

Course Curricula

**Under
SKILL DEVELOPMENT INITIATIVE SCHEME (SDIS)**

**Based on
Modular Employable Skills (MES)**

**on
RENEWABLE ENERGY
SECTOR**

Designed in 2010

**Government of India
Ministry of Labour & Employment
Directorate General of Employment & Training**

**Course Curriculum under Skill Development Initiative Scheme (SDIS)
based on Modular Employable Skills (MES) On
RENEWABLE ENERGY SECTOR**

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**List of members attended the Trade Committee Meeting for designing
the course curriculum under Skill Development Initiative Skill (SDIS)
based on Modular Employable Skills (MES) on
RENEWABLE ENERGY SECTOR held on 13th August 2010**

Sl. No.	Name and Designation SRI/SRIMATI	Organization	Remarks
1	S.D.Lahiri, Director	C.S.T.A.R.I, Kolkata	Chairman
2	S. Bhattacharya, Director	W.B.R.E.D.A, Kolkata	Member
3	Amarnath Sanyal, Addl, Director	I.EM, Kolkata	Member
4	R. Gangopadhyay, Lecturer	KanchraparaRailwayWorkshop, E-Railway	Member
5	R, N. Banerjee, Director	Sunshine Power Products, Kolkata	Member
6	P. K. Ghosh, Training Manager	G.R.S.E. Ltd, Kolkata	Member
7	S. K. Pal, Manager	M/sMascotIntegratedIndustry, Kol.	Member
8	Dr. Soumen Bose, Dy, Director	Directorate of Industrial Trg, WB	Member
9	Dibyendu Paul, Lecturer	Sahaj Academy, Kolkata	Member
10	Dr. Tapas Kr Majumder, Manager	B S N L, Kolkata	Member
11	S.K.Bose, Manager	Trans Bio Energy Ltd, Kolkata	Member
12	Monisha Sarkar, Asstt Manager	Trans Bio Energy Ltd, Kolkata	Member
13	Dr.K. mukhopadhyaya, Director	AGNI, Kolkata	Member
14	Anupam Bose, Manager	Geetanjali Solar, Kolkata	Member
15	A Majumder, DE	W.B.R.E.D.A, Kolkata	Member
16	Joy Chakraborty, DE	W.B.R.E.D.A, Kolkata	Member
17	Utpal Kr Roy, Supervisor	W.B.R.E.D.A, Kolkata	Member
18	A.Ghosh, Supervisor	W.B.R.E.D.A, Kolkata	Member
19	Moloy Kr Mondal, Supervisor	W.B.R.E.D.A, Kolkata	Member
20	Rudrendu Basu, Asstt. Director	W.B.R.E.D.A, Kolkata	Member
21	S.K.Biswas, Asstt Director	W.B.R.E.D.A, Kolkata	Member
22	D.K.Hazra, Spervisor	W.B.R.E.D.A, Kolkata	Member
23	A.Karmakar, Supervisor	W.B.R.E.D.A, Kolkata	Member
24	Gautam Banerjee, Manager	ESAB India Ltd, Kolkata	Member
25	M.K.Saha, Trg Superintendent	G.R.S.E. Ltd. Kolkata	Member
26	P.Majumder, Consultant	Kolkata	Member
27	Rabin Debnath, Asstt. Director	Directorate of Industrial Trg, WB	Member
28	Sib Chandra Pal, Instructor	Govt, ITI, Howrah Homes, WB	Member
29	D.P.Sarkar, Instructor	Govt, ITI, Howrah Homes, WB	Member
30	AnilKumar, Joint Director of Trg	C.S.T.A.R.I, Kolkata	Member
31	L.K.Mukherjee, Dy.Director of Trg	C.S.T.A.R.I, Kolkata	Member Secretary
32	A. Nandi, Dy.Director of Trg	C.S.T.A.R.I, Kolkata	Member
33	P.K.Dutta, Asstt. Director of Trg	C.S.T.A.R.I, Kolkata	Member
34	S.B.Sarder, Asstt. Director of Trg	C.S.T.A.R.I, Kolkata	Member
35	R. N. Manna, Trg. Officer	C.S.T.A.R.I, Kolkata	Member
36	L. M. Pharikhal, Trg-Officer	ATI, Kolkata	Member

Skill Development based on Modular Employable Skills (MES)

Background

The need for giving emphasis on Skill Development, especially for the educated unemployed youth (both for rural & urban) has been highlighted in various forums. Unfortunately, our country's current education system does not give any emphasis on development of skills. As a result, most of the educated unemployed youths are found wanting in this area, which is becoming their Achilles heel.

As India is on the path of economic development and the share of service sector's contribution to the GDP of the country is increasing (53% of GDP) it is becoming imperative that Government of India along with other nodal agencies play an important role in providing employable skills, with special emphasis on Skills.

Hence, need of the hour is some policy change at Apex level which will address the needs of the changing economy and look at providing mandatory skills training to all educated unemployed youths, with a view to have them gainfully employed. This shift in policy will ultimately benefit all the stake holders, namely the individuals, industry, Government and the economy by way of providing employment, increasing the output/productivity and ultimately resulting in a higher GDP for the nation.

- **Frame work for skill development based on 'Modular Employable Skills (MES)'**
Very few opportunities for skill development are available for the above referred groups (educated unemployed youth). Most of the existing skill development programmes are long term in nature. Poor and less educated persons cannot afford long term training programmes due to higher entry qualifications, opportunity cost, etc. Therefore, a new framework for skill development has been evolved by the DGET to address the employability issues.
The **key features of new framework for skill development** are:
 - Demand driven short term training courses based on modular employable skills are decided in consultation with Industries.
 - Flexible delivery mechanism (part time, week ends, full time)
 - Different levels of programmes (foundation level as well as skill up gradation) to meet demands of various target groups
 - Central Government will facilitate and promote training while vocational training providers (VIPs) under the Govt. and Private Sector will provide training
 - Optimum utilization of existing infrastructure to make training cost effective.
 - Testing of skills of trainees by Independent Assessing Bodies (IABs) who would not be involved in conducting training programme, to ensure that it is done impartially.
 - Testing & Certification of prior learning (skills of persons acquired informally)

The Short Term courses would be based on "Modular Employable Skills (MES)".

The **concept for the MES** is:

- ✓ Identification of minimum skills set, which is sufficient to get an employment in the labour market.
- ✓ It allows skills up gradation, multi skilling, multi entry and exit, vertical mobility and life long learning opportunities in a flexible manner.
- ✓ It also allows recognition of prior learning (certification of skills acquired informally) effectively.
- ✓ The modules in a sector when grouped together could lead to a qualification equivalent to National Trade Certificate or higher.

- ✓ Courses could be available from level 1 to level 3 in different vocations depending upon the need of the employer organizations.
- ✓ MES would benefit different target groups like:
 - Workers seeking certification of their skills acquired informally
 - Workers seeking skill up gradation
 - Early school drop-outs and unemployed
 - Previously child Labour and their family

INTRODUCTION

Economic growth in India is increasingly supported by robust industrial growth. Renewable Energy sector is one of the relatively lesser known but significant sectors that support almost all industrial activity. However, notwithstanding its importance and size (INR 4 trillion), it has traditionally not been accorded the attention it deserves as a separate sector in itself. The level of inefficiency in Renewable Energy Sector activities in the country has been very high across all modes.

The required pace of efficiency and quality improvement will demand rapid development of capabilities of Renewable Energy Sector service providers. And with Renewable Energy Sector being a service oriented sector, skill development will emerge as a key capability.

This lack of focus on developing manpower and skills for the Renewable Energy Sector has resulted in a significant gap in the numbers and quality of manpower in the sector.

This gap, unless addressed urgently, is likely to be a key impediment in the growth of the Renewable Energy Sector in India and in consequence, could impact growth in industry and manufacturing sectors as well.

This underscores the need identifying areas where such manpower and skill gaps are critical, and developing focused action plans to improve the situation.

A look at the required initiatives for manpower development in the above sector makes it clear that sustainable development of the sector's manpower requires a collaborative public private effort. The level of commitment demonstrated by each stakeholder would largely determine the direction that the sector heads towards.

Age of participants

The minimum age limit for persons to take part in the scheme is 18 years but there is no upper age limit.

Curriculum Development Process

Following procedure is used for developing course curricula

- Identification of Employable Skills set in a sector based on division of work in the Labour market.
- Development of training modules corresponding to skills set identified so as to provide training for specific & fit for purpose
- Organization of modules in to a Course Matrix indicating vertical and horizontal mobility. The course matrix depicts pictorially relation among various modules, pre requisites for higher level modules and how one can progress from one level to another.
- Development of detailed curriculum and vetting by a trade committee and by the NCVT

(Close involvement of Employers Organizations, State Governments and experts, Vocational Training Providers and other stakeholders are ensured at each stage).

Development of Core Competencies

Possession of proper attitudes is one of the most important attributes of a competent person. Without proper attitudes, the performance of a person gets adversely affected. Hence, systematic efforts will be made to develop attitudes during the training programme. The trainees deal with men, materials and machines. They handle sophisticated tools and instruments. Positive attitudes have to be developed in the trainees by properly guiding them and setting up examples of good attitudes by demonstrated behaviours and by the environment provided during training.

Some important core competencies to be developed are:

1. Communication skills
2. Better usage of English language/Vernacular
3. Presentation skills
4. Self management
5. Resume preparation
6. GD participation/facing techniques
7. Interview facing techniques

Following competencies should also be developed during level-II and higher courses:

1. Ability for planning, organizing and coordinating
2. Creative thinking, problem solving and decision-making
3. Leadership
4. Ability to bear stress
5. Negotiation

Duration of the Programme:

Time taken to gain the qualification will vary according to the pathway taken and will be kept very flexible for persons with different backgrounds and experience. Duration has been prescribed in hours in the curriculum of individual module, which are based on the content and requirements of a MES Module. However, some persons may take more time than the prescribed time. They should be provided reasonable time to complete the course.

Pathways to acquire Qualification:

Access to the qualification could be through:

- ✧ An approved training Programme.

Methodology

The training methods to be used should be appropriate to the development of competencies. The focus of the programme is on “performing” and not on “Knowing”. Lecturing will be restricted to the minimum necessary and emphasis to be given for learning through active participation and involvement.

The training methods will be individual centered to make each person a competent one. Opportunities for individual work will be provided. The learning process will be continuously monitored and feedback will be provided on individual basis.

Demonstrations using different models, audio visual aids and equipment will be used intensively.

Instructional Media Packages

In order to maintain quality of training uniformly all over the country, Instructional Media Packages (Imps) will be developed by the National Instructional Media Institute (NIMI), Chennai.

Assessment

DGE&T will appoint assessing bodies to assess the competencies of the trained persons. The assessing body will be an independent agency, which will not be involved in conducting the training programme. This, in turn, will ensure quality of training and credibility of the scheme. Keeping in view, the target of providing training/testing of one million persons through out the country and to avoid monopoly, more than one assessing bodies will be appointed for a sector or an area.

Certificate

Successful persons will be awarded competency-based certificates issued by **National Council for Vocational Training (NCVT)**.

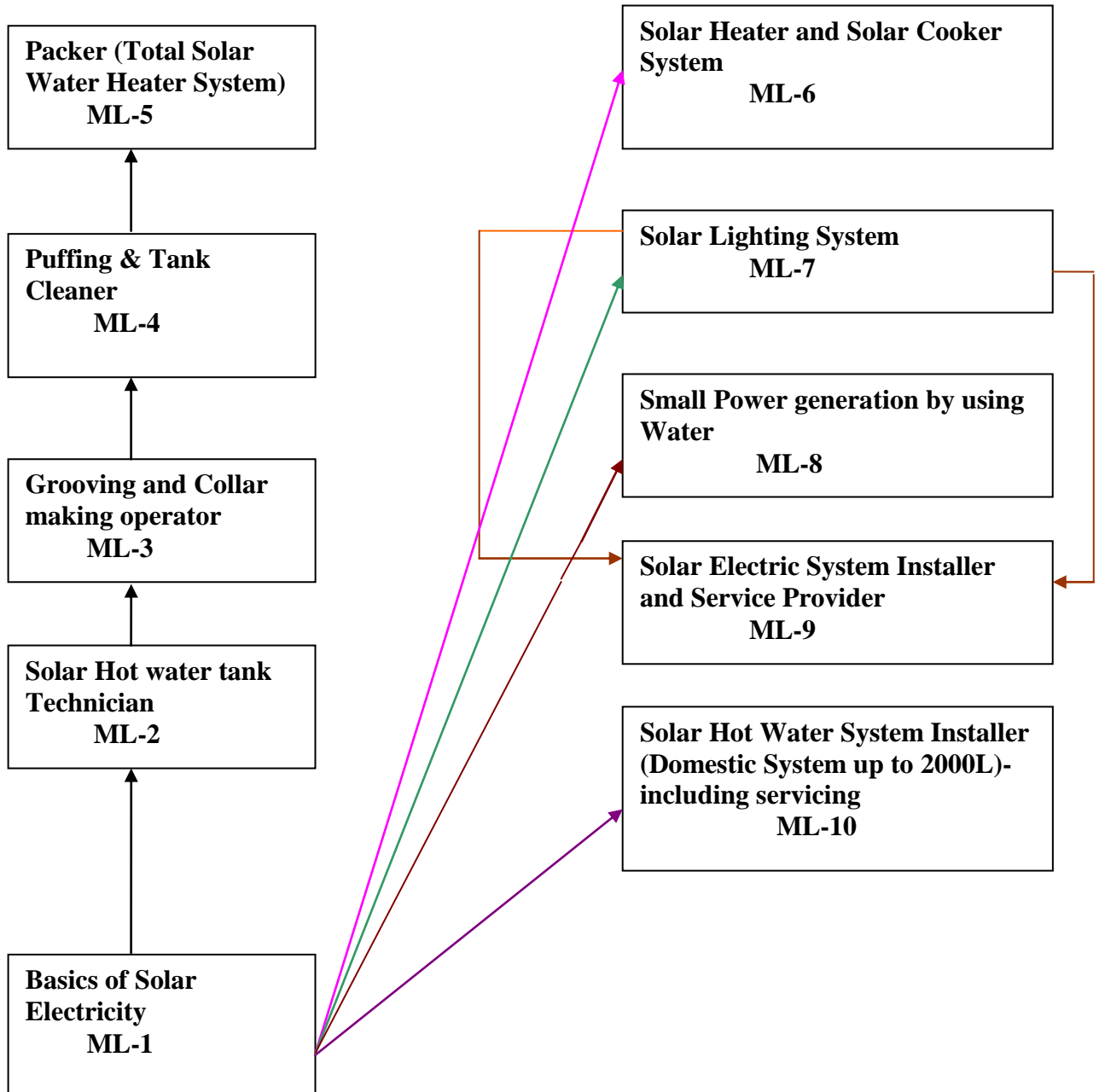
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Course Matrix

RENEWABLE ENERGY SECTOR

LEVEL-1 *****

***** LEVEL-2



**LEVEL-1
MODULE- I**

- 1. Name of Module** : Basics of Solar Electricity
- 2. Sector** : Renewable Energy
- 3. Code** : RNE101
- 3. Educational Qualification** : VIII th Class Pass
- 4. Age** : 18 years of age
- 5. Terminal Competency** : After completion of course Trainees may be able to:
- a. Know the differentiate between Conventional & non Conventional energy source.
 - b. Know the works on AC-DC Voltage/Current.
 - c. Know the Various circuit parameters i.e. Resistance, Energy, Power, Wiring, Earthlings etc.
 - d. Know the function of battery and its construction.
- 5. Duration** : 180 Hrs.
- 6. Contents** :

Sl. No.	Underpinning Knowledge	Practical Competencies
1.	a. Introduction to conventional and non-conventional sources of energy. b. Differentiates between conventional energy and non-conventional energy. c. Limitations of conventional energy and non-conventional energy. d. Advantages and disadvantages of non-conventional energy. e. Solar energy: 1. Causes for the non-conventional energy is not so popular. 2. Chances for development of non-conventional energy in India.	Demonstration on conventional and non-conventional energy sources.
2.	Basic Electricity: - Characteristic of electricity. - Understands electron and proton, phase and neutral wire with figure (description in simple way by giving example). - Understands electrical symbols used in system. - Understands Laws of electricity. - Understands electrical safety (electric shock). - Understands various methods for the generation of electric current. - Definitions of Volt, Ampere and Resistance, Ohm's Law, Joule's Law (description in simple way by giving example).	Demonstration on various safety measures. Study and applications of various electrical symbols used. Demonstration on verification of various Laws.
3.	Introduction to electric circuit, AC and DC current. Understands series and parallel connection.	Study and practice on various electrical circuits

	<p>Understands power, energy. Resistance of wires made of different materials, Importance of resistance. Various wirings such is used more now a day, Faults in wiring and effects. Importance of earthing in a wiring, various types of earthing and the type of earthing used now a days.</p>	Practice on various earthing systems.
4.	<p>Introduction to photo voltaic cell. Understands the advantages and disadvantages of photo-voltaic conversion. Uses of solar cell in various instruments. Photo-voltaic array and its connections, arrangements of array according to the voltage. Module and its connections. Faults and their effects in photo voltaic cell, array and module (connection of cell, connection of array, connection of module).</p>	<p>Prepare a wiring using various accessories in solar electricity and perform its testing. Make series and parallel wiring in solar electricity and pare a table of equations of voltage and current. To study the faults and their remedies in the wiring in solar electricity. Make an array using photo-voltaic cell in solar electricity. In solar electricity, prepare modules of various capacities with the help of array. In solar electricity, make a 2000 capacity power pack, connect with instruments and test it.</p>
5.	<p>Introduction to lead-acid battery, construction, each part of battery. Understands the electrolyte (Sulphuric acid + Distilled water) construction and working of a Hydrometer. Working of a battery capacity tester. Connection of battery (series and parallel). Battery cable and lamp. Maintenance and faults in a battery (battery box, negative and positive plates, cell connector, terminal, electroplate, specific gravity, battery voltage etc.).</p>	In the charging system of solar electricity, perform the servicing of lead acid battery (deep discharge battery), measure its specific gravity and voltage and not down the capacity of the battery.

List of Tools & Equipment required for a batch of 20 trainees:

1.	Ammeter	05 nos.
2.	Voltmeter	05 nos.
3.	Multimeter	05 nos.
4.	Megger	05 nos.
5.	Electric tester	20 nos.
6.	Plier	05 nos.
7.	Screw Driver (light duty)	05 nos.
8.	Spanner Set	05 sets
9.	Hydrometer	05 nos.
10.	Battery capacity tester	05 nos.
11.	Portable drilling machine	02 nos.
12.	Crimping tool	05 nos.
13.	Knife	05 nos.
14.	Hacksaw	05 nos.
15.	Hammer small	05 nos.
16.	Wire stripper	05 nos.
17.	Different types of Photo Voltaic Cell	05 sets
18.	Cut models of :	
	(i) Photo voltaic cell assembly	1 set
	(ii) Lead Acid Battery	1 no.

LEVEL – I
MODULE- II

- 1. Name of Module** : Solar Hot water tank Technician
2. Sector : Renewable Energy
3. Code : RNE 102
4. Entry Qualifications : Minimum 8th Standard
5. Age : 16 years of age
5. Terminal Competency : The successful candidates would be able to
 1) Fabricate the sheets as per dimensions & different settings on solar tank
 2) Operate different types of machines
 3) Manufacture solar hot water tank

6. Duration : 150 Hours

7. Course Content

Sl. No.	Practical Competencies	Underpinning Knowledge (Theory)
1.	Checking dimensions and thickness of the sheets with the standards for the size of the tank to be produced.	Knowledge about dimensions and quality of steel sheets used for making hot tank outer and inner.
2.	Practice on sheet cutting by shearing machine. Marking dimensions on sheet as per the tank size. Selecting correct template for cutting as per the size of the water tank. Checking shearing edge before operating the machine. Collecting scraps and putting them in proper place for disposal.	Knowledge of parts and functions of a shearing machine. Importance and practices of marking dimensions on sheet as per the tank size. Safe disposal of scraps without damaging self or the surroundings.
3.	Checking the number of punches to be made and the pitch. Checking the number of tubes to be inserted. Checking the dimensions of punch hole required. Checking the stopper setting before starting operation. Punching the required number of holes and at the spacing as needed. Collecting the scraps and putting in the drum for disposal.	Knowledge of parts and the functions of a power press and hand press.
4.	Checking settings of the bending machine before handling. Safe handling of bending machine. Bending sheets at the edges and forming the cylindrical tube shape.	Knowledge of parts and functions of a bending machine.
5.	Adjusting current voltage in the welding machine Setting temperature (Current Level) according the thickness of the sheets. Checking the settings the machine before of Welding the sheets. Checking the quality of welding after cooling.	Knowledge of parts and functions of a Linear welding machine. Knowledge of parts and functions of gas welding machine.
6.	Practicing Tube Welding.	Knowledge of parts and functions of a Nipple welding machine.

7	Replacing the Gas cylinders.	Knowledge of capacity of gas cylinders. Method of knowing the availability of gas in the cylinders.
8	Checking gas pipes for leakages before starting.	Safety precautions while handling inflammable gas cylinders, replacing the pipes and regulators. Environmental impacts of gas leakage
9	Practicing on use of Eye protecting glass, gloves, shoes. Inserting the shirts and folding the sleeves in case of full arm shirts.	Safety precautions to be taken while operating a shearing machine, power press, bending machine, Linear welding and Nipple welding machines.
10	Practice on working in a team for bringing material, setting the machine, loading and unloading, removing the scraps, cutting, punching, bending, grooving, collar making and welding.	Importance of team work and mutual cooperation.

List of Tools and equipments required for a batch of 20 trainees:

Sl. No.	Description	Qty.
1.	Shearing Machine	01 no.
2.	Power press	01 no.
3.	Bending machine	01 no.
4.	Linear welding machine	01 no.
5.	Nipple welding machine(Tig Welding)	01 no.
6.	Air compressor for leak testing	01 no.
7	Resistance welding machine (Electric)	01 no.
8	Gas Welding equipments	01 no.
9	Puff insulator and its machine	01 no.
10	Drill machine(Electric)	01 no.
11	Plumbing instrument / equipment for hot and cold water pipe line - Oxiac	01 set.
12	Painting machine (powder coated / spray painting)	01 no.
13	Screw gauge	01 set.
14	Digital temperature meter	01 no.
15	Die for threading of pipes	01 set.
16	Safety gadgets – Shoes, gloves	20 sets
17	Template of different sizes	01 set.
18	Punching tools power press	01 set.

LEVEL –I
MODULE- III

- 1. Name of Module** : Grooving and Collar making operator
2. Sector : Renewable Energy
3.Code : RNE 103
4. Entry Qualifications : Minimum 8th Standard
5. Age : 14 years of age
6. Terminal Competency : The successful candidates would be able to
 1) Form tube from sheets
 2) Make groove cutting on tube
 3) Fix the collar in appropriate place
 4) Handle different types of machines
7. Duration : 100 hours
8. Course content :

Sl. No.	Practical Competencies	Underpinning Knowledge (Theory)
1.	Check dimensions of the sheets, tube with the standards for the Size of the tank to be produced.	Knowledge about dimensions and quality of steel sheets used for making hot tank outer and Inner.
2.	Keeping the sheet in tube form to be grooved on the spinning lathe. Selecting the depth of groove as per the size of the water tank.	Knowledge of parts and functions of a Spinning Lathe
3.	Check dimensions of the collar to be made. Bending sheet to the shape of the collar. Check the dimensions of the collar after preparation.	Knowledge of Importance of Collar. Knowledge of sizes of Collar.
4.	Practice on fixing the collar securely.	Knowledge of fixing the collar.
5.	Practice on fixing the end dish.	Knowledge of dimensions of End dish. Knowledge of importance of end dish.
6.	Practice on use of gloves, shoes & inserting the shirts, folding the sleeves in case of full arm shirts.	Safety precautions to be taken while operating a lathe, and fixing the end dish
7.	Practice/ working in a team for bringing material, setting the machine, loading and unloading and removing the scraps.	Importance of Team work and mutual cooperation.

List of Tools and equipments required for a batch of 20 trainees:

1.	Spinning Lathe	1
2.	Grooving Machine	1
3.	Safety gadgets-Shoes, gloves	20 sets

**LEVEL -1
MODULE- IV**

- 1. Name of Module** : **Puffing & Tank Cleaner**
2. Sector : **Renewable Energy**
3. N.C.O Code : **RNE 104**
4. Entry Qualifications : **Minimum 7th Standard**
5. Age : **14 years of age**
6. Terminal Competency : **The successful candidates would be able to work in a team producing hot water tank used in solar water heating systems.**
7. Duration : **160 hours**
8. Course content :

Sl. No.	Practical Competencies	Underpinning Knowledge (Theory)
1.	Identifying the tank dimensions and marking pair of Inner and Outer tank as per the design	Specifications of different tank dimensions
2.	Adjusting the stand length depending on size of the tank	Use of stand for inserting the inner into outer
3.	Putting the correct inner tank in side the outer tank as per the pairing done	Importance and properties of polyurethane foam in insulating the hot water tanks.
4.	Aligning the hole positions of inner tank and outer tank	Importance of maintaining uniformity of mixing.
5.	Applying a mixture of oil and grease on the out side of outer tank in the hole positions to make the cleaning easy after installation	Chemicals used for preparing the foam.
6.	Mixing chemicals in steel bucket or bowl. Maintain mixing ratio of Isocynate to Elastoper at 1:1.2.	Precautions to be taken while puffing.
7.	Pour mixed chemical in between the tank space. Allow it to foam and settle for 30 minutes. Fix the end cap on the open side. Observe for one day.	Precautions to be taken from chemicals hazards.
8.	Sending the cleaned tank for cleaning	Importance of reaction time while puffing.
9.	Inserting the shirts and folding the sleeves in case of full arm shirts	Precautions to be taken while sending the finished tank for packing.
10.	Practice working in a team for bringing material, setting the machine, loading and unloading and removing the scrapes.	Importance of team work and mutual cooperation.
11.	Disposing of chemical drums. Practice of safe working habits in view of occupational health and hazards.	Precautions to be taken while disposing the empty drums of chemical and the possible impact on environment. Knowledge on environmental pollution – their causes, consequences, and mitigation related to the module.
12.	Cleaning surface of the tank using a thinner and soft cloth	Knowledge of thinners and the method of using them for removing the puff particles on surface of the tank

13	Apply powder of Plaster of Paris or French Chalk and rub gently with a soft cotton cloth	Knowledge of using French Chalk powder for polishing tank surface
14	Handing over the finished tank to packing	Safety precautions taken when handling of Plaster of Paris or French Chalk.
15	Practicing the use of gloves and shoes. Inserting the shirts and folding the sleeves in case of full arm shirts.	Safety precautions to be taken while cleaning a tank
16	Practice working in a team for bringing material, setting the machine, loading and unloading and removing the scraps.	Importance of Team work and mutual cooperation.

List of Tools and equipments required for a batch of 20 trainees:

1.	Stand for insertion of tank	1
2.	Safety gadgets – shoes, gloves	20 sets
3.	Isocynate	1 drum
4.	Elastoper	1 drum
5.	Buckets for mixing	2
6.	Bowls for mixing	2
7.	Facility for washing hands and face	1
8	Thinner	10 Liters
9	French Chalk	5 Kgs.

LEVEL - I**MODULE- V**

- 1. Name of Module** : **Packer (Total Solar Water Heater System)**
- 2. Sector** : **Renewable Energy**
- 3. N.C.O Code** : **RNE 105**
- 4. Entry Qualifications** : **Minimum 7th Standard**
- 5. Age** : **14 years of age**
- 6. Terminal Competency** : **The successful candidates would be able to**
1) Handle the different packing materials
2) Make the packaging box as per solar water heater
3) Arrange sealing the cartoons & packing register
- 7. Duration** : **100 hrs.**

8. Course contents

Sl. No.	Practical Competencies	Underpinning Knowledge (Theory)
1.	Selecting carton as per the size of the tank.	Different sizes of cartons for different materials for packing
2.	Check markings on the cartons if any.	Markings on carton, the statutory requirements, the customers' requirements.
3.	Paste packing information after ensuring the tank model/size and the serial numbers.	Knowledge of tank size & the serial numbers.
4.	Putting thermo coal on the sides of the tank as needed	Precautions while packing.
5	Putting accessories as decided in the carton with secure packing.	Use of thermo coal as shock absorbers.
6.	Practice to sealing the cartons.	Knowledge of accessories as decided in the carton with secure packing.
7.	Entering the packing details in the packing register.	Details needed in Packing registers.
8.	Entering the name of person responsible for inspection before packing.	Accountability of packing person for correctness of the materials packed.
9.	Inserting the shirts and folding the sleeves in case of full arm shirts.	Safety precautions to be taken while Packing
10.	Practice working in a team for bringing material, setting the machine, loading and unloading and removing the scraps.	Importance of Team work and mutual cooperation
11.	Disposing the scrap packing materials	Environ impacts of the scrapped packing materials.

List of Tools and equipments required for a batch of 20 trainees:

Sl. No.	Description	Qty.
1	Cartons	As required
2	Sealing tapes	As required
3	Safety gadgets- Shoes, gloves	20 sets

LEVEL – II
MODULE- VI

- 1. Name of Module** : **Solar Heater and Solar Cooker System**
- 2. Sector** : **Renewable Energy**
- 3. N.C.O Code** : **RNE 206**
- 3. Entry Qualifications** : **Minimum 8th Standard**
- 4. Age** : **18 years of age**
- 5. Competencies acquired** : **After completion of course participant may be able to:**
- a. Use and operate Solar Water Heater and Solar Cooker.**
 - b. Carry out first hand maintenance.**
 - c. Install SWH and solar cooker.**
 - d. Work in manufacturing unit.**
- 6. Duration** : **120 Hrs.**
- 7. Content** :

Sl. No.	Underpinning Knowledge	Practical Competencies
1.	Solar Water Heaters: <ul style="list-style-type: none"> - Basic working principles. - Designs available in markets and solar water heater industry in India. - Installation of SWHs. - Special requirement of plumbing for SWHs. - Maintenance of SWHs. - Servicing schedule. - Marketing inputs : Solar water heater and Electric Geyser 	<ul style="list-style-type: none"> - Study on SWH designs/ components. - Assemble SWH. - General maintenance schedule for SWH components. - Fault finding and trouble shooting.
2.	Solar Cooker: <ul style="list-style-type: none"> - Basic working principles. - Designs available in market. - Information on solar cookers manufactures in India. - Introduction to solar cookers for household and community applications. - Operation and maintenance. - Servicing schedule. - Disadvantages and Limitations 	<ul style="list-style-type: none"> - Study solar cookers designs/components. - Assemble solar cookers. - General maintenance schedule for solar cooker components. - Fault finding and trouble shooting

List of Tools and equipments required for a batch of 20 trainees:

- | | |
|--|-------------|
| 1. Different types of SWHs and Solar Cookers | As required |
| 2. Radiation measurement devices. | As required |
| 3. Components of SWH and Solar Cookers. | As required |
| 4. Assembling and dismantling practice of SWH and Cookers. | As required |
| 5. Required Tool Kit. | As required |

LEVEL – II
MODULE- VII

- 1. Name of Module** : **Solar Lighting System**
- 2. Sector** : **Renewable Energy**
- 3. N.C.O Code** : **RNE207**
- 3. Entry Qualifications** : **Minimum 8th Standard and must completed the Module of Basics of Solar Electricity.**
- 4. Age** : **18 years of age**
- 5. Competencies acquired** : **After completion of course participant may be able to:**
a. Operate solar systems
b. Carry out first hand maintenance
c. Work in manufacturing unit
- 6. Duration** : **120 Hrs.**
- 7. Content** :

Sl. No.	Underpinning Knowledge	Practical Competencies
1.	Introducing Renewable Energy Source <ul style="list-style-type: none"> - Basic working principles of solar photo voltaics. - Description of main parts of solar lighting systems: Solar Laltern, Street light, Home light. - Charge controller. - Storage battery. - Inverter - Luminars - Maintenance of solar lighting systems. - Major solar lighting manufacturers in India. 	<ul style="list-style-type: none"> - Study solar photovoltaic module. - Charge the battery and trace out the faults. - Assemble a solar lighting system. - Carry out first hand maintenance. - Dismantle every part of solar lantern, study the construction and function of solar parts. - Test for fault finding. - Dismantle every part of solar home light system, study the construction, function of each part.
2.	Comparative study in between conventional lighting system and solar lighting system.	<ul style="list-style-type: none"> - List for finding of the faults.

List of Tools & Equipments required for a batch of 20 trainees:

- | | |
|---|-------------|
| 1. Different models of solar lighting systems. | As required |
| 2. Various components of solar lighting system. | As required |
| 3. Installation of solar systems. | As required |
| 4. Required Tool Kit | As required |

LEVEL – II
MODULE- VIII

- 1. Name of Module** : **Small Power generation by using Water**
- 2. Sector** : **Renewable Energy**
- 3. Code** : **RNE 208**
- 3. Entry Qualifications** : **Minimum 8th Standard and must completed the module of Basics of Solar Electricity.**
- 4. Age** : **18 years of age**
- 5. Competencies acquired** : **After completion of course participant may be able to:**
a. Operate small hydro power and water mills.
b. Carry out first hand maintenance
c. Work in manufacturing unit
- 6. Duration** : **120 Hrs.**
- 7. Content**

Sl. No.	Underpinning Knowledge	Practical Competencies
1.	Basic working principles <ul style="list-style-type: none"> - Fundamentals of hydraulics - Water flow measure, type of flow measurement devices. - Description of main parts of hydropower station. - Electrical and mechanical equipments. - Control equipments. - Power plant maintenance. Water mill components <ul style="list-style-type: none"> - Available designs. - Water mills for livelihood. - Operation and maintenance. - Servicing schedule. 	<ul style="list-style-type: none"> - Study detail SHP designs/components. - General maintenance schedule for SHP components. - Fault finding and trouble shooting. <ul style="list-style-type: none"> - Study water mill designs/components. - General maintenance schedule for water mill components. - Fault finding and trouble shooting.

List of Tools & Equipments required for a batch of 20 trainees:

- | | |
|---|-------------|
| 1. Cut models of SHP/Water Mill and Simulators. | As required |
| 2. Components of a typical small hydropower unit. | As required |
| 3. Components of a typical water mill. | As required |
| 4. Required Tool Kit. | As required |

LEVEL- II
MODULE- IX

- 1. Module Name** : Solar Electric System Installer and Service Provider
- 2. Sector** : Renewable Energy
- 3. Code** : RNE 209
- 4. Entry Qualifications** : Minimum 8th Standard and must completed completed the module on solar lighting system.
- 5. Age** : 18 years of age
- 6. Terminal Competency** : The successful candidates would be able to
1) Plan & installation Solar Electric System.
2) Commission and service Solar Electric Systems
3) Check all equipments, parts & instruments with Safety measures
- 7. Duration** : 200 hours
- 8. Course contents** :

Slo. No.	Practical Competencies	Underpinning Knowledge (Theory)
1.	<ul style="list-style-type: none"> • Identifying all components of a simple DC Solar lighting system and Solar Lantern. • Segregating defective parts and labeling them. 	Basics of simple Solar Photovoltaic System. Check the functions of different parts up to the performance level expected.
2.	Planning installation activity	<ul style="list-style-type: none"> • Role of an installer • Description of trade
3.	Adopt all safety practices - <ul style="list-style-type: none"> • Safe use of ladders, safe working in open terraces and other risky and elevated places. • Correct handling of heavy components • Use of personal protective equipments (PPE) like gloves, goggles, safety belts etc. • Handling any incidents/accidents 	<ul style="list-style-type: none"> • Need for personal safety and safety of others. Dangers associated with working at heights. Methods of Safety practices while using different hand tools • Impact of incorrect lifting of objects, system components (especially battery) while installing at heights and while working. • Personal Protective Equipments and their usage. • Knowledge of the causes of accident and its remedial actions.
4.	<ul style="list-style-type: none"> • Safe handling of Batteries, working principles and maintenance. • Checking batteries for their function. 	<ul style="list-style-type: none"> • Electricity fundamentals. Typical values of battery voltage, module current and voltage and introduction to battery. • Specific Gravity, Voltage and Current measurement with their definitions.
5.	<ul style="list-style-type: none"> • Measurement of voltage, current and specific gravity of battery acid. Series and parallel circuit. • Correcting the gravity of acid and 	<ul style="list-style-type: none"> • Acid and their properties, current flow in batteries and impact of shorting of terminals. • Charging process and precautions to be

	charging the battery.	taken while charging a battery.
6.	Use of installation tools	Different types of tools and its operation
7.	Identifying current location of the solar modules, correct installation practice, correct location for charge controller and batteries and visual indications in charge controller and check for proper functioning	Sun movement over the day, shadowing effects Risks involved in Hydrogen released by batteries and the need for ventilation Charge controller basic functions
8.	Wiring plan and location of loads and charge controllers and modules to avoid loss	Short circuit length, aesthetics, maximizing the utility (as in the case of lighting max space) and convenience
9.	Commissioning the Solar Electric system	Commissioning steps
10.	Educating the customer on use	Overall operation of system, safe use and basic maintenance and trouble shooting
11.	Documentation	I&C format and contents
12.	Complaint management system	Registering complaints, tracing and disposing complaints, customer relations.

List of Tools & Equipments required for a batch of 20 trainees:

Building

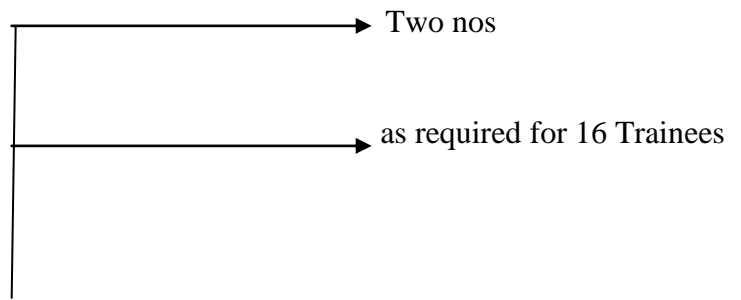
1. A class room with basic teaching aids-Black board, Table 6' x 3'
2. At least two AC power outlets
3. A shadow free terrace area of 20ft x 20ft/shadow free open flat area on the Ground
4. Transparent / White Board with Temporary Marker
5. LCD Projector and Screen

Demo Equipments

1. Solar Cell based sunlight radiation meter
2. An assortment of solar modules- 10W, 40W and 75W
3. A charge controller 12V/10A
4. Flooded lead acid Battery 12V/40Ah, 75Ah.
5. CFL based and LED based lanterns
6. Home lighting systems with CFL and LED based lamps, DC fans
7. Solar Cell Education kit.
8. Cables of varying sizes-2x2.5 sq.mm. 4sq mm
9. Ring and fork type terminals
10. PVC Mug, 25 ltr bucket and PVC rod
11. Tool kit bag with standard installation and measurement tools
12. A laminate coating the following: Multi crystalline and single crystalline (both circular and square) wafer, processed solar cells both front and back
13. A typical module junction box
14. Sample fuses
15. Chart for voltage drop in respect of length and size of wire / cable i.e. Wire Table.
16. Complete line diagram with installation procedure of each equipment step by step with connection of wire with equipments.

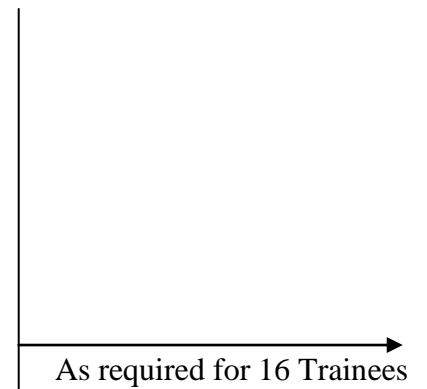
Tools

1. Drilling machine
2. Screw drivers and spanner set
3. Wire stripper
4. Crimping tool
5. Knife
6. Hacksaw
7. Hammer
8. Tool kit bag



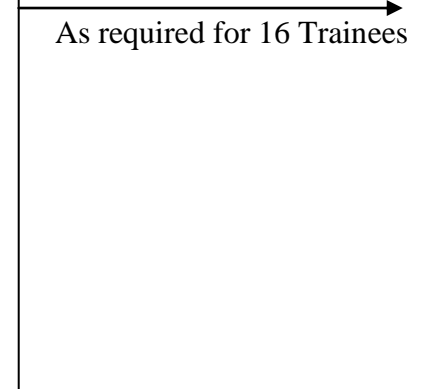
Measuring Equipment

1. Multi-meter for current and voltage measurement
2. Specific Gravity meter (Hydrometer)
3. Measuring tape
4. Magnetic compass
5. Solar Insulation Meter
6. Pyranometer
7. Pyrheliometer
8. Luxmeter
9. Sunshine Recoder
10. Megger



Safety/Protective Equipments

1. Rubber Gloves
2. Cotton gloves
3. Goggles
4. Helmet
5. Gum boots
6. Safety Belt
7. First Aid kit
8. Register to record all complaints received and disposed.



**LEVEL-II
MODULE- X**

- 1. Module Name** : Solar Hot Water System Installer (Domestic System up to 2000L)-including servicing
- 2. Sector** : Renewable Energy
- 3. Code** : RNE 210
- 4. Entry Qualifications** : Minimum 8th Standard and must completed completed the module on Basics of Solar Electricity.
- 5. Age** : 18 years of age
- 6. Terminal Competency** : The successful candidates would be able to
 1) Plan & install Solar Hot Water System.
 2) Commission and service Solar Electric Systems
 3) Check all equipments, parts with instruments with Taking Safety measures
- 7. Duration** : 200 hours
- 8. Course contents** :

Sl. No.	Practical Competencies	Underpinning Knowledge (Theory)
1.	<ul style="list-style-type: none"> • Able to distinguish between copper based flat plate collector and Evacuated tube collectors (ETC). • Flow diagrams-reading and understanding various systems/drawings/Animated representation. • System installation (erection) ensuring leak proof joints. • Safe Transportation, erection and commissioning. • Connecting Electrical back-up heaters. 	<ul style="list-style-type: none"> • Basics working of simple solar hot water system-copper flat plate and Evacuated tube collectors (ETC). • Parts of a SWH and criticality. • Types of system-Thermo. Siphon/Systems operating under pressure/no pressure / Heat exchangers. • Importance of insulate on and insulation materials. • Equipment handling, moving to location and erection (sequentially). • Basic electrical knowledge. • Basic plumbing knowledge/pipe sizes.
2.	<ul style="list-style-type: none"> • Planning installation activity of solar hot water system. 	<ul style="list-style-type: none"> • Role of an installer. • Description of trade.
3.	<ul style="list-style-type: none"> • Adopt all safety practices • Safe use of ladders, safe working in open terraces and other risky and elevated places. • Correct handling heavy components • Use of personal protective equipments (PPE) like gloves, goggles, safety belts etc. • Handling any incidents/accidents • Precautions against heat 	<ul style="list-style-type: none"> • Need for personal safety and safety of others. Dangers associated with working at heights, methods of Safety practices while using different hand tools • Impact of incorrect lifting of objects System components (tank, ETC tubes) and while installing at heights. • Importance using PPEs and their usage. Installation and in the presence of end users. • Handling hot parts.

		<ul style="list-style-type: none"> • Knowledge of the cause and remedial actions.
4.	Safe handling of Collectors	Collector components, cover glass/ETC tubes
5.	Use of installation tools	Different types of tools and its operation
6.	Measurement of temperature, volume and dimensions	Use of thermometer and standard measuring devices
7.	Identifying correct location of the solar collectors/system capacity/water quality	<ul style="list-style-type: none"> • Sun movement over the day, shadowing effects • Carrying out site survey to identify suitability and location • Water quality-hard/soft-remedies • Availability of other support system (overhead water tank/plumbing arrangement/electrical access) • Recommending correct size and type of system
8.	Plumbing on the inlet and outlet side and integrating to the Water line. Location of water outlets.	<ul style="list-style-type: none"> • Heat loss and piping length, aesthetics, maximizing the utility and convenience.
9.	<ul style="list-style-type: none"> • Educating the customer on use • Interaction with customers • Trouble shooting of existing systems (servicing & maintenance/AMC) 	<ul style="list-style-type: none"> • Overall operation of system, safe use and basic maintenance and trouble shooting • Communication skills • (Explaining system features / dos & don'ts) • Explaining warranty features • Common problems of SWH and solutions
10.	Documentation	I&C format and contents

List of Tools & Equipments required for a batch of 20 trainees:

Building

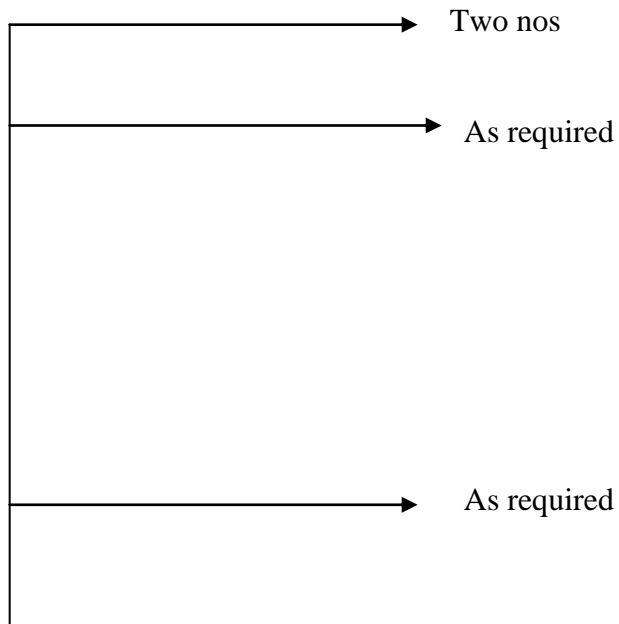
1. A class room with basic teaching aids-black board, table 6'x3'
2. At least two AC power outlets
3. A shadow free terrace area of 20ft x 20ft with overhead storage tank
4. Transparent / White Board with Temporary Marker
5. LCD Projector and Screen

Demo equipments

1. One 100 lpd hot water system each with flat plate collector and evacuated tube collector
2. Various types of valves- Gate valve, NRV, Pressure Release valve
3. Hose pipe and flanges/sealing rings/dust rings/washers
4. Teflon tape/cotton thread
5. Heater coils/ insulation tape
6. Sacrificial anode
7. T joints, L bends, union and other plumbing joints
8. Water mixer taps
9. Model storage tank showing the cross section-m SS tank, insulation and cladding, heater coil and sacrificial anode

Tools

- 1. Portable Drilling Machine
- 2. Set of spanners
- 3. Set of screw drivers
- 4. Pipe Wrench
- 5. Knife
- 6. Hacksaw
- 7. Hammer
- 8. Electric tester
- 9. Tool kit bag



Measuring Equipment

- 1. Magnetic Compass
- 2. Thermometer
- 3. Bucket 20L
- 4. Measuring tape

Safety Equipments/Protective gears

- 1. Rubber gloves
- 2. Cotton gloves
- 3. Goggles
- 4. Helmet
- 5. Gum boots
- 6. Safety Belt
- 7. First Aid kit

