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Solar Photovoltaic Technician

(A Competency Based Short-term Curriculum)

Council for Technical Education and Vocational Training

Curriculum Development Division

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Introduction

This curriculum has been developed with a purpose of preparing Solar Photovoltaic Technicians as a lower level technical workforce able to get employment in the country. The technical skills incorporated in this curriculum come from the solar photovoltaic technology. Its contents are organized in the form of modules. So it is a tailor made curriculum with a special purpose to be implemented in a modular form.

It is a competency based curriculum. It is also designed to produce lower level technical workforce in the field of solar photovoltaic technology equipped with skills and knowledge related to solar photovoltaic technology in order to meet the demand of such workforce in the country so as to contribute in the national streamline of poverty reduction.

Aims

The main aim of this curricular program is to produce skilled workforce in the field of solar photovoltaic technology by providing training to the potential citizen of the country and link them to employment opportunities in the country. The aims of this curriculum are:

- To produce lower level technical workforce in the area of solar photovoltaic technology
- To produce such technical workforce who will be able to serve the community and household people through the application of the techniques /skills of solar photovoltaic technology being an entrepreneur

Objectives

After the completion or this training program, the trainees will be able:

- To be familiar with the Basics of electricity
- To be familiar with the Basics of solar PV technology
- To handle Tools / Materials / Equipment
- To Design Solar PV System
- To Install/Assemble Solar PV system
- To Test Solar PV System / Equipment
- To carry out Routine Maintenance/Servicing
- To carry out Repairing and Maintenance of Solar PV Electronic Components
- To carry out Marketing of Solar PV Products
- To carry out First Aid Management
- To carry out Store Management
- To Prepare Documents
- To Communicate with others

Description

This curriculum provides skills and knowledge necessary for solar photovoltaic technician as a technical worker. There will be both demonstration by trainers/instructors and opportunity by trainees to carry out the skills/tasks necessary for this level of technical workforce. Trainees will practice and learn skills by using typical tools, materials and equipment necessary for this curricular program. On successful completion of this training, the trainees will be able to apply skills and knowledge related to the basics of solar PV technology, handling of the related tools / materials / equipment, designing solar PV system, installing/assembling solar PV system, testing solar PV system / equipment, routine maintenance/servicing, repair and maintenance of solar PV electronic components, marketing solar PV Products, first aid management, store management, preparing documents, and communication.

Course structure

			Time (hrs.)			Marks		
Modules and sub modules		**Nature**	**Th.**	**Pr.**	**Tot.**	**Th.**	**Pr.**	**Tot.**
1. Basics Electricity		**T + P**	**7**	**8**	**15**	**5**	**5**	**10**
2. Basics of solar PV technology		**T + P**	**12**	**18**	**30**	**10**	**15**	**25**
3. Designing, Installing & Testing		**T + P**	**32**	**193**	**225**	**30**	**130**	**160**
	1. Tools / Materials / Equipment	T + P	4	18	22			
	2. Designing Solar PV System	T + P	6	24	30			
	3. Installing/Assembling Solar PV System	T + P	15	98	113			
	4. Testing Solar PV System / Equipment	T + P	8	52	60			
4. Maintenance, Servicing and Trouble shooting		**T + P**	**12**	**78**	**90**	**10**	**70**	**80**
	1. Routine Maintenance/Servicing	T + P	6	24	30			
	2. Trouble shooting of Solar Home System Components	T + P	6	54	60			
5. Management		**T + P**	**10**	**20**	**30**	**5**	**20**	**25**
	1. Marketing Solar PV Products	T + P	4	8	12			
	2. Store Management	T + P	4	8	12			
	3. Preparing Documents	T + P	2	4	6			
	Sub total:		**73**	**317**	**390**	**60**	**240**	**300**
6. Common module		**T + P**	**14**	**56**	**70**	**10**	**40**	**50**
	1. Applied math	T + P	4	16	20			
	2. Occupational health and safety	T + P	2	8	10			
	3. First aid	T + P	1	4	5			
	4. HIV/AIDS	T + P	1	4	5			
	5. Communication	T + P	2	8	10			
	6. Small enterprise development	T + P	4	16	20			
	Total:		**87**	**373**	**460**	**70**	**280**	**350**

Duration
The total duration of this curricular program will be **390** hours [three months] plus 70 hours of common module

Target group
The target group for this training will be all the interested individuals of the country with academic qualification of grade eight pass

Group size
The group size of this training program will be not more than 20

Target location
The target location of this training program will be all over Nepal.

Medium of Instruction
The medium of instruction for this training program will be Nepali or English or both.

Pattern of attendance
The trainees should have 80% attendance in theory classes and 90% in Practical (Performance) to be eligible for internal assessment and final examinations.

Focus of the program
This is a competency based curriculum. This curriculum emphasizes on competent performance of the task specified in it. Not less than 80% time is allotted to the competencies and not more than 20% to the related technical knowledge. So, the main focus will be on the performance of the specified competencies/tasks /skills included in this curriculum.

Entry criteria
Individuals who meet the following criteria will be allowed to enter in this curricular program:

- Eight grade pass
- Physically and mentally fit
- Age : minimum of 16 years old
- Preference will be given to female, Dalit, Janjati, and Conflict affected people

Follow up suggestion
This is not a training program only for training sake. The ultimate success of this program will rest on the proficiency of the graduates of this training program in providing services in the community either by wage employment or by self-employment.
In other to assess the success of this program and collect feedbacks/inputs for the revision of the program, a schedule of follow up is suggested as follows:-

- First follow up: - Six months after the completion of the training program.
- Second follow up: - Six months after the completion of the first follow up.
- Follow up cycle: - In a cycle of one year after the completion of second follow up for five years

Certificate requirement
The related training institute will provide the certificate of "Solar Photovoltaic Technician" to those individuals who successfully complete all the tasks with their related technical knowledge specified in this curriculum

Student evaluation details

- Continuous evaluation of the trainees' performance is to be done by the related instructor/trainer to ensure the proficiency over each competency.
- Related technical knowledge learnt by the trainees will be evaluated through written or oral tests as per the nature of the content
- Trainees must secure minimum marks of 60% in an average of both theory and practical evaluations

Trainers' qualification

- Diploma in electrical engineering plus trainings in Solar Photovoltaic technology
- Good communicative & instructional skills.
- Experience in the related field.

Trainer: trainee's ratio

- 1:10 for practical classes
- Depends on the nature of subject matter and class room situation for theory classes.

Suggestion for instruction

1. Demonstrate task performance

- Demonstrate task performance in normal speed
- Demonstrate slowly with verbal description of each and every steps in the sequence of activity flow of the task performance using question and answer techniques
- Repeat the above step for the clarification on trainees demand if necessary.
- Perform fast demonstration of the task performance.

2. Provide trainees the opportunity to practice the task performance demonstrated.

- Provide trainees to have guided practice:- create environment for practicing the demonstrated task performance and guide the trainees in each and every step of task performance
- Provide trainees the opportunity to repeat & re-repeat as per the need to be proficient on the given task performance
- Switch to another task demonstration if and only if the trainees developed proficiency in the given task performance

3. Evaluation performance of the trainees/ student

- Perform task analysis
- Develop a detail task performance check list
- Perform continuous performance evaluation of the trainees / students by applying the performance check list.

Details of modules and sub modules

	Module: 1: Basic Electricity					
	Description: It consists of the basic skills and knowledge related to electricity.					
	Objectives: • To State the concept of electricity • To state Ohm's law • To measure current, voltage, resistance and power					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
	7 hrs. (Th.) + 8 Hrs. (Pr.) = 15hrs.			Time (hrs.)		
SN	**Tasks**		**Related technical knowledge**	**Th.**	**Pr,**	**Tot.**
1	**State the concept of electricity.**		**Stating the concept of electricity** • Introduction of electricity • Importance of electricity • Nature of electricity • History of electricity • Uses of electricity • Sources of electricity • Electric current and conventional flow • Voltage – The Electric pressure or electromotive force (EMF) • Source of EMF • Resistance and conductance	**2**	**0**	**2**
2	**State Ohm's law.**		**Stating Ohm's Law:** • Statement of laws • Importance • Application • Units of current, voltage & resistance • Relationship among V, I & R • Calculation of current, voltage & resistance.	**1**	**4**	**5**
3	Measure resistance using Ohmmeter/Multimeter		**Measure resistances using Ohmmeter/Multimeter:** ➢ Identification ➢ Principle ➢ Application	**1**	**1**	**2**

			➢ Connection diagram of Ohm meter ➢ Connecting procedures in circuit ➢ Safety precautions			
4	Measure voltages using Voltmeter/ Multimeter.		**Measuring voltages using Voltmeter/ Multimeter:** • Identification • Principle • Application • Connection diagram of Voltmeter/ multimeter. • Connecting procedures in circuit • Safety precautions	**1**	**1**	**2**
5	Measure current using Ampere meter/ Multimeter.		**Measuring current using Ampere meter/ Multimeter:** ➢ Identification ➢ Principle ➢ Application ➢ Connection diagram of Ammeter ➢ Connecting procedures in circuit ➢ Procedure ➢ Safety precautions	**1**	**1**	**2**
6	Measure electrical powers		**Measuring electrical power:** ➢ Definition of work, power and energy, ➢ Units of work, power & energy ➢ Measuring procedure ➢ Conversion of power ➢ Procedure ➢ Safety precautions	**1**	**1**	**2**
	Sub total:			**7**	**8**	**15**

	Module:2: Basics of solar Photovoltaic system					
	Description: It consists of the basic skills and knowledge related to solar photovoltaic technology.					
	Objectives: • To be familiar with Solar Energy • To identify PV system configurations /applications • To be familiar with fundamentals of Solar Radiation • To determine Solar Cells/ Modules/Arrays • To be familiar with Solar Cell / Module Characteristics					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
	12 hrs. (Th.) + 18 Hrs. (Pr.) = 30hrs.			Time (hrs.)		
SN	**Tasks**		**Related technical knowledge**	**Th.**	**Pr,**	**Tot.**
1.	Define terminologies of solar home systems		**<u>Defining the terminologies of solar home systems</u>**: • Terminologies • Power • Peak watt • Ampere hour • Irradiance • Insolation • Peak sun • Related precautions to be taken • Related records to be kept	**2**	**0**	**1**
2.	**Be familiar with Solar Energy** • Identify various forms of energy • Be aware of the potential applications of solar energy • Be aware of the advantages and disadvantages of solar energy		**<u>Familiarizing with Solar Energy:</u>** (i) Biomass (ii) Fossil fuel (iii) Solar electricity • applications • advantages • limitations • electricity storage (iv) Solar thermal • green house effect • concentrating technologies • solar crop driers	**2**	**2**	**4**

			• solar water heaters • solar cookers • solar distillation • thermal storage (v) Solar wind **(**vi) Solar hydro-power			
3.	**Identify PV system configurations /applications** • Identify various PV systems options • Identify potential uses PV systems • Identify limitation of PV technology • Identify advantages of PV systems		**<u>Identifying PV system configurations /applications</u>:** • Basic Photovoltaic system options • DC stand alone systems • Basic AC/DC systems • Utility interactive systems • Choosing PV systems • PV Application areas: • Domestic, industrial and medical • Fencing and security • Refrigeration and fishing • Water pumping • PV powered Calculators • Flashlight battery charger • PV powered emergency telephone • Railway signalling • Corrosion protection • PV powered vending machine for parking • PV powered lighting bus stop shelters • PV powered watches/clocks/ • PV systems limitations • Potential advantages of PV technology	**3**	**5**	**8**
4.	**Be familiar with fundamentals of Solar Radiation** • Determine solar radiation measurements using simple meteorological instruments		**<u>Familiarizing with fundamentals of Solar Radiation:</u>** • The sun as basic source of renewable energy; • Solar radiation principles. • Direct, diffuse and global	**2**	**3**	**5**

	• Carry out study visits to meteorological station.		radiation; • Uses of meteorological records; • Seasonal solar radiation; • Hourly solar radiation; • Optimum tilt for solar collectors; • Tracking the sun; • Solar energy applications			
5.	**Determine Solar Cells/ Modules/Arrays** • Determine the Photovoltaic effect; • Determine the effect of arranging PV modules in series on output current (Isc), voltage (Voc), and power; • Determine the effect of arranging PV modules in parallel on output current (Isc), voltage (Voc) and power • Determine the effect of partial shading on the output current and voltage of PV module or array; • Determine the effect of module temperature on output current and voltage.		**<u>Determining Solar Cells/ Modules/Arrays:</u>** • Photoelectric effect. • Solar cell technology • Solar cell • Types of solar cell: • Mono – crystalline • Poly – crystalline • Amorphous • Thin film • Solar module • Solar string • Solar array: • Series connection • Parallel connection • Blocking and shunt (bypass) diodes • PV modules as current limiting devices • Methods of disposing toxic materials	**2**	**5**	**7**
6.	**Be familiar with Solar Cell / Module Characteristics** • Measure I-V characteristics of a module in both series and parallel configuration • Determine maximum power output (Pmax or		**<u>Familiar with Solar Cell / Module Characteristics:</u>** • IV characteristics and Power output • IV curve • Open circuit voltage (VOC) • Short circuit current (ISC) • Maximum power, (Pmax) • current (Imax) and voltage • (Vmax)	**1**	**3**	**4**

	Wp) • Determine short circuit current, Isc and open circuit voltage, Voc		• Choice of solar cell module(s)			
	Sub total:			**12**	**18**	**20**
	Module: 3: Designing, Installing & Testing					
	Description: It consists of the basic skills and knowledge related to handling of tools / materials / equipment, designing of solar PV system, installing and assembling of solar PV system, and testing of solar PV system / equipment necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To handle Tools / Materials / Equipment • To Design Solar PV System • To Install/Assemble Solar PV system • To Test Solar PV System / Equipment					
	Sub modules: 1. Tools / Materials / Equipment 2. Designing Solar PV System 3. Installing/Assembling Solar PV system 4. Testing Solar PV System / Equipment					
	Sub module: 1: Tools / Materials / Equipment					
	Description: It consists of the basic skills and knowledge related to handling and care of tools, materials, and equipment necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To handle hammer • To handle wire cutter • To handle combination pliers • To handle wire stripper • To handle hydrometer • To handle multi meter • To handle hand drill machine • To handle nose pliers • To handle slide wrench • To handle crimping tools • To handle screw driver					

	• To handle compass • To handle set square • To handle solder wire • To handle disolder wire • To handle solder paste • To handle soldering iron • To handle solder pump • To handle iron stand • To handle power supply • To handle clamp meter • To handle battery tester					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
	4 hrs. (Th.) + 18 Hrs. (Pr.) = 22 hrs.			Time (hrs.)		
SN	**Tasks**			**Th.**	**Pr,**	**Tot.**
1.	Handle hammer		**<u>Handling hammer:</u>** • Functions of hammer • Identification of hammer • Handling and care of hammer • Related precautions to be taken • Related records to be kept	0.1	0.9	1
2.	Handle wire cutter		**<u>Handling wire cutter:</u>** • Functions of wire cutter • Identification of wire cutter • Handling and care of wire cutter • Related precautions to be taken • Related records to be kept	0.1	0.9	1
3.	Handle combination pliers		**<u>Handling combination pliers:</u>** • Functions of combination pliers • Identification of combination pliers • Handling and care of combination pliers • Related precautions to be taken • Related records to be kept	0.1	0.9	1
4.	Handle wire stripper		**<u>Handling wire stripper:</u>** • Functions of wire stripper • Identification of wire stripper	0.1	0.9	1

			• Handling and care of wire stripper • Related precautions to be taken • Related records to be kept			
5.	Handle hydrometer		**Handling hydrometer:** • Functions of hydrometer • Identification of hydrometer • Handling and care of hydrometer • Related precautions to be taken • Related records to be kept	0.2	0.8	1
6.	Handle multi meter		**Handling multi meter:** • Functions of multi meter • Identification of multi meter • Handling and care of multi meter • Related precautions to be taken • Related records to be kept	0.2	0.8	1
7.	Handle hand drill machine		**Handling hand drill machine**: • Functions of hand drill machine • Identification of hand drill machine • Handling and care of hand drill machine • Related precautions to be taken • Related records to be kept	0.2	0.8	1
8.	Handle nose pliers		**Handling nose pliers:** • Functions of nose pliers • Identification of nose pliers • Handling and care of nose pliers • Related precautions to be taken • Related records to be kept	0.2	0.8	1
9.	Handle slide wrench		**Handling slide wrench:** • Functions of slide wrench • Identification of slide wrench • Handling and care of slide wrench	0.2	0.8	1

			• Related precautions to be taken • Related records to be kept			
10.	Handle crimping tools		**Handling crimping tools:** • Functions of crimping tools • Identification of crimping tools • Handling and care of crimping tools • Related precautions to be taken • Related records to be kept	0.2	0.8	1
11.	Handle screw driver		**Handling screw driver:** • Functions of screw driver • Identification of screw driver • Handling and care of screw driver • Related precautions to be taken • Related records to be kept	0.2	0.8	1
12.	Handle compass		**Handling compass:** • Functions of compass • Identification of compass • Handling and care of compass • Related precautions to be taken • Related records to be kept	0.2	0.8	1
13.	Handle set square		**Handling set square:** • Functions of set square • Identification of set square • Handling and care of set square • Related precautions to be taken • Related records to be kept	0.2	0.8	1
14.	Handle solder wire		**Handling solder wire:** • Functions of solder wire • Identification of solder wire • Handling and care of solder wire • Related precautions to be taken • Related records to be kept	0.2	0.8	1

15.	Handle disolder wire		**Handling disolder wire:** • Functions of disolder wire • Identification of disolder wire • Handling and care of disolder wire • Related precautions to be taken • Related records to be kept	0.2	0.8	1
16.	Handle solder paste		**Handling solder paste:** • Functions of solder paste • Identification of solder paste • Handling and care of solder paste • Related precautions to be taken • Related records to be kept	0.2	0.8	1
17.	Handle soldering iron		**Handling soldering iron:** • Functions of soldering iron • Identification of soldering iron • Handling and care of soldering iron • Related precautions to be taken • Related records to be kept	0.2	0.8	1
18.	Handle solder pump		**Handling solder pump:** • Functions of solder pump • Identification of solder pump • Handling and care of solder pump • Related precautions to be taken • Related records to be kept	0.2	0.8	1
19.	Handle iron stand		**Handling iron stand:** • Functions of iron stand • Identification of iron stand • Handling and care of iron stand • Related precautions to be taken • Related records to be kept	0.2	0.8	1
20.	Handle power supply		**Handling power supply:** • Functions of power supply • Identification of power	0.2	0.8	1

			supply • Handling and care of power supply • Related precautions to be taken • Related records to be kept			
21.	Handle clamp meter		**Handling clamp meter:** • Functions of clamp meter • Identification of clamp meter • Handling and care of clamp meter • Related precautions to be taken • Related records to be kept	0.2	0.8	1
22.	Handle battery tester		**Handling battery tester**: • Functions of battery tester • Identification of battery tester • Handling and care of battery tester • Related precautions to be taken • Related records to be kept	0.2	0.8	1
	Sub total:			4	18	22
	Sub module: 2: Designing solar PV system					
	Description: It consists of the basic skills and knowledge related to the selection of solar PV system designs necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To select module/ Panel design • To select battery design • To select charge controller design • To select lamps design • To select switches design • To select converter(DC to DC) design • To select inverter (DC to AC) design • To select solar pumps design • To select vaccine refrigerator design • To select wire sizing design					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
	6 hrs. (Th.) + 24 Hrs. (Pr.) = 30 hrs.			Time (hrs.)		

SN	Tasks			Th.	Pr,	Tot.
1.	Collect relevant data through customer home survey		**<u>Collecting relevant data through customer home survey</u>**: • Introduction • Methods • Factors to be considered while collecting the data • Data/information collection procurers	0.5	2.0	2.5
2.	Interpret solar PV system designs		**<u>Interpreting solar PV system designs</u>**: • Design parameters and technical specification • Analysis and reporting of data • Interpretation of designs	0.5	2.0	2.5
3.	Select module/ Panel design		**<u>Selecting module/ Panel design:</u>** • Introduction to solar module • Specification table(parameters and capacity) • Identification of module/ Panel • Need of selecting module/ Panel design • Peak power calculation • Procedure for selecting module/ Panel design as per the customer's need • Related precautions to be taken • Related records to be kept	0.5	2.0	2.5
4.	Select battery design		**<u>Selecting battery design :</u>** • Introduction • Identification of battery • Battery components • Chemical reaction of a lead battery • Capacity of battery • Technical specification • Need of selecting battery design • Procedure for selecting	0.5	2.0	2.5

			battery design as per the customer's need • Related precautions to be taken • Related records to be kept			
5.	Select charge controller design		**Selecting charge controller design :** • Introduction • Identification of charge controller • Technical specification • Types with working principles • Need of selecting charge controller design • Procedure for selecting charge controller design as per the customer's need • Related precautions to be taken • Related records to be kept	0.5	2.0	2.5
6.	Select lamps /balast design		**Selecting lamps design :** • Introduction • Identification of lamps • Technical specification • Types with component details • Need of selecting lamp design • Procedure for selecting lamp design as per the customer's need • Related precautions to be taken • Related records to be kept	0.5	2.0	2.5
7.	Select switches design		**Selecting switches design:** • Introduction • Identification of switches • Technical specification • Need of selecting switches • Procedure for selecting switches as per the customer's need • Related precautions to be taken • Related records to be kept	0.5	2.0	2.5
8.	Select converter(DC to DC) design		**Selecting converter(DC to DC)**	0.5	2.0	2.5

			design: • Introduction • Identification of converter(DC to DC) • Technical specification • Need of selecting converter(DC to DC)design • Procedure for selecting converter(DC to DC)design as per the customer's need • Related precautions to be taken • Related records to be kept			
9.	Select inverter (DC to AC) design		**Selecting inverter (DC to AC) design:** • Introduction • Identification of inverter (DC to AC) • Technical specification with its parameters • Need of selecting inverter (DC to AC) design • Procedure for selecting inverter (DC to AC) design as per the customer's need • Related precautions to be taken • Related records to be kept	0.5	2.0	2.5
10.	Select solar pumps design		**Selecting solar pumps design:** • Introduction • Identification of solar pumps • Technical specification • Need of selecting solar pumps design • Procedure for selecting solar pumps design as per the customer's need • Related precautions to be taken • Related records to be kept	0.5	2.0	2.5
11.	Select vaccine refrigerator design		**Selecting vaccine refrigerator design:** • Introduction • Identification of vaccine	0.5	2.0	2.5

			refrigerator • Need of selecting vaccine refrigerator design • Technical specification • Procedure for selecting vaccine refrigerator design as per the customer's need • Related precautions to be taken • Related records to be kept			
12.	Select wire sizing design		**Selecting wire sizing design:** • Introduction • Identification of wire sizing • Technical specification • Need of selecting wire sizing design • Procedure for selecting wire sizing design as per the customer's need • Related precautions to be taken • Related records to be kept	0.5	2.0	2.5
	Sub total:			**6**	**24**	**30**
	Sub module: 3: Installing/Assembling Solar PV System					
	Description: It consists of the basic skills and knowledge related to installing and assembling of solar PV system necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To install module/panel • To install battery • To install support structures • To install charge controller • To install junction box • To install wiring system • To install lamps • To install switches • To install inverter • To install earthing wire/plate • To install fans • To install solar pumps • To carry out operational tests					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to					

	perform the task and time necessary for both the theory and practical aspects of the task.					
	15 hrs. (Th.) + 98 Hrs. (Pr.) = 113 hrs.			Time (hrs.)		
SN	**Tasks**			**Th.**	**Pr,**	**Tot.**
1.	Read/interpret code/drawings		**Code/drawings:** • Concept, need, and identification of code/drawings • Interpretation of code/drawings • Related precautions to be taken • Related records to be kept	2	7	9
2.	Install module/panel		**Installing module/panel:** • Identification of module/panel • Procedure for assembling and installing module/panel as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8
3.	Install battery		**Installing battery:** • Identification of battery • Procedure for assembling and installing battery as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8
4.	Install support structures		**Installing support structures:** • Identification of support structures • Procedure for assembling and installing support structures as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8

5.	Install charge controller		**Installing charge controller:** • Identification of charge controller • Procedure for assembling and installing charge controller as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8
6.	Install junction box		**Installing junction box:** • Identification of junction box • Procedure for assembling and installing junction box as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8
7.	Install wiring system		**Installing wiring system:** • Identification of wiring system • Procedure for assembling and installing wiring system as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8
8.	Install lamps		**Installing lamps:** • Identification of lamps • Procedure for assembling and installing lamps as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8
9.	Install switches		**Installing switches:** • Identification of switches	1	7	8

			• Procedure for assembling and installing switches as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept			
10.	Install inverter		**Installing inverter:** • Identification of inverter • Procedure for assembling and installing inverter as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8
11.	Install earthing wire/plate		**Installing earthing wire/plate:** • Identification of earthing wire/plate • Procedure for assembling and installing earthing wire/plate as per the design made based to the needs of customers • Test for proper functioning • Related precautions to be taken • Related records to be kept	1	7	8
12.	Install fans		**Installing fans:** • Identification of fans • Procedure for assembling and installing fans as per the design made based to the needs of customers • Related precautions to be taken • Related records to be kept	1	7	8
13.	Install solar pumps		**Installing solar pumps:** • Identification of solar pumps • Procedure for assembling and installing solar pumps as per the design made based to the needs of customers • Test for proper functioning	1	7	8

			• Related precautions to be taken • Related records to be kept			
14.	Carry out operational tests		**Carry out operational tests**: • Concept and need for operational tests • Procedure for carrying out operational tests • Related precautions to be taken • Related records to be kept	1	7	8
	Sub total:			**15**	**98**	**113**
	Sub module: 4: Testing Solar PV System / Equipment					
	Description: It consists of the basic skills and knowledge related to testing of solar PV system and equipment necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To test module / panel • To test for angles • To test battery • To test for specific gravity (Electrolyte level) • To test for voltage • To test for current • To test for acid level • To test charge controller • To test for resistance • To test wire • To test switches • To test lamps • To test converter • To test inverter • To test vaccine refrigerator					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
	8 hrs. (Th.) + 52 Hrs. (Pr.) = 60 hrs.			Time (hrs.)		
SN	**Tasks**			**Th.**	**Pr,**	**Tot.**
1.	Test Module / panel		**Test of Module / panel**: • Concept, need and application of testing module/panel for its proper functioning • Principle and procedures for	0.6	3.4	4

			testing module/panel for its proper functioning • Related precautions to be taken • Related records to be kept			
2.	Test for angles		**Test for angles:** • Concept, need and application of testing for angles • Principle and procedures for testing for angles • Related precautions to be taken	0.6	3.4	4
3.	Test battery		**Test of battery:** • Concept, need and application of testing battery for its proper functioning • Principle and procedures for testing battery for its proper functioning • Related precautions to be taken	0.6	3.4	4
4.	Test for specific gravity (Electrolyte level)		**Test for specific gravity (Electrolyte level):** • Concept, need and application of testing specific gravity • Principle and procedures for testing specific gravity • Related precautions to be taken	0.6	3.4	4
5.	Test for voltage		**Test for voltage:** • Concept, need and application of testing voltage • Principle and procedures for testing voltage • Related precautions to be taken	0.6	3.4	4
6.	Test for current		**Test for current:** • Concept, need and application of testing current • Principle and procedures for testing current • Related precautions to be taken	0.5	3.5	4

7.	Test for acid level		**Test for acid level:** • Concept, need and application of testing acid level • Principle and procedures for testing acid level • Related precautions to be taken	0.5	3.5	4
8.	Test charge controller		**Test of charge controller**: • Concept, need and application of testing charge controller for its proper functioning • Principle and procedures for testing charge controller for its proper functioning • Related precautions to be taken	0.5	3.5	4
9.	Test for resistance		**Test for resistance:** • Concept, need and application of testing resistance • Principle and procedures for testing resistance • Related precautions to be taken	0.5	3.5	4
10.	Test wire		**Test of wire :** • Concept, need and application of testing wire for its proper functioning • Principle and procedures for testing wire for its proper functioning • Related precautions to be taken	0.5	3.5	4
11.	Test switches		**Test of switches:** • Concept, need and application of testing switches for its proper functioning • Principle and procedures for testing switches for its proper functioning • Related precautions to be taken	0.5	3.5	4
12.	Test lamps		**Test of lamps:**	0.5	3.5	4

			• Concept, need and application of testing lamps for its proper functioning • Principle and procedures for testing lamps for its proper functioning • Related precautions to be taken			
13.	Test converter		**Test of converter:** • Concept, need and application of testing converter for its proper functioning • Principle and procedures for testing converter for its proper functioning • Related precautions to be taken	0.5	3.5	4
14.	Test inverter		**Test of inverter:** • Concept, need and application of testing inverter for its proper functioning • Principle and procedures for testing inverter for its proper functioning • Related precautions to be taken	0.5	3.5	4
15.	Test vaccine refrigerator		**Test of vaccine refrigerator**: • Concept, need and application of testing vaccine refrigerator for its proper functioning • Principle and procedures for testing vaccine refrigerator for its proper functioning • Related precautions to be taken	0.5	3.5	4
	Sub total:			**8**	**52**	**60**
	Module:4: Maintenance, Servicing and Trouble shooting					
	Description: It consists of the basic skills and knowledge related to maintenance, servicing and trouble shooting of solar PV electronic components necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives:					

	• To perform routine maintenance/servicing activities • To Trouble shoot solar home system components					
	Sub modules: 1. Routine Maintenance/Servicing 2. Trouble shooting of solar home system components					
	Sub module: 1: Routine Maintenance/Servicing					
	Description: It consists of the basic skills and knowledge related to routine maintenance and servicing of solar PV electronic components necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To perform regular maintenance of power conditioning equipment • To perform regular maintenance of weather sealing • To perform regular maintenance of balance of system equipment • To perform regular maintenance of batteries • To perform regular maintenance of arrays • To perform regular maintenance of module • To perform regular maintenance of structural system • To perform regular maintenance of safety system • To perform after sales services • To train customers for PV solar system					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
	6 hrs. (Th.) + 24 Hrs. (Pr.) = 30 hrs.			Time (hrs.)		
SN	**Tasks**			**Th.**	**Pr,**	**Tot.**
1.	Perform regular maintenance of power conditioning equipment		**<u>Regular maintenance of power conditioning equipment</u>**: • Identification of power conditioning equipment • Need for regular maintenance of power conditioning equipment • Trouble shooting procedures • Procedures for maintenance of power conditioning equipment • Related precautions to be taken • Related records to be kept	0.6	2.4	3
2.	Perform regular maintenance of weather sealing		**<u>Regular maintenance of weather sealing</u>**: • Identification of weather	0.6	2.4	3

			sealing • Need for regular maintenance of weather sealing • Trouble shooting procedures • Procedures for maintenance of weather sealing • Related precautions to be taken • Related records to be kept			
3.	Perform regular maintenance of balance of system equipment		**Regular maintenance of balance of system equipment**: • Identification of system equipment • Need for regular maintenance of balance of system equipment • Trouble shooting procedures • Procedures for maintenance of balance of system equipment • Related precautions to be taken • Related records to be kept	0.6	2.4	3
4.	Perform regular maintenance of batteries		**Regular maintenance of batteries**: • Identification of batteries • Need for regular maintenance of batteries • Trouble shooting procedures • Procedures for maintenance of batteries • Related precautions to be taken • Related records to be kept	0.6	2.4	3
5.	Perform regular maintenance of arrays		**Regular maintenance of arrays:** • Identification of arrays • Need for regular maintenance of arrays • Trouble shooting procedures • Procedures for maintenance of arrays • Related precautions to be taken • Related records to be kept	0.6	2.4	3

6.	Perform regular maintenance of module		**Regular maintenance of module:** • Identification of module • Need for regular maintenance of module • Trouble shooting procedures • Procedures for maintenance of module • Related precautions to be taken • Related records to be kept	0.6	2.4	3
7.	Perform regular maintenance of structural system		**Regular maintenance of structural system:** • Identification of structural system • Need for regular maintenance of structural system • Trouble shooting procedures • Procedures for maintenance of structural system • Related precautions to be taken • Related records to be kept	0.6	2.4	3
8.	Perform regular maintenance of safety system		**Regular maintenance of safety system:** • Identification of safety system • Need for regular maintenance of safety system • Trouble shooting procedures • Procedures for maintenance of safety system • Related precautions to be taken • Related records to be kept	0.6	2.4	3
9.	Perform after sales services		**After sales services:** • Concept of after sales services • Need for after sales services • After sales service procedures • Related precautions to be taken • Related records to be kept	0.6	2.4	3
10.	Train customers for PV solar system		**Training for customers for PV solar system**:	0.6	2.4	3

			• Concept and need for training customers for PV solar system • Customer training curricula • Training methods • Procedures for training customers for PV solar system • Related precautions to be taken • Related records to be kept			
	Sub total:			**6**	**24**	**30**
	Sub module: 2: Trouble shooting of Solar Home System Components					
	Description: It consists of the basic skills and knowledge related to trouble shooting of solar home system components necessary for a solar photovoltaic technician for an effective and efficient performance of the job. It also provides skills and knowledge of replacing and replacing faulty components.					
	Objectives: • To trouble shoot for solar PV module • To trouble shoot for charge controller/generic • To trouble shoot for light set • To trouble shoot for battery • To trouble shoot for DC/DC converter/generic • To trouble shoot for DC/AC invertors					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
			6 hrs. (Th.) + 54 Hrs. (Pr.) =60 hrs.	Time (hrs.)		
SN	**Tasks**			**Th.**	**Pr,**	**Tot.**
1.	Trouble shoot for solar PV module		**<u>Trouble shooting for solar PV module:</u>** • Interpret catalogues /drawings/manuals • Dissembling • Detecting faults • Replacing/repairing components • Assembling • Testing • Safety precautions • Record keeping	1	9	10

2.	Trouble shoot for charge controller/generic		**<u>Trouble shooting for charge controller/generic:</u>** • Interpret catalogues /drawings/manuals • Dissembling • Detecting faults • Replacing/repairing components • Assembling • Testing • Safety precautions • Record keeping	1	9	10
3.	Trouble shoot for light set		**<u>Trouble shooting for light set:</u>** • Interpret catalogues /drawings/manuals • Dissembling • Detecting faults • Replacing/repairing components • Assembling • Testing • Safety precautions • Record keeping	1	9	10
4.	Trouble shoot for battery		**<u>Trouble shooting for battery:</u>** • Interpret catalogues /drawings/manuals • Dissembling • Detecting faults • Replacing/repairing components • Assembling • Testing • Safety precautions • Record keeping	1	9	10
5.	Trouble shoot for DC/DC converter/generic		**<u>Trouble shooting for DC/DC converter/generic:</u>** • Interpret catalogues /drawings/manuals • Dissembling • Detecting faults • Replacing/repairing components • Assembling	1	9	10

			• Testing • Safety precautions • Record keeping			
6.	Trouble shoot for DC/AC invertors		**Trouble shooting for DC/AC invertors:** • Interpret catalogues /drawings/manuals • Dissembling • Detecting faults • Replacing/repairing components • Assembling • Testing • Safety precautions • Record keeping	1	9	10
	Sub total:			**6**	**54**	**60**
	Module:5: Management					
	Description: It consists of the basic skills and knowledge related to market solar PV products, manage store and prepare documents necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To market solar PV products • To manage store • To prepare documents					
	Sub modules: 1. Marketing Solar PV Products 2. First Aid Management 3. Store Management 4. Preparing Documents 5. Communication					
	Sub module: 1: Marketing Solar PV Products					
	Description: It consists of the basic skills and knowledge related to market solar PV products necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To provide introduction of solar installation company • To advertise the products • To communicate with others					

	• To introduce products • To price the products • To receive customers' orders • To collect demands • To analyze the data • To place orders					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
			4 hrs. (Th.) + 8 Hrs. (Pr.) = 12 hrs.	**Time (hrs.)**		
SN	**Tasks**			**Th.**	**Pr,**	**Tot.**
1.	Provide introduction of solar installation company		**Providing introduction of solar installation company**: • Solar installation companies and their introduction • Related records to be kept	0.4	0.8	1.2
2.	Advertise the products		**Advertising the products**: • Concept and need for advertising the products • Procedures for advertising the products • Related precautions to be taken • Related records to be kept	0.5	0.8	1.3
3.	Communicate with others		**Communicating with others**: • Concept and need for communicating with others • Procedures for communicating with others Related precautions to be taken • Related records to be kept	0.5	0.8	1.3
4.	Introduce products		**Introducing products**: • Concept and need for introducing products • Procedures for introducing products • Related precautions to be taken • Related records to be kept	0.5	0.8	1.3
5.	Price the products		**Pricing the products**: • Concept and need for pricing the products • Procedures for pricing the	0.4	0.8	1.2

			products • Related precautions to be taken • Related records to be kept			
6.	Receive customers' orders		**Receiving customers' orders**: • Concept and need for receiving customers' orders • Procedures for receiving customers' orders • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
7.	Collect demands		**Collecting demands:** • Concept and need for collecting demands • Procedures for collecting demands • Related precautions to be taken • Related records to be kept	0.4	1	1.4
8.	Analyze the data		**Analyzing the data:** • Concept and need for analyzing the data • Procedures for analyzing the data • Related precautions to be taken • Related records to be kept	0.5	1.4	1.9
9.	Place orders		**Placing orders**: • Concept and need for placing orders • Procedures for placing orders • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
	Sub total:			**4**	**8**	**12**
	Sub module:2: Store Management					
	Description: It consists of the basic skills and knowledge related to manage store necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To receive incoming tools/materials/ equipment • To check received tools/materials/ equipment (Quality control check up)					

	• To prepare inventory (Record stock) • To code company serial number (in grabbed company serial number) • To fill acid battery • To charge battery (Single/storage bank) • To cut wire to required size • To carry out packing • To deliver the packages • To keep records					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
			4 hrs. (Th.) +8 Hrs. (Pr.) = 12 hrs.	Time (hrs.)		
SN	**Tasks**			**Th.**	**Pr,**	**Tot.**
1.	Receive incoming tools/materials/ equipment		**Receiving incoming tools/materials/ equipment:** • Identification of incoming tools/materials/ equipment • Reception procedures for incoming tools/materials/ equipment • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
2.	Check received tools/materials/ equipment (Quality control check up)		**Checking received tools/materials/ equipment (Quality control check up):** • Concept and need of Quality control check up • Checking received tools/materials/ equipment (Quality control check up) • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
3.	Prepare inventory (Record stock)		**Preparing inventory (Record stock):** • Concept and need of preparing inventory • Procedures for preparing inventory • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
4.	Code company serial number (in grabbed company serial number)		**Coding company serial number (in grabbed company**	0.4	0.8	1.2

			serial number): • Concept and need of coding company serial number • Procedures for coding company serial number • Related precautions to be taken • Related records to be kept			
5.	Fill acid in battery		**Filling acid in battery:** • Concept and need of filling acid in battery • Procedures for filling acid in battery • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
6.	Charge battery (Single/storage bank)		**Charging battery (Single/storage bank):** • Concept and need of charging battery • Procedures for charging battery • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
7.	Cut wire to required size		**Cutting wire to required size**: • Concept and need of cutting wire to required size • Procedures for cutting wire to required size • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
8.	Carry out packing		**Carrying out packing:** • Concept and need of packing • Procedures for packing • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
9.	Deliver the packages		**Delivering the packages:** • Concept and need of delivering the packages • Procedures for delivering the packages	0.4	0.8	1.2

			• Related precautions to be taken • Related records to be kept			
10.	Keep records		**Keeping records**: • Concept and need of keeping records • Procedures for keeping records • Related precautions to be taken	0.4	0.8	1.2
	Sub total:			**4**	**8**	**12**
	Sub module: 3: Preparing Documents					
	Description: It consists of the basic skills and knowledge related to prepare documents necessary for a solar photovoltaic technician for an effective and efficient performance of the job.					
	Objectives: • To fill warranty card • To inform about subsidiary policy • To fill subsidiary form • To take photos • To compile documents					
	Tasks: Each task consists of a task statement, related technical knowledge necessary to perform the task and time necessary for both the theory and practical aspects of the task.					
			2 hrs. (Th.) + 4 Hrs. (Pr.) = 6 hrs.	Time (hrs.)		
SN	**Tasks**			**Th.**	**Pr,**	**Tot.**
1.	Fill warranty card		**Filling warranty card:** • Concept and need of warranty card • Format of warranty card • Filling the warranty card • Procedures for keeping records • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
2.	Inform about subsidiary policy		**Informing about subsidiary policy:** • Concept and need of subsidiary policy • Informing about subsidiary policy	0.4	0.8	1.2

			• Related precautions to be taken • Related records to be kept			
3.	Fill subsidiary form		**<u>Filling subsidiary form:</u>** • Concept and need of subsidiary form • Format of subsidiary form • Filling the subsidiary form • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
4.	Take photos		**<u>Taking photos:</u>** • Need of taking photos • Handling and care of cameras • Procedures for taking photos • Related precautions to be taken • Related records to be kept	0.4	0.8	1.2
5.	Compile documents		**<u>Compiling documents</u>**: • Need to compile documents • 'How to' of compiling documents • Related precautions to be taken	0.4	0.8	1.2
	Sub total:			**2**	**4**	**6**

Module: 6: Common module

Description: This module consists of skills and knowledge related to applied math, occupational health and safety, HIV/AIDS, first aid, communication, and small business management applicable in the related job performances.

Objectives: After its completion the trainees will be able:

- To carry out simple mathematical calculations related to the occupation
- To be familiar with hazards related to this occupation
- To apply preventive measures for occupational health and safety
- To apply first aid measures
- To apply preventive measures for HIV/AIDS
- To communicate with others
- To apply skills of small business management

Sub modules:

1. Applied math
2. Occupational health and safety
3. First aid
4. HIV/AIDS
5. Communication
6. Small business management

Sub module: 1: Applied math

Description: It consists of skills and knowledge related to mathematical calculations applicable in the related occupational performances.

Objective: After its completion the trainees will be able:

- To carry out simple mathematical calculations that must be done for the effective performance in the occupational job.

Tasks: To fulfill the objective the trainees are expected to get proficiency on the following tasks/skills/steps together with their related technical knowledge:

		Th.(4 hrs) + Pr.(16hrs) = Tot.(20 hrs)		Time(hrs)	
SN	**Tasks or skills/ steps**	**Related technical knowledge**	**Th.**	**Pr.**	**Tot.**
1.	Carry out simple addition applicable in job situation	**Addition:** • Concept • Simple calculations • Application in the occupation	0.2	0.8	1
2.	Carry out simple subtraction applicable in job situation	**Subtraction**: • Concept • Simple calculations • Application in the occupation	0.2	0.8	1
3.	Carry out simple multiplication applicable in job situation	**Multiplication** • Concept • Simple calculations • Application in the occupation	0.2	0.8	1
4.	Carry out simple division applicable in job situation	**Division:**	0.2	0.8	1

			• Concept • Simple calculations • Application in the occupation			
5.	Carry out measurements		**Measurement:** • Concept • Application in the occupation	0.2	0.8	1
6.	Convert units of measurement		**Units of measurement:** • Concept • Units of measurement • Unit conversion • application	0.2	0.8	1
7.	Convert units of measuring temperature		**Units of measuring temperature:** • Concept • Units of temperature measurement • Unit conversion • Application	0.2	0.8	1
8.	Calculate area		**Area:** • Concept • Formula • Calculation • Application	0.2	0.8	1
9.	Calculate volume		**Volume:** • Concept • Formula • Calculation • Application	0.2	0.8	1
10.	Calculate weight		**Weight:** • Concept • Formula • Calculation • Application	0.2	0.8	1
11.	Calculate percentage		**Percentage:** • Concept • Formula • Calculation • Application	0.2	0.8	1
12.	Calculate ratio and proportions		**Ratio and proportions:** • Concept • Formula • Calculation • Application	0.2	0.8	1

13.	Apply Pythagoras formula		**Pythagoras formula:** • Concept • Formula • Calculation • Application	0.2	0.8	1
14.	Apply unitary method		**Unitary method:** • Concept • Calculation • Application	0.2	0.8	1
15.	Calculate simple interest		**Simple interest:** • Concept • Formula • Calculation • Application	0.2	0.8	1
16.	Calculate unit cost		**Unit cost:** • Concept • Formula • Calculation • Application	0.2	0.8	1
17.	Calculate per unit income		**Per unit income:** • Concept • Formula • Calculation • Application	0.2	0.8	1
18.	Calculate profit and loss		**Profit and loss:** • Concept • Formula • Calculation • Application	0.2	0.8	1
19.	Perform billing		**Billing:** • Concept • Calculation • Bill format • Procedure • Application	0.2	0.8	1
20.	Prepare simple balance sheet		**Balance sheet:** • Concept • Format • Procedure • Application	0.2	0.8	1
	Total:			**4**	**16**	**20**
	Sub module: 2: Occupational health and safety					
	Description: It consists of skills and knowledge related to occupational health and					

	safety applicable in the related occupational performances					
	Objectives: After its completion the trainees will be able: • To be familiar with hazards related to this occupation • To apply preventive measures for occupational health and safety					
	Tasks: To fulfill the objective the trainees are expected to get proficiency on the following tasks/skills/steps together with their related technical knowledge:					
		Th.(2 hrs) + Pr.(8hrs) = Tot.(10 hrs)		Time(hrs)		
SN	**Tasks or skills/ steps**		**Related technical knowledge**	**Th.**	**Pr.**	**Tot.**
Be familiar with hazards related to this occupation						
1.	Be familiar with accident hazards		**Accident hazards:** • Concept • Causes • Procedures for managing this hazard	0.2	0.8	1
2.	Be familiar with physical hazards		**Physical hazards:** • Concept • Causes • Procedures for managing this hazard	0.2	0.8	1
3.	Be familiar with chemical hazards		**Chemical hazards:** • Concept • Causes • Procedures for managing this hazard	0.2	0.8	1
4.	Be familiar with biological hazards		**Biological hazards:** • Concept • Causes • Procedures for managing this hazard	0.2	0.8	1
5.	Be familiar with ergonomic/psychological / organizational factors:		**Ergonomic /psychological / organizational factors:** • Concept of : ▪ Ergonomic factors ▪ Psychological factors ▪ organizational factors • Procedures for managing hazards caused by these factors	0.2	0.8	1
	Sub total:			**1**	**4**	**4**
Apply preventive measures for occupational health and safety						
1.	Ware safety wares		**Safety wares:** • Identification • Needs • Wearing procedures	0.2	0.5	0.7

2.	Inspect workplace before working		**<u>Workplace inspection:</u>** • Concept • Principle and procedures • Records keeping	0.2	0.5	0.7
3.	Inspect tools/materials/equipment before use		**<u>Inspection of tools/materials/equipment:</u>** • Concept and identification • Principle and procedures • Records keeping	0.1	0.5	0.6
4.	Be prevented from accident hazards		**<u>Prevention of accident hazards</u>**: • Concept • Being prevented from accident hazards • Records keeping	0.1	0.5	0.6
5.	Be prevented from physical hazards		**<u>Prevention of physical hazards:</u>** • Concept • Being prevented from physical hazards • Records keeping	0.1	0.5	0.6
6.	Be prevented from chemical hazards		**<u>Prevention of chemical hazards</u>**: • Concept • Being prevented from chemical hazards • Records keeping	0.1	0.5	0.6
7.	Be prevented from biological hazards		**<u>Prevention of biological hazards</u>**: • Concept • Being prevented from biological hazards • Records keeping	0.1	0.5	0.6
8.	Be prevented from ergonomic/psychological / organizational factors that create problems/hazards.		**<u>Prevention of ergonomic/psychological / organizational factors that create problems/hazards:</u>** • Concept • Being prevented from ergonomic/psychological / organizational factors that create problems/hazards • Records keeping	0.1	0.5	0.6
	Sub total:			**1**	**4**	**5**
	Total:			**2**	**8**	**10**

	Sub module: 3: First aid				
	Description: It consists of skills and knowledge related to first aid measures applicable in the related occupational performances.				
	Objective: After its completion the trainees will be able: • To **a**pply first aid measures				
	Tasks: To fulfill the objective the trainees are expected to get proficiency on the following tasks/skills/steps together with their related technical knowledge:				
	Th.(1 hrs) + Pr.(4hrs) = Tot.(5 hrs)			Time(hrs)	
SN	**Tasks or skills/ steps**		**Related technical knowledge**	**Th.**	**Pr.**	**Tot.**
1.	Carryout simple dressings		**Carryout simple dressings:** • Concept • Needs • Procedures • Precautions • Recording	0.10	0.40	0.5
2.	Apply simple bandages		**Apply simple bandages:** • Concept • Needs • Procedures • Precautions • Recording	0.10	0.40	0.5
3.	Apply first aid for simple wounds		**Apply first aid for simple wounds:** • Concept • Needs • Procedures • Precautions • Recording	0.10	0.40	0.5
4.	Apply first aid for heat /chemical burns		**Apply first aid for heat /chemical burns:** • Concept • Needs • Procedures • Precautions • Recording	0.10	0.40	0.5
5.	Apply first aid for injuries/cuts		**Apply first aid for injuries/cuts**: • Concept • Needs • Procedures • Precautions • Recording	0.10	0.40	0.5
6.	Apply first aid for fracture		**Apply first aid for fracture:** • Concept	0.10	0.40	0.5

			• Needs • Procedures • Precautions • Recording			
7.	Apply first aid for simple bleeding		**<u>Apply first aid for simple bleeding:</u>** • Concept • Needs • Procedures • Precautions • Recording	0.10	0.40	0.5
8.	Apply first aid for insect bites		**<u>Apply first aid for insect bites:</u>** • Concept • Needs • Procedures • Precautions • Recording	0.05	0.20	0.25
9.	Apply first aid for animal bites		**<u>Apply first aid for animal bites:</u>** • Concept • Needs • Procedures • Precautions • Recording	0.05	0.20	0.25
10.	Apply first aid for frost bite		**<u>Apply first aid for frost bite :</u>** • Concept • Needs • Procedures • Precautions • Recording	0.05	0.20	0.25
11.	Apply first aid for simple poisoning		**<u>Apply first aid for simple poisoning:</u>** • Concept • Needs • Procedures • Precautions • Recording	0.05	0.20	0.25
12.	Apply first aid for electrical shock		**<u>Apply first aid for electrical shock:</u>** • Concept • Needs • Procedures • Precautions • Recording	0.05	0.20	0.25

13.	Apply first aid for choking/ drowning		**<u>Apply first aid for choking/ drowning:</u>** • Concept • Needs • Procedures • Precautions • Recording	0.05	0.20	0.25
	Total:			**1**	**4**	**5**
	Sub module: 4: HIV/AIDS					
	Description: It consists of skills and knowledge related to safety measures to be followed for the prevention of HIV/AIDS including its management.					
	Objectives: After its completion the trainees will be able: • To state the concept of HIV/AIDS To apply safety measures for prevention of HIV/AIDS					
	Tasks: To fulfill the objective the trainees are expected to get proficiency on the following tasks/skills/steps together with their related technical knowledge:					
	Th.(1 hrs) + Pr.(4hrs) = Tot.(5 hrs)			Time(hrs)		
SN	**Tasks or skills/ steps**		**Related technical knowledge**	**Th.**	**Pr.**	**Tot.**
1.	**State the concept of HIV/AIDS** 1. Define HIV 2. Enlist modes of transmission of HIV 3. Enlist signs and symptoms of HIV infected person 4. Enlist stages of HIV 5. Define AIDS 6. Enlist signs and symptoms of AIDS 7. Enlist current status of global HIV/AIDS 8. Enlist difference between HIV/AIDS		**<u>State the concept of HIV/AIDS:</u>** **<u>HIV</u>:** • Definition of HIV: • Modes of transmission of HIV • Signs and symptoms of HIV infected person • Stages of HIV **<u>AIDS</u>:** • Definition of AIDS • Signs and symptoms of AIDS • Current status of global HIV/AIDS • Difference between HIV and AIDS	0.5	2	2.5
2.	Apply safety measures for prevention of **HIV/AIDS:** 1. Keep touch with single partner for sexual intercourse 2. Ensure safe intercourse 3. Use condom carefully and consistently during each act of sexual intercourse incase of other than single sex partner 4. Keep away from sharing syringes, needles and other		**<u>Apply safety measures for prevention of HIV/AIDS:</u>** • Keeping touch with single partner for sexual intercourse • Ensuring safe intercourse • Using condom carefully and consistently during each act of sexual intercourse incase of other than single sex partner • Keeping away from sharing	0.5	2	2.5

	skin piercing instrument with HIV infected people 5. Keep away from sharing toothbrushes, blade razors or other instruments that could become contaminated from blood 6. Keep away from handling clothes or cloths that are visibly contaminated with blood 7. Follow positive health behavior 8. Get blood be tested to ensure HIV negative/positive		• syringes, needles and other skin piercing instrument with HIV infected people • Keeping away from sharing toothbrushes, blade razors or other instruments that could become contaminated from blood • Keeping away from handling clothes or cloths that are visibly contaminated with blood • Positive health behavior • Getting blood be tested to ensure HIV negative/positive			
	Total:			1	4	5
	Sub module: 5 : Communication					
	Description: It consists of the skills and knowledge related to communication in the related occupation. Each task consists of its steps, related technical knowledge and hour distribution.					
	Objectives: After its completion the trainees will be able:					
	• To handle telephone calls • To handle fax • To handle mail • To write letters • To write memos / tips / notes / notice • To perform internal communication • To perform external communication • To perform oral communication • To perform written communication		• To communicate with donors To communicate with financial institutes • To link with media • To disseminate information • Write job application • Prepare Resume. • Communicate with senior. • Communicate with juniors. • Deal with customers • Request / purchase tool, supplies, materials and equipment. • Fill up leave requisition form.			
	Tasks: To fulfill the objective the trainees are expected to get proficiency on the following tasks/skills/steps together with their related technical knowledge:					
			Th.(2 hrs) + Pr.(8hrs) = Tot.(10 hrs)	**Time(hrs)**		
SN	**Tasks or skills/ steps**		**Related technical knowledge**	**Th.**	**Pr.**	**Tot.**
1.	Handle telephone calls		**<u>Handling telephone calls:</u>** • Concept, need, and importance • Operating principles and procedures	0.1	0.4	0.5

			• Care and maintenance • Safety precautions to be taken • Keeping activity records			
2.	Handle fax		**<u>Handling fax:</u>** • Concept, need, and importance • Operating principles and procedures • Care and maintenance • Safety precautions to be taken • Keeping activity records	0.1	0.4	0.5
3.	Handle mail		**<u>Handling mail:</u>** • Concept, need, and importance • Operating principles and procedures • Care and maintenance • Safety precautions to be taken • Keeping activity records	0.1	0.4	0.5
4.	Write letters		**<u>Writing letters:</u>** • Concept, need, and importance • Types of letter • Component parts of each type of letter • Format of each type of letter • Writing letters • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
5.	Write memos / tips / notes / notice		**<u>Writing memos / tips / notes / notice :</u>** • Concept, need, and importance • Component parts of memos / tips / notes / notice • Format of memos / tips / notes / notice • Writing memos / tips / notes / notice • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
6.	Prepare simple report		**<u>Preparing simple report:</u>** • Concept, need, and importance	0.1	0.4	0.5

			• Component parts of a report • Format of a report • Writing a report • Precautions to be taken • Keeping activity records			
7.	Prepare simple proposal		**<u>Preparing simple proposal:</u>** • Concept, need, and importance • Component parts of a proposal • Format of a proposal • Writing a proposal • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
8.	Perform internal/ external communication		**<u>Performing internal/ external communication:</u>** • Concept, need, and importance • Principles, procedures, and application • Performing internal/ external communication • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
9.	Perform horizontal/vertical communication		**<u>Performing horizontal/vertical communication:</u>** • Concept, need, and importance • Principles, procedures, and application • Performing horizontal/vertical communication • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
10.	Perform oral/ written communication		**<u>Performing oral/ written communication:</u>** • Concept, need, and importance • Principles, procedures, and application • Performing oral/ written communication • Precautions to be taken	0.1	0.4	0.5

			• Keeping activity records			
11.	Communicate with financial institutes		**<u>Communicating with financial institutes:</u>** • Concept, need, and importance • Principles, procedures, and application • Communicating with financial institutes • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
12.	Link with media		**<u>Linking with media:</u>** • Concept, need, and importance • Principles, procedures, and application • Linking with media • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
13.	Disseminate information		**<u>Disseminating information:</u>** • Concept, need, and importance • Principles, procedures, and application • Disseminating information • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
14.	Write job application		**<u>Writing job application:</u>** • Concept, need, and importance • Component parts of job application • Format of job application • Writing job applications • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
15.	Prepare resume		**<u>Preparing resume:</u>** • Concept, need, and importance • Component parts of a resume • Format of a resume • Writing resume • Precautions to be taken • Keeping activity records	0.1	0.4	0.5

16.	Communicate with senior.		**<u>Communicating with senior:</u>** • Concept, need, and importance • Principles, procedures, and application • Communicating with senior • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
17.	Communicate with juniors.		**<u>Communicating with juniors:</u>** • Concept, need, and importance • Principles, procedures, and application • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
18.	Deal with customers/stake holders		**<u>Dealing with customers/stake holders:</u>** • Concept, need, and importance • Principles, procedures, and application • Communicating with juniors • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
19.	Request / purchase tool, supplies, materials and equipment.		**<u>Requesting / purchasing tool, supplies, materials and equipment</u>**: • Concept, need, and importance • Principles, procedures, and application • Requesting / purchasing tool, supplies, materials and equipment • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
20.	Fill up leave requisition form		**<u>Filling up leave requisition form</u>**: • Concept, need, and importance • Principles, procedures, and application • Filling up leave requisition form	0.1	0.4	0.5

			• Precautions to be taken • Keeping activity records			
			Total:	**2**	**8**	**10**
	Sub module: 6 : Small enterprise development					
	Description: It consists of the skills and knowledge related to small enterprise development in the related occupation. Each task consists of its steps, related technical knowledge and hour distribution.					
	Objectives: After its completion the trainees will be able: • To be familiar with entrepreneurship development To prepare a business plan					
	Tasks: To fulfill the objective the trainees are expected to get proficiency on the following tasks/skills/steps together with their related technical knowledge:					
			Th.(4 hrs) + Pr.(16 hrs) = Tot.(20 hrs)	Time(hrs)		
SN	**Tasks or skills/ steps**		**Related technical knowledge**	**Th.**	**Pr.**	**Tot.**
	<u>Entrepreneurship development:</u>		**<u>Entrepreneurship development:</u>**			
1.	Be familiar with business / entrepreneurship		**<u>Business / entrepreneurship:</u>** • Concept, definitions, need, and importance • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
2.	Develop qualities of a successful entrepreneur		**<u>Qualities of a successful entrepreneur:</u>** • Concept and needs • Qualities of a successful entrepreneur • Keeping activity records	0.1	0.4	0.5
3.	Follow professional ethics		**<u>Professional ethics:</u>** • Concept, need, and importance • Professional ethics • Interpretation • Precautions to be taken • Keeping activity records	0.1	0.4	0.5
4.	Analyze prevailing rules / regulations/ laws /acts related to the profession		**<u>Prevailing rules / regulations/ laws /acts related to the profession:</u>** • Concept, need, and importance • Prevailing rules / regulations/ laws /acts related to the profession • Interpretation • Precautions to be taken	0.1	0.4	0.5

			• Keeping activity records			
5.	Develop skills of good governance		**<u>Good governance:</u>** • Concept, need, and importance • Principles and procedures of good governance • Precautions to be taken • Keeping activity re	0.1	0.4	0.5
6.	Be familiar with entrepreneurship development/ factors affecting the growth of entrepreneurship		**<u>Entrepreneurship development/ factors affecting the growth of entrepreneurship:</u>** • Concept, need, and importance • Entrepreneurship development • Factors affecting the growth of entrepreneurship • Precautions to be taken • Keeping records	0.1	0.4	0.5
7.	Develop an entrepreneurship competency development [ECD] program		**<u>Entrepreneurship competency development [ECD] program</u>**: • Concept, need, and importance • Entrepreneurship competency development [ECD] • ECD program development • Precautions to be taken • Keeping records	0.1	0.4	0.5
8.	Be familiar with identification / selection/appraising/gaining instructional a support of a project • Be familiar with identification of a project • Be familiar with selection of a project • Be familiar with appraising of a project • Be familiar with gaining instructional a support of a project		**<u>Identification / selection/appraising/gaining instructional a support of a project:</u>** • Concept, need, and importance • Identification of a project • Selection of a project • Appraising of a project • Gaining instructional a support of a project • Precautions to be taken • Keeping records	0.1	0.4	0.5
9.	Be familiar with the preparation of a comprehensive business plan		**<u>Be familiar with the preparation of a</u>**	0.1	0.4	0.5

	for starting / acquiring /running a business		**<u>comprehensive business plan for starting / acquiring /running a business:</u>** • Preparation of a comprehensive business plan for starting a business • Preparation of a comprehensive business plan for acquiring a business • Preparation of a comprehensive business plan for running a business • Precautions to be taken • Keeping records			
10.	Be familiar with marketing of products		**<u>Be familiar with marketing of products:</u>** • concept of product, price, place, promotion • marketing of products • Precautions to be taken • Keeping records	0.1	0.4	0.5
			Sub total**:**	**1**	**4**	**5**
	<u>Business plan:</u>		**<u>Business plan:</u>**			
11.	Collect related information / data		**<u>Collecting related information / data:</u>** • Concept, need, and importance of data and information • Difference between data and information • Principles and procedures for collecting related information / data • Collecting related information / data • Precautions to be taken • Keeping records	0.4	1.6	2
12.	Prepare production plan		**<u>Preparing production plan:</u>** • Concept, need, and importance • Component parts • Format • Principles and procedures • Precautions to be taken • Keeping records	0.4	1.6	2

13.	Prepare cost plan		**<u>Preparing cost plan:</u>** • Concept, need, and importance • Component parts • Format • Principles and procedures • Precautions to be taken • Keeping records	0.4	1.6	2
14.	Prepare financial plan		**<u>Preparing financial plan:</u>** • Concept, need, and importance • Component parts • Format • Principles and procedures • Precautions to be taken • Keeping records	0.4	1.6	2
15.	Prepare marketing plan		**<u>Preparing marketing plan:</u>** • Concept, need, and importance • Component parts • Format • Principles and procedures • Precautions to be taken • Keeping records	0.4	1.6	2
16.	Prepare a business plan		**<u>Preparing a business plan:</u>** • Concept, need, and importance • Component parts • Format • Principles and procedures • Precautions to be taken • Keeping records	0.6	2.4	3
17.	Appraise business plan		**<u>Appraising business plan:</u>** • Concept, need, and importance • Principles and procedures • Precautions to be taken • Keeping records	0.4	1.6	2
			Sub total:	3	12	15
			Total:	4	16	20
			Common module total:	14	56	70
			All total:	**80**	**380**	**460**

List of tools, materials and equipment				
	• Acid water (litres) • Adjustable spanner • Ammeters (5 – 10 amps) • Banking powder (packets) • Battery 12V/40 Ah • Battery boxes • Bandages (rolls) • Battery terminals • Battery tester • Black mat paint (litres) • Burn cream (in tubes -80 gm) • Cable lugs (variable sizes) • Cable lug-tool • Calculator • Charge controller • Clamp meter • Claw Hammer • Combination pliers • Compass • Connectors • Continuity tester • Converter • Cotton woollen cloth • Crimping tools • DC Cable various sizes 4 -25 mm2(• DC power supply • DC/DC converter • DC+AC (5, 8, 11, 15, 18, 22, 25)-watt • Diodes 5, 10, 15, 20, 30 amp-rating • Disorder wire • Distilled water (litres) • Drawing instruments • Drill machine • Earth electrode • Electrician knife • Energy efficient bulbs • Extension cord • Files		• Hydrometer • Inclinometer and compass • Installation board • Iron stand • Junction box • Ladder • Lamp holder • Line tester • Lux meter • Metal plate 50x50cm. • Meter/Clamp • Modules -amorphous/ 20W • Modules: 40/20 Watt Mono/Poly • Multi meter • Nails, screws • Nose pliers • Ohmmeter • One way switch • Oscilloscope • Pencil • Pliers • Power supply • Pyranometer -Eppley • RMS meter • Ruler • Screw driver • Screw drivers • Set square • Shovel • Side cutting • Slide wrench • Solar light -DC • Solder paste • Solder pump • Solder wire • Soldering gun/iron • Soldering iron • Soldering wire (25kg) • Sprit level • Square boxes • Sulphuric acid (litres)	

	• Fire extinguisher (CO2) fused • Fuses-5, 10, 15, 20, 30 Amps • Glass/plastic • Gloves • Goggles • Hack saw • Hammer • Hand drill machine • Megger • Ammeter • Ohmmeter • Voltmeter • Wattmeter • Multimeter		• Switch over relay • Switch sockets • Tape measure • Tooth brush • Torch various lengths in m) • Vaseline (50 gm) • Water pumps • Watt-meter • Wire cutter • Wire stripper	

	Reading materials			
	• सौर्य विद्युत प्राविधिक तह - २ " तालिम पुस्तिका " : वैकल्पिक ऊर्जा प्रवर्द्धन केन्द (AEPC), २०६३ • सौर्य विद्युत प्राविधिक तह - १ "तालिम निर्देशिका " : वैकल्पिक ऊर्जा प्रवर्द्धन केन्द (AEPC), २०६१		• Instructor selected textbooks/ reference books / manuals/ journals and articles available in the market • Instructor prepared books, handouts, notes and manuals	
	Facilities			
	• Classroom (Spacious) • Well equipped workshop • Principal' room • Admin/Account room • Reception room • Trainers room • Still and Video Camera • A/V room • Vehicle(optional) • Canteen(optional) • Hostel(optional)		• OHP • Multimedia projector • Computer/Lap top • Photocopier/Scanner/Printer • Internet facilities • Telephone • Fax • Well equipped library • Water supply • Power supply	

Modules, sub modules, tasks, and time allocation

	Module:1: Basics of solar PV technology					
	10 hrs. (Th.) + 10 Hrs. (Pr.) = 10hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Be familiar with Solar Energy			2	1	3
2.	Identify PV system configurations /applications			3	1	4
3.	Be familiar with fundamentals of Solar Radiation			2	2	4
4.	Determine Solar Cells/ Modules/Arrays			2	3	5
5.	Be familiar with Solar Cell / Module Characteristics			1	3	4
	Sub total:			10	10	20

	Module:2: Designing, Installing & Testing					
	Sub module: 1: Tools / Materials / Equipment					
	4 hrs. (Th.) + 18 Hrs. (Pr.) = 22 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Handle hammer			0.1	0.9	1
2.	Handle wire cutter			0.1	0.9	1
3.	Handle combination pliers			0.1	0.9	1
4.	Handle wire stripper			0.1	0.9	1
5.	Handle hydrometer			0.2	0.8	1
6.	Handle multi meter			0.2	0.8	1
7.	Handle hand drill machine			0.2	0.8	1
8.	Handle nose pliers			0.2	0.8	1
9.	Handle slide wrench			0.2	0.8	1
10.	Handle crimping tools			0.2	0.8	1
11.	Handle screw driver			0.2	0.8	1
12.	Handle compass			0.2	0.8	1
13.	Handle set square			0.2	0.8	1
14.	Handle solder wire			0.2	0.8	1
15.	Handle disolder wire			0.2	0.8	1
16.	Handle solder paste			0.2	0.8	1
17.	Handle soldering iron			0.2	0.8	1
18.	Handle solder pump			0.2	0.8	1
19.	Handle iron stand			0.2	0.8	1
20.	Handle power supply			0.2	0.8	1
21.	Handle clamp meter			0.2	0.8	1
22.	Handle battery tester			0.2	0.8	1
	Sub total:			4	18	22

	Sub module: 2: Designing Solar PV System					
	6 hrs. (Th.) + 24 Hrs. (Pr.) = 30 hrs.					
SN	Tasks			Th.	Pr,	Tot.

1.	Design module/ Panel			0.6	2.4	3
2.	Design battery			0.6	2.4	3
3.	Design charge controller			0.6	2.4	3
4.	Design lamps			0.6	2.4	3
5.	Design switches			0.6	2.4	3
6.	Design converter(DC to DC)			0.6	2.4	3
7.	Design inverter (DC to AC)			0.6	2.4	3
8.	Design solar pumps			0.6	2.4	3
9.	Design vaccine refrigerator			0.6	2.4	3
10.	Design wire sizing			0.6	2.4	3
	Sub total:			6	24	30

	Sub module: 3: Installing/Assembling Solar PV system					
	14 hrs. (Th.) + 98 Hrs. (Pr.) = 112 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Read/interpret code/drawings			1	7	8
2.	Install module/panel			1	7	8
3.	Install battery			1	7	8
4.	Install support structures			1	7	8
5.	Install charge controller			1	7	8
6.	Install junction box			1	7	8
7.	Install wiring system			1	7	8
8.	Install lamps			1	7	8
9.	Install switches			1	7	8
10.	Install inverter			1	7	8
11.	Install earthing wire/plate			1	7	8
12.	Install fans			1	7	8
13.	Install solar pumps			1	7	8
14.	Carry out operational tests			1	7	8
	Sub total:			14	98	112

	Sub module: 4: Testing Solar PV System / Equipment					
	8 hrs. (Th.) + 52 Hrs. (Pr.) = 60 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Test Module / panel			0.6	3.4	4
2.	Test for angles			0.6	3.4	4
3.	Test battery			0.6	3.4	4
4.	Test for specific gravity (Electrolyte level)			0.6	3.4	4
5.	Test for voltage			0.6	3.4	4
6.	Test for current			0.5	3.5	4
7.	Test for acid level			0.5	3.5	4
8.	Test charge controller			0.5	3.5	4
9.	Test for resistance			0.5	3.5	4
10.	Test wire			0.5	3.5	4
11.	Test switches			0.5	3.5	4
12.	Test lamps			0.5	3.5	4

13.	Test converter			0.5	3.5	4
14.	Test inverter			0.5	3.5	4
15.	Test vaccine refrigerator			0.5	3.5	4
	Sub total:			8	52	60
	Module:3: Repair and maintenance					
	Sub module: 1: Routine Maintenance/Servicing					
	6 hrs. (Th.) + 24 Hrs. (Pr.) = 30 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Perform regular maintenance of power conditioning equipment			0.6	2.4	3
2.	Perform regular maintenance of weather sealing			0.6	2.4	3
3.	Perform regular maintenance of balance of system equipment			0.6	2.4	3
4.	Perform regular maintenance of batteries			0.6	2.4	3
5.	Perform regular maintenance of arrays			0.6	2.4	3
6.	Perform regular maintenance of module			0.6	2.4	3
7.	Perform regular maintenance of structural system			0.6	2.4	3
8.	Perform regular maintenance of safety system			0.6	2.4	3
9.	Perform after sales services			0.6	2.4	3
10.	Train customers for PV solar system			0.6	2.4	3
	Sub total:			6	24	30
	Sub module: 2: Repair /Maintenance of Solar PV Electronic Components					
	8 hrs. (Th.) + 77 Hrs. (Pr.) = 85 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Replace bypass diode			0.6	6	6.6
2.	Replace transistor			0.6	6	6.6
3.	Replace mosfet			0.6	5	5.6
4.	Replace preset			0.6	5	5.6
5.	Replace czpacitor			0.6	5	5.6
6.	Replace integrated circuit(IC)			0.5	5	5.5
7.	Replace general diode			0.5	5	5.5
8.	Replace zener diode			0.5	5	5.5
9.	Replace transformer			0.5	5	5.5
10.	Replace lamp/indicator/tube			0.5	5	5.5
11.	Replace resister			0.5	5	5.5
12.	Replace connector			0.5	5	5.5
13.	Repair circuits opened			0.5	5	5.5
14.	Replace fuse			0.5	5	5.5
15.	Replace switches			0.5	5	5.5
	Sub total:			8	77	85

	Module:4: Management					
	Sub module: 1: Marketing Solar PV Products					
	4 hrs. (Th.) + 5 Hrs. (Pr.) = 9 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Provide introduction of solar installation company			0.5	0.6	1.1
2.	Advertise the products			0.5	0.6	1.1

3.	Communicate with others			0.5	0.6	1.1
4.	Introduce products			0.5	0.6	1.1
5.	Price the products			0.4	0.6	1.0
6.	Receive customers' orders			0.4	0.5	0.9
7.	Collect demands			0.4	0.5	0.9
8.	Analyze the data			0.4	0.5	0.9
9.	Place orders			0.4	0.5	0.9
	Sub total:			4	5	9

	Sub module: 2: First Aid Management					
	2 hrs. (Th.) + 5 Hrs. (Pr.) = 7 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Take vital sins			0.2	0.8	1.0
2.	Perform simple dressings			0.3	0.7	1.0
3.	Perform simple bandaging			0.3	0.7	1.0
4.	Perform first aid for cuts/wounds/ simple injury			0.3	0.7	1.0
5.	Perform first aid for burns			0.3	0.7	1.0
6.	Perform first aid for electrical shocks			0.3	0.7	1.0
7.	Perform first aid for animal bites			0.3	0.7	1.0
	Sub total:			2	5	7

	Sub module: 3: Store Management					
	2 hrs. (Th.) + 3 Hrs. (Pr.) = 5 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Receive incoming tools/materials/ equipment			0.2	0.3	0.5
2.	Check received tools/materials/ equipment (Quality control check up)			0.2	0.3	0.5
3.	Prepare inventory (Record stock)			0.2	0.3	0.5
4.	Code company serial number (in grabbed company serial number)			0.2	0.3	0.5
5.	Fill acid battery			0.2	0.3	0.5
6.	Charge battery (Single/storage bank)			0.2	0.3	0.5
7.	Cut wire to required size			0.2	0.3	0.5
8.	Carry out packing			0.2	0.3	0.5
9.	Deliver the packages			0.2	0.3	0.5
10.	Keep records			0.2	0.3	0.5
	Sub total:			2	3	5

	Sub module: 4: Preparing Documents					
	1 hrs. (Th.) + 4 Hrs. (Pr.) = 5 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Fill warranty card			0.2	0.8	1
2.	Inform about subsidiary policy			0.2	0.8	1
3.	Fill subsidiary form			0.2	0.8	1
4.	Take photos			0.2	0.8	1
5.	Compile documents			0.2	0.8	1

	Sub total:			1	4	5

	Sub module: 5: Specific Communication					
	1 hrs. (Th.) + 4 Hrs. (Pr.) = 5 hrs.					
SN	Tasks			Th.	Pr,	Tot.
1.	Receive telephone calls			0.1	0.4	0.5
2.	Make telephone calls			0.1	0.4	0.5
3.	screen massages			0.1	0.4	0.5
4.	Write letters			0.1	0.4	0.5
5.	Write reports			0.1	0.4	0.5
6.	Communicate with customers			0.1	0.4	0.5
7.	Communicate with suppliers			0.1	0.4	0.5
8.	Communicate with seniors			0.1	0.4	0.5
9.	Communicate with juniors			0.1	0.4	0.5
10.	Communicate with peers			0.1	0.4	0.5
	Sub total:			1	4	5
	Total:			66	324	390

Duties and tasks (Solar PV Technician)

Duty: A: Manage/Maintain Store
Tasks:

1. Receive incoming tools/materials/ equipment
2. Check received tools/materials/ equipment (Quality control check up)
3. Prepare inventory (Record stock)
4. Code company serial number (in grabbed company serial number)
5. Fill acid battery
6. Charge battery (Single/storage bank)
7. Cut wire to required size
8. Carry out packing
9. Deliver the packages
10. Keep records

Duty: B: Test Solar PV System / Equipment
Tasks:

1. Test Module / panel
2. Test for angles
3. Test battery
4. Test for specific gravity (Electrolyte level)
5. Test for voltage
6. Test for current
7. Test for acid level
8. Test charge controller

9. Test for resistance
10. Test wire
11. Test switches
12. Test lamps
13. Test converter
14. Test inverter
15. Test vaccine refrigerator

Duty: C: Market Solar PV Products
Tasks:

1. Provide introduction of solar installation company
2. Advertise the products
3. Communicate with others
4. Introduce products
5. Price the products
6. Receive customers' orders
7. Collect demands
8. Analyze the data
9. Place orders

Duty: D: Design Solar PV System
Tasks:

1. Design module/ Panel
2. Design battery
3. Design charge controller
4. Design lamps
5. Design switches
6. Design converter(DC to DC)
7. Design inverter (DC to AC)
8. Design solar pumps
9. Design vaccine refrigerator
10. Design wire sizing

Duty: E: Handle Tools / Materials / Equipment
Tasks:

1. Handle hammer
2. Handle wire cutter
3. Handle combination pliers
4. Handle wire stripper
5. Handle hydrometer
6. Handle multi meter
7. Handle hand drill machine
8. Handle nose pliers
9. Handle slide wrench
10. Handle crimping tools
11. Handle screw driver
12. Handle compass
13. Handle set square

14. Handle solder wire
15. Handle disolder wire
16. Handle solder paste
17. Handle soldering iron
18. Handle solder pump
19. Handle iron stand
20. Handle power supply
21. Handle clamp meter
22. Handle battery tester

Duty: F: Install/Assemble Solar PV system
Tasks:

1. Read/interpret code/drawings
2. Install module/panel
3. Install battery
4. Install support structures
5. Install charge controller
6. Install junction box
7. Install wiring system
8. Install lamps
9. Install switches
10. Install inverter
11. Install earthing wire/plate
12. Install fans
13. Install solar pumps
14. Carry out operational tests

Duty: G: Prepare Documents
Tasks:

1. Fill warranty card
2. Inform about subsidiary policy
3. Fill subsidiary form
4. Take photos
5. Compile documents

Duty: H: Perform Routine Maintenance/Servicing
Tasks:

1. Perform regular maintenance of power conditioning equipment
2. Perform regular maintenance of weather sealing
3. Perform regular maintenance of balance of system equipment
4. Perform regular maintenance of batteries
5. Perform regular maintenance of arrays
6. Perform regular maintenance of module
7. Perform regular maintenance of structural system
8. Perform regular maintenance of safety system
9. Perform after sales services
10. Train customers for PV solar system

Duty: I: Repair Maintain Solar PV Electronic Components
Tasks:

1. Replace bypass diode
2. Replace transistor
3. Replace mosfet
4. Replace preset
5. Replace czpacitor
6. Replace integrated circuit(IC)
7. Replace general diode
8. Replace zener diode
9. Replace transformer
10. Replace lamp/indicator/tube
11. Replace resister
12. Replace connector
13. Repair circuits opened
14. Replace fuse
15. Replace switches

Duty: J: Perform Simple First Aids
Tasks:

1. Take vital sins
2. Perform simple dressings
3. Perform simple bandaging
4. Perform first aid for cuts/wounds/ simple injury
5. Perform first aid for burns
6. Perform first aid for electrical shocks
7. Perform first aid for animal bites

Duty: K: Communicate with others
Tasks:

1. Receive telephone calls
2. Make telephone calls
3. Screen massages
4. Write letters
5. Write reports
6. Communicate with customers
7. Communicate with suppliers
8. Communicate with seniors
9. Communicate with juniors
10. Communicate with peers

Duty: L: Develop Professionalism
Tasks:

1. Attend professional meetings
2. Attend professional workshops
3. Attend professional seminars
4. Attend professional trainings
5. Attend for higher education

6. Consult senior technicians
7. Consult peer technicians
8. Consult books/manuals
9. Consult professional journals
10. Browse WWW