

# kWATT SOLUTIONS PVT LTD

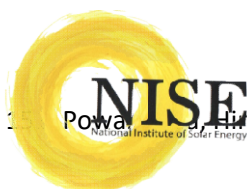


## SOLAR TRAINING PROGRAM

Techno Commercial Proposal

Submitted to

14/2/2017





**Enlightening minds through customized solar  
training programs**



**Motivation:** India is not rich in conventional fuels like oil, gas and nuclear. Our dependence on import of these fuels and ever increasing prices makes the electricity unreliable and expensive. There is need to demonstrate and practice alternative electricity solutions which are environment friendly, and, more importantly, cost-effective. With advancement in solar Photovoltaic technologies and significant reduction in the prices, solar electricity, even today in many sectors, is an economically viable alternative to grid electricity.

***Dr. Chetan Singh Solanki***  
***Professor , IIT***



## COVERING LETTER

Dear Sir/Madam,

Subject: - Techno-Commercial Proposal to conduct Solar Training Program under S-SparQ

This is reference to above subject for Solar Training Program, we are pleased to submit our best suitable Techno-Commercial Proposal for the same in which each session of the course is designed and developed by kWatt Solutions Private Limited, Mumbai (KSPL) and it is enclosed to this letter.

We assure to provide complete technical; knowledge and education on in the field of solar energy and cater your requirements with complete support and cooperation.

If you need any more information regarding same, please feel free to contact us all the time.

Thanking you,



Mr. Mehul Patel  
Manager-Training & Product Development,  
kWatt Solutions Private Limited

## ABOUT S-SPARQ

**S-SparQ** is a vertical of kWatt Solutions Private Limited (kSPL) which works to impart education and training in the field of Solar Energy and create solar engineers to fulfill India's manpower needs envisioned in the National Solar Mission of Ministry of New and Renewable Energy (MNRE), Government of India. S-SparQ consists of various customized in house developed course work (under the guidance of **Prof. Chetan Singh Solanki** ) to impart concepts of solar energy conversion and utilizations from basics to advanced.

## VISION AND MISSION

*"To train maximum number of Engineers in Solar field to meet the requirement of National Solar Mission & to make students Solar Smart while they are studying by exploring the concepts of solar energy conversion and utilizations from basic to advanced levels"*



**S-SparQ offers skill development in the field of solar energy and aims to:**

- Impart fundamental as well as practical knowledge in solar
- Nurture creativity and Innovation
- Develop skill sets as per industry requirements
- Provide an insight into emerging sectors



**S-SparQ program(s) students will have ability to**

- Use Industry Based Simulation Software
- Develop Industry Oriented Innovative Gadgets/Products
- Develop Technology & Entrepreneurial Skills
- Work on Industry Designed Projects(IDPs)
- Think Out-of Box Ideas





## CERTIFIED TRAINING PROGRAMS

This certified program can be attended by any Engineering Students majorly from EEE, EXTC, EXTR and Mechanical Engineering streams.

The S-SparQ training program is categorized in following levels:

### STUDENTS, FACULTY AND PROFESSIONAL PROGRAMS

Sr. No.	Course Name	Duration
1	Basic Training Program	2 Days
2	Advanced Training Program	5 Days
3	SolarInstall- Hands on Installation training	10 Days
4	SOLBIZZ- Understanding Solar Business	2 Days
5	Solar Product Assembly Training Program	60 Days



## BASIC TRAINING PROGRAM

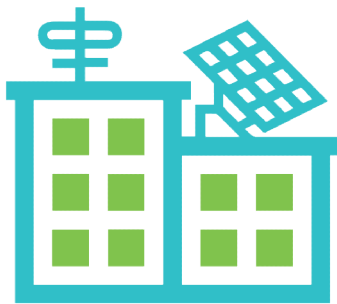
This course is a 2 days training program which is designed with a objective of empowering students in Solar. After attending this program students will be able to design a Solar Power Plant for their House/College. Students will also get the practical knowledge and skills to develop solar products which will boost their Entrepreneur skills.

The Basic Certified training program will be a 2 days program which will cover the following topics:

### Day 1

#### Part 1 (Overview)

- Solar Energy Scenario in India & Job Opportunities
- Basics of Solar Photo Voltaic Technology (PV)



#### Part 2 (Simulation & PV System Design)

- Basics of simulation tool
  - Concepts of PV System Design
  - Design a Solar Power Plant to light/power your own house/college
- Understand the system design using simulation tool
  - Hands on experience to determine PV size, Inverter & Battery Capacity using tool
  - Estimation of monthly power generation and financial savings

### Day 2

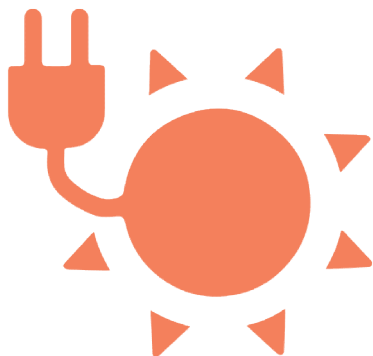
#### Part 3 (Hands on Session)

##### Solar Operated Mobile Charger

- Design and build your own Solar Mobile Charger
- Get practical insight into basic and advanced features

##### Light seeking Robot

- Design and build your own Vision 180
- Get practical insight into basic and advanced features



## ADVANCED TRAINING PROGRAM

Designed for any Engineering Students and Faculties majorly from EEE, EXTC, EXTR, Mechanical engineering streams. The Advanced Training Program will be of 5 Days (6 Hours a day) where the Students/faculties will get the knowledge from Solar Basics to Solar System Design and from circuit design to circuit implementation.

Sr. No.	Course	Schedule
1	PVSyst Simulation Software for Solar System design	Day 1
2	Basics of Microcontroller and solar Applications using Arduino	Day 2
3	Solar Instruments( Solar Temperature sensor and Solar Radiation meter using Arduino)(Hands On)	Day 3
4	PCB Designing Software for Solar Products	Day 4
5	Arduino based solar Inverter(Hands-On)	Day 5

### Day 1

## PVSyst Simulation Software for Solar System Design

This course is designed with following learning objectives:-

- To understand the Indian power sector and conversion of light energy to electricity
- To analyze different angles and calculating the optimum tilt for the solar panel.
- Demonstrating solar tracker and observing types of radiations.
- To clarify the battery selection and inverter selection
- The simulate and analyze the PVsyst report

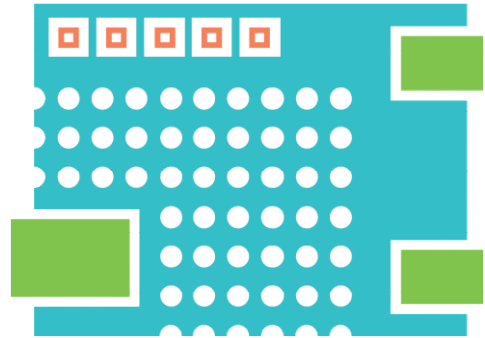


## Day 2

### Basics of Microcontroller and solar Applications using Arduino

This course is designed with following learning objectives:-

- To understand the Indian power sector and conversion of light energy to electricity
- To study basics of UART and microcontroller
- Improving the coding skills
- Practically Interfacing Arduino with LCD
- Arduino programming , arduino software
- Arduino and 16\*2 LCD interfacing, code writing for printing on lcd
- Arduino based solar project ideas discussion

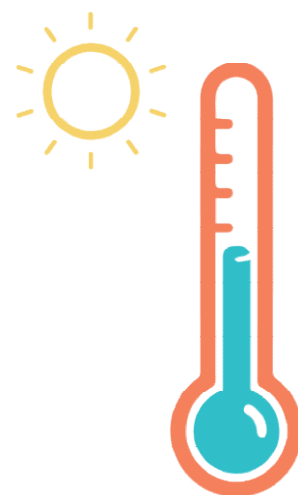


## Day 3

### Solar Instruments( Solar Temperature sensor and Solar Radiation meter using Arduino)(Hands On)

This course is designed with following learning objectives:-

- Understand the working of solar radiation meter
- Demonstrating solar instruments to understand their working
- Experiencing hands on session on solar energy meter
- Understanding the solar temperature sensor circuit
- Experiencing the solar temperature sensor hands on session



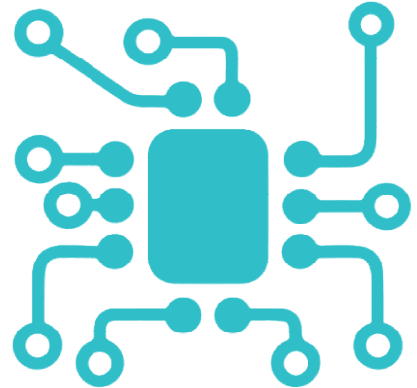


## Day 4

### PCB Designing Software for Solar Products

This course is designed with following learning objective:-

- To study the need of PCB designing
- Explanation of all the tools and commands
- To have hands-on experience on designing the circuit layout
- Understanding the type of components available in electronics
- Clarity on creating the gerber files of the layout

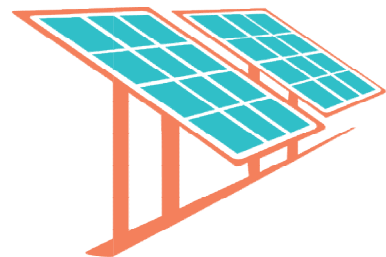


## Day 5

### Arduino based solar Inverter(Hands-On)

This course is designed with following learning objectives:-

- Block level explanation of grid tied system and the need of grid tie inverter
- Understanding the difference between stand alone inverter, grid tie inverter, string inverter, solar inverter etc.
- Understanding the concept of designing inverter
- Implementing the inverter circuit practically



## SOLAR TAKE AWAY KIT

- 2 X Solar Panel of 0.3 W for testing Circuits
- Solar Mobile Charger kit

## **SOLARINSTALL-HANDS-ON TRAINING ON SOLAR SYSTEM DESIGN AND INSTALLATION**

The course majorly focuses on hands on training in components, installation, commissioning of off-grid and on grid 4kWp PV system installation and maintenance training

The participants will also be given training on marketing & entrepreneurship skill so that they will become the campaigners of solar energy.

### **JOB OPPORTUNITIES**

Government has set a target of 100GW solar installation by the year 2022 which will create job opportunities for more than 1.6 million skilled technicians in solar installation

### **COURSE STRUCTURE OF TRAINING**

The course consists of the following detail topics in the field of Solar Energy. This training will be covered in 80 hours of interaction.

<b>Sr. No.</b>	<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>	<b>Duration(Days)</b>
1	a. Electricity Basics b. Introduction to Conventional & Non-conventional source of Energy c. Basics of Solar energy	Introduction of Institute, Display Room Visit, solar training yard visit, a. Demonstration of PV components:- 1. Module 2. Inverter 3. Battery 4. Structure 5. BoS b. Tools Introduction & type of tools:- 1. Safety tools 2. Marking tools, 3. Measuring tools, 4. Testing tools, 5. Working tools, c. Site selection, suitability & Planning	1
2	a. Study of solar photovoltaic cell & solar photovoltaic module, type and size b. PV module, Fundamental types of modules and its applications, PV components and configuration etc. 1. Solar Photovoltaic system 2. Types of solar photovoltaic system, 3. Grid connected solar PV system, c. Off Grid connected solar PV system/Standalone Solar PV	a. Series and Parallel connections of battery and Modules b. Reading and observations of PV power c. Module datasheet reading d. Inverter datasheet reading	1

	d. Series and Parallel connections of battery and Modules		
3	a. Understanding the parameters of site survey	a. Practical site survey b. Site survey form filling c. Analyzing the shading objects d. Land analysis	1
4	Preparation of work statement & layout documents for the following: a. Foundation-P&M, Tools & Tackles b. Structure Erection- P&M, Tools & Tackles c. Module Mounting- Module sorting , tools & Tackles d. Cable Trenching & Conduit Laying- P&M, Tools & Tackles e. Cable Laying & Termination- Tools & Tackles, Pre Requisite f. Cable tray & cable laying g. Junction box Installation-Basic knowledge h. Inverter Erection –Tools & Tackles i. Battery installation & maintenance	a. Site observation b. Observing Installation of Inverter, LT panel, PV module Series & parallel connection & testing c. Earthing pit design d. Earthing pit location/sizing e. Layout observation	1
5	Reading of drawing and Specification for the followings b. Civil Foundation or Ramming c. Structure erection d. Requirement & Uses of Tools & Tackles. Basic knowledge of Ammeter Voltmeter, clamp on-meter, tong tester, Irradiance sensor, temperature sensors.	a. Civil Foundations b. Module mounting structure and fixing of the same. c. Proper alignment and tightening. d. Fixing of structure and its connection.	1
6	a. Reading of Single Line Diagram(SLD)Basic knowledge about tools and tackles required for PV plant Installation b. Performance analysis and troubleshooting monitoring of generation per string incoming & outgoing power at junction box & Inverter level. c. Cable Gland- Types of cable Gland a. Single compression cable Gland b. Double compression Cable Gland	a. Module mounting (1kWp) b. Inverter Installation and Connection c. Installation of balance equipment and End termination Power cable. d. Installation of Junction e. String testing DC Side box f. Pole Erection, Types of pole g. Cable tray , types of cable tray & cable Tray h. Erection Battery , types of battery , Installation of Battery	1 <b>(Off Grid/Stand Alone System installation)</b>

7	<ul style="list-style-type: none"> <li>a. Plant commissioning procedure</li> <li>b. Understanding Testing tools</li> <li>c. Understanding plant interconnections</li> </ul>	<ul style="list-style-type: none"> <li>a. Inspection, Testing &amp; commissioning of PV plant</li> <li>b. Purpose for Inspection &amp; testing</li> <li>c. Tools/Instrumentation required</li> <li>d. Procedure and Work Method Study of work method &amp; document for the followings</li> <li>e. String Testing –Pre-checks</li> <li>f. Short Circuit Test-Work Method</li> <li>g. Inverter Testing-Work Method</li> <li>h. Dismantle of Module mounting structure</li> <li>i. Termination Power cable.</li> </ul>	1 <b>(Off Grid/Stand alone system installation of 1kWp)</b>
8	<ul style="list-style-type: none"> <li>a. Understanding the concept of power evacuation</li> <li>b. Understanding the concept of grid synchronization</li> <li>c. Grid Fundamental AC &amp; DC</li> </ul>	<ul style="list-style-type: none"> <li>a. Module mounting (3kWp)</li> <li>b. Inverter Installation and Connection</li> <li>c. Installation of balance equipment and End termination Power cable.</li> <li>d. Installation of Junction</li> <li>e. String testing DC Side box</li> <li>f. Cable tray , types of cable tray &amp; cable Tray</li> <li>g. Inspection, Testing &amp; commissioning of PV plant</li> <li>h. Power evacuation</li> <li>i. Grid Synchronization</li> </ul>	2 <b>(On Grid System installation of 3kWp)</b>
10	Operation & Maintenance <ul style="list-style-type: none"> <li>a. Introduction and over view of PV system</li> <li>b. Equipment's under AC side &amp; DC side and regular maintenance</li> <li>c. General Safety Guidelines for O&amp;M</li> <li>d. Soft &amp; Entrepreneurship skills</li> </ul>	<ul style="list-style-type: none"> <li>a. Solar PV module cleaning &amp; testing</li> <li>b. Inverter testing,</li> <li>c. Battery testing,</li> <li>d. Cell voltage testing</li> <li>e. Earthing testing,</li> <li>f. Cable testing.</li> </ul>	1
<b>Complete hands-on solar PV system design and installation training</b>		<b>Theory + Practical</b>	<b>10 Days</b>

## SOLBIZZ-UNDERSTANDING SOLAR BUSINESS

Want to be an Entrepreneur? Looking on for a change of business?

Solbizz is a 2 days training Program giving all nuances of becoming Solar Entrepreneur.

With Solbizz we give you an opportunity to fulfil your dreams and become an Entrepreneur in the field of Solar. The course help you open up your own business in the field of solar by providing you with all the knowledge required,

The Trainers are the best from the field of solar, like Prof. Dr. Chetan Singh Solani of IIT Bombay, who has an experience of more than 15 years in the field of solar, with 11+ Patents, 4 books on his name, who has also successfully incubated company in field of solar at SINE, IITB.

So what are you waiting for? Come and be a part of solar revolution!!!

## Course Outline

Day1 (Technology, System Designing, Market Analysis and Policy)	Day2 (Financials and Legalities)
<ul style="list-style-type: none"> <li>• Introduction to the speakers</li> </ul>	<ul style="list-style-type: none"> <li>• Determining Plant Capacity</li> <li>• Economic evaluation of a PV Plant</li> </ul>
<ul style="list-style-type: none"> <li>• Energy Scenario in India, National Solar Mission &amp; Timeline</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding economy of scale, tax benefits, accelerated depreciation</li> <li>• Simple Payback Period (SPP)</li> </ul>
<ul style="list-style-type: none"> <li>• Solar PV system layout &amp; components &amp; System Sizing</li> </ul>	<ul style="list-style-type: none"> <li>• Net Present Value (NPV), Levelized Cost of Electricity (LCOE) calculations</li> <li>• Different investment models</li> </ul>
<ul style="list-style-type: none"> <li>• Solar PV Value chain</li> <li>• Component selection &amp; Overview of standards</li> <li>• Policy framework by MNRE, GOI</li> <li>• PV implementation status</li> </ul>	<ul style="list-style-type: none"> <li>• Legal framework</li> <li>• Power Purchasing Agreement (PPA) and contracts</li> </ul>
<ul style="list-style-type: none"> <li>• Power Evacuation</li> <li>• List of vendors of PV components</li> </ul>	<ul style="list-style-type: none"> <li>• Financing of Solar Projects</li> </ul>
<ul style="list-style-type: none"> <li>• Trends and upcoming PV Technology</li> </ul>	<ul style="list-style-type: none"> <li>• Business opportunities in Solar PV field</li> <li>• Present businesses and Solar Entrepreneurs</li> </ul>
<ul style="list-style-type: none"> <li>• Understanding Solar PV Plant installation steps and Project Execution Strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Association options (S-Packages)</li> </ul>
<ul style="list-style-type: none"> <li>• PV Plant Visit</li> </ul>	<ul style="list-style-type: none"> <li>• Vote of Thanks</li> </ul>

## SOLAR PRODUCT ASSEMBLY TRAINING PROGRAM

The training will be to impart training on development, assembly, repair and maintenance of various solar products such as

1. Home Lighting System
2. Solar Power Bank
3. Solar Lamps



Total duration of training will be 2 months (416 hours) including a 15 days on field internship which should majorly focus on installation of solar products like street lights and solar home lighting systems.

The participants will also be given training on marketing and entrepreneurship skills so that they will become the campaigners of solar energy. The training program is strictly residential with a clear daily timetable.

Training will majorly focus on repair and maintenance of solar products like solar mobile charger, solar home lighting system, solar street lights etc.

### **Selection of Participants**

Selection of participants depends upon the institute, however there are some selection criteria which are needed to be followed:-

**Essential Qualification:** Candidate should be 10+2 pass and should be not less than 18 years.

**Preferable:** It is also preferred that trainee should have certificate of ITI, diploma or degree in engineering branches Electrical/Mechanical/Electronics, experience in certified electrician is also preferred.

### **Course Curriculum**

No.	Theoretical know-how	Practical experiments
1	<ul style="list-style-type: none"><li>a. Electricity basics.</li><li>b. Introduction to commonly used electronics and semiconductor devices like resistors, capacitors, diodes, transistors, etc.</li><li>c. Principles of measurements tools for various parameters and components like current, voltage, resistor, etc.</li><li>d. Introduction to conventional and non-conventional energy sources.</li><li>e. Electrical safety and rules, general safety related to electronic components and equipments.</li></ul>	<ul style="list-style-type: none"><li>a. Introduction to various electronics components, calculating and measuring their values.</li><li>b. Measurement of parameters like current and voltage.</li><li>c. Demonstration of safety rules for various components and equipments.</li></ul>
2	<ul style="list-style-type: none"><li>a. Solar PV fundamentals –Operation of solar cells.</li><li>b. Design and types of PV modules.</li><li>c. Introduction to different types of off-grid PV system.</li><li>d. Examples of off-grid PV system design.</li></ul>	<ul style="list-style-type: none"><li>a. Study of Solar cells/modules and measurement of associated parameters.</li><li>b. Examples of standalone PV system and understand the design factors.</li></ul>
3	<ul style="list-style-type: none"><li>a. Different types of smaller off-grid solar PV</li></ul>	<ul style="list-style-type: none"><li>a. Demonstration of different off-</li></ul>

	<p>solutions.</p> <ul style="list-style-type: none"> <li>b. International and national standards for the various off-grid solar solutions.</li> <li>c. Introduction to Solar PV based lighting solutions – Solar Lamps, Solar Mobile Chargers, Home Lighting System, Solar Street-Lights.</li> <li>d. Introduction to non-lighting based solar PV based solutions like solar water pumping, etc.</li> </ul>	<p>grid solar PV lighting solutions.</p> <ul style="list-style-type: none"> <li>b. Demonstration of different off-grid solar PV non-lighting solutions.</li> </ul>
4	<ul style="list-style-type: none"> <li>a. Basic principles of operation of the solar PV lighting products.</li> <li>b. Introduction to different lighting sources and their comparison.</li> <li>c. Different principles of LED driver circuits.</li> <li>d. Principles of charge controller circuits.</li> <li>e. Different types of batteries and their comparison.</li> </ul>	<ul style="list-style-type: none"> <li>a. Demonstration of different types of light sources, batteries and circuits for various products.</li> <li>b. Study and compare different lighting sources.</li> <li>c. Study and compare different battery performances.</li> <li>d. Study and compare different LED driver circuits.</li> <li>e. Study and compare different charge controller circuits.</li> </ul>
5	<ul style="list-style-type: none"> <li>a. Flow for assembling of different solar PV based products.</li> <li>b. Different checks during assembling to ensure proper working of the products.</li> <li>c. Demonstration of working proto types of different products.</li> <li>d. Trouble-shooting check list and steps for various products.</li> </ul>	<ul style="list-style-type: none"> <li>a. Assembly of different products available in kit form.</li> <li>b. Different tests and checks during the assembling.</li> <li>c. Trouble-shooting of old products.</li> </ul>
6	<ul style="list-style-type: none"> <li>a. Selection of the solutions based on customer requirements and budget.</li> <li>b. Installation of the different solar products with the best practices.</li> <li>c. Steps for regular O&amp;M of the installed solar products.</li> <li>d. Best practices for the customer after installation of the products.</li> <li>e. Importance of maintaining relationship with the customers.</li> </ul>	<ul style="list-style-type: none"> <li>a. Assessment of customer requirements and proposing a suitable system.</li> <li>b. Field-level installation of different solar products.</li> </ul>

## COMMERCIALS

Solar SparQ is a social initiative of kWatt and we are looking for “**Making Students Solar Smart**”, and keeping note of student’s pockets, fees has been kept very nominal, affordable to students. Here is the fees structure tabulated below:

Sr. No.	Training Program	Duration (Days)	Fees (INR)/student
1	Basic Course	2	2,000
2	Advanced Course (Students)	5	7,500
3	Advanced Course (Faculties)	5	15,000
4	SOLBIZZ-Understanding solar business	2	15,000
5	SolarInstall-Solar PV Installation training	10	39,999*
6	Solar Product Assembly Training Program	60	60,000*

## Terms and Conditions

1. **Venue:** Institute will provide a Lecture hall for theory section and a Laboratory for Practical session
2. **Payment:** Cheque/DD in favor of “kWatt Solutions Private Limited” should be handed over to the trainers at the end of the course.
3. **Taxes:** *Fees is inclusive of Service Tax*; Invoice will be handed over to the Institute coordinator before the Course for transfer of Payment.
4. **Min Number of Students:** The basic course batch should have a minimum of 80 students. Advanced course batch should have a minimum of 40 participants.
5. **Food and Accommodation:-** Food and accommodation for trainers will be taken care by Institute for the duration of course

For any queries, please feel free get in touch with our team member on below mentioned contact details

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