individual must be able to: Use the cables to connect multiple PV modules in combination to generate the desired voltage and current Choose type of connection, i.e., series or parallel, as per design Use recommended cable to generate maximum voltage Check the maximum system voltage as per the installation and follow adjustment measures accordingly to match output requirement Ensure that the modules are grounded as specified Connect the system and check for functioning Escalate for any issues faced during the functioning of the system.	30	15%
4.	**Understanding installation and material usage procedure and assessing mounting** Understand the customer requirement on installation. Ensure that all appropriate materials are available during installation time. Ensure to disconnect PV module from any electric sources such as batteries, inverters, etc., before working on the module. Ensure to take specified measures such as fire resistance, corrosion resistance for the module during installation. Assess the degree of inclination and angle of tilt of PV module for the specific area, locality or region to enable the system absorb maximum annual sunlight. Ensure that any special construction requirement for mounting is done by following acceptable quality standards, especially, in rooftop installations. Use approved tools for mounting. Set the mounting fixture firmly at the desired location.	30	15%
5.	**Understanding the work requirement** Understand the individual work requirement and areas of operation. Interact with the supervisor in order to understand	20	10%

	the installation targets for the day and/or week. Understand the location of installations and optimise the route plan. Plan the day's activities and the complete work plan for each installation. Coordinate with the various departments and persons involved in installation. Operation such as design, logistics, material handling and stores. Minimise absenteeism and report to work on time		
6.	**Assessing site conditions and understanding installation requirements** Assess the site level pre-requisites for solar panel installation. Decide on the type of mounting to be made such as roof top, open fields, small spaces. Ensure that land is levelled for flat surface mounting. Decide the type of mounting accessories required for installation as per the site condition. Decide the place of installation and ensure maximum period of sunlight is captured in the area Ensure that construction is strong to hold solar panel for 20-25 years, especially, on roof top. Inform the customer for any civil construction to be undertaken for installing the panels. To be competent, the user/ individual must be able to: understand the location and mounting preference of customers, interact with customers and understand the purpose of installation and suggest alternatives. Match the voltage and power output of the type of installation designed and losses with customer's requirement. Inform customers about the approximate time required for installation and any requirements during installation. Get concurrence from the customer on the package of materials to be procured for installation based on agreed design.	30	15%
7.	**Completing the work and following quality and safety procedures** To be competent, the user/ individual must be able to: Clean the work area after completing the installation activity, Remove all the tools, consumables used from the installation area, Fill in the job completion form and get the signature of the customer, Inform customers about maintenance of solar panels and procedure for cleaning of solar panels. Follow company standards in documentation of installation activities performed To be competent, the user/ individual must be able to: Remove any metals or jewellery to avoid possibility of current shock during installation activity. Wear all safety gears such as work shoes, cotton gloves, goggles while carrying out installation activities. Take specified precautionary measures while handling electrical system, Keep work area clean and organised Adhere to relevant health and safety standards. Dispose of any waste materials	30	15%

	in accordance with safe working practices and procedures.		

Suggested Specification table with Marks (Practical):

Distribution of Practical Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	30	10	10	20

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

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes:

Sr No.	CO statement	Marks % weightage
CO1	Understand the fundamentals of PV solar systems and Solar PV technology, including their structure, components, and working principles.	20
CO2	Assess solar installation sites by identifying prerequisites, arranging materials, and planning effective panel mounting and installation procedures.	30
CO3	Demonstrate the ability to install solar panels at customer premises, ensuring system efficiency and adherence to standard practices.	30
CO4	Apply proactive maintenance techniques and post-installation measures to ensure the effective and sustained functioning of solar energy systems.	20

Reference:

1. Solar Photovoltaic: Fundamentals, Technologies and Application, Chetan Singh Solanki, PHI Learning Pvt., Ltd., 2009.
2. Renewable Energy Source & Emerging Technologies, D P Kothari, K C Singal. PHI Learning Pvt. Ltd.
3. Renewable Energy Technologies; A Practical Guide for Beginners, Chetan Singh Solanki, PHI School Books (2008)
4. https://nsdcindia.org/nos-listing/30