

Vertical – 4 VSC Practical (2)

VSC: Vocational Skill Course (Credit - 2)
Study of Solar Panel and its installation

Sr. No.	Heading	Particulars
1	Description the course (Including but not limited to)	Introduction, Relevance, Usefulness, Application, Interest, Connection with other courses, Demand in the Industry, Job Prospects etc.
2	Vertical:	Elective
3	Type:	Practical
4	Credits:	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a Semester)
5	Hours:	60 Hours
6	Marks Allotted:	50 Marks
7	Course Objective (CO): The students are expected to	
	CO 1	generate awareness among students about Renewable Energy sources and Solar Energy System
	CO 2	develop concept of Working Solar Cell and Solar Photo Voltaic (SPV) Module
	CO 3	understand components of solar photovoltaic system and its parameters
	CO 4	understand I-V characteristics and calculation of power, fill factor and efficiency of solar panel
	CO 5	students understand the room energy audit, installation and interconnections of solar panel
	CO 6	understand the Maintenance and Trouble-shooting of PV Modules
8	Course outcomes (OC): After successful completion of this course, the students will be able to	
	OC 1	students gain the basics of renewable energy sources and solar energy system and its applications.
	OC 2	students comprehend knowledge about solar cell and Solar Photo Voltaic (SPV) Module
	OC 3	students understand basics of components of solar photovoltaic system its parameters.
	OC 4	students comprehend knowledge of installation and interconnection of solar panel.
	OC 5	students understand the maintenance and troubleshooting of PV Modules
9	List of Experiments - Photovoltaic effect and working of solar cell Aim and Objective: Explain Photovoltaic effect, Construction & Working Solar Cell and Solar Photo Voltaic (SPV) Module - Study of solar panel and main components of solar photo voltaic system Aims and objectives: Explain structure of solar panel, types of solar panel and main components solar photovoltaic system - Study of Electrical Parameters of Solar Cells: Aims and Objectives: Explain short circuit current, I_{sc}, open circuit voltage V_{oc}, Maximum power current I_{MP}, Maximum power voltage V_{MP}, Maximum power voltage (MPP), Fill Factor, efficiency with I- V characteristics. - Study of I-V Characteristics of a Solar Panel Aim and Objective: To plot current vs. voltage (I-V) and power vs. voltage (P-V) characteristics of a photovoltaic panel under different illumination levels and determine open-circuit voltage, short-circuit current, and maximum power point (MPP) and calculate the fill factor and efficiency of a solar panel.	

5. Study of effect of load on output power of a Solar Panel
Aim and Objective: To measure the current, voltage and calculate power for different resistive loads of the solar panel
6. Effect of Shading on Solar Panel Performance
Aim and Objective: To study how shading (25 %, 50% etc.) affects on a solar panel current, voltage, and output power.
7. Effect of Different Colour Light on Solar Panel Performance
Aim and Objective: To study how different coloured lights (red, green, blue) affect the voltage, current, and power output of a solar panel. Compare which light wavelength gives maximum output.
8. Study of series connections of solar panels and the output power
Aims and objectives: To investigate the electrical behavior (voltage, current, power) of solar panels connected in series and parallel configurations.
9. Study of parallel connections of solar panels and the output power
Aims and objectives: To investigate the electrical behavior (voltage, current, power) of solar panels connected in series and parallel configurations.
10. Energy Audit
Aim and Objective: To calculate daily system energy demand using different household appliances
11. Installation of 2 kW solar panel system and load calculation
Aims and objectives: To determine the number of solar panels required for a 2-kilowatt solar system
12. Interconnections to the solar module (Using a Small PV Panel)
Aims and objectives: To study the correct polarity and wiring sequence of a solar module and perform the interconnection between the solar panel and charge controller using a small (10–20 W) photovoltaic module.
13. Installation of solar panel
Aims and objectives: To study the effect of tilt angle and row spacing on solar panel installation using a small indoor model and calculate recommended spacing using site latitude.
14. Maintenance and troubleshooting of PV Modules
Aim and Objective: Maintenance on solar PV modules, wiring and mounting structures by inspecting for dust, shading, corrosion, loose connections, physical damage, and environmental wear, and ensuring proper cleaning and system health.
15. Fault Diagnosis & Repair (Electrical Troubleshooting)
Aim and Objective: To diagnose intentionally introduced faults in a PV module system such as open circuits, short circuits, loose connections, reverse polarity, blown fuses, bypass diode failure, and weak cells and to restore normal operation using systematic troubleshooting.

- Minimum **08** experiments from the list of experiments
- All the measurements and readings should be written with proper units in SI system only.
- After completing the required number of experiments in the semester and recording them in journal, student will have to get their journal certified and produce the certified journal at the time of practical examination to be eligible to appear in the Semester End Practical Examination

General Instructions:

- For practical examinations, the learner will be examined in One experiment only.
- Evaluation in viva voce will be based on regular experiments and skill experiments.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester

	or a certificate from the Head of the Department / Institute to the effect that the candidate has completed the practical course of that semester of T. Y. B. Sc. Physics as per the minimum requirement.																									
10	Reference Books: 1. Solar Electricity Handbook. A Simple, Practical Guide to Solar Energy - Designing and Installing Photovoltaic Solar Electric Systems. Michael Boxwell · 2010. Greenstream Publishing 2. Solar Based Geen Energy Solutions Basics, Sizing & Installation, Dr Dinesh V Kala, Book Media 3. From Sunlight to Electricity: A practical handbook on solar photovoltaic applications (Third Edition), Suneel Deambi. 4. Solar PV System: Design, Installation, Operation and Maintenance, L. Ashok Kumar, K. Mohana Sundaram, Nova Publisher.																									
11	Scheme of Examination: Semester End Practical Examination: • The duration of Each Experiment in Semester End External Practical Examination will be of Two hours. • The Semester End External Practical Examination will be for 30 marks as per the marking scheme given below: <table> <tr> <th>Sr. No.</th><th>Activity</th><th>Total 30 Marks</th></tr> <tr> <td>1</td><td>One Experiment from either Group A or Group B</td><td>20 Marks</td></tr> <tr> <td>2</td><td>Certified Journal</td><td>05 Marks</td></tr> <tr> <td>3</td><td>Viva</td><td>05 Marks</td></tr> </table> Internal Practical Examination: • The duration of Internal Practical Examination per experiment will be of Two hours. • The Internal Practical Examination Pattern for 20 marks (During the Semester), will be as per the marking scheme given below: <table> <tr> <th>Sr. No.</th><th>Activity</th><th>Total 20 Marks</th></tr> <tr> <td>1</td><td>Skill testing related any one experiment.</td><td>10 Marks</td></tr> <tr> <td>2</td><td>Overall performance</td><td>05 Marks</td></tr> <tr> <td>3</td><td>Viva-Voce</td><td>05 Marks</td></tr> </table>		Sr. No.	Activity	Total 30 Marks	1	One Experiment from either Group A or Group B	20 Marks	2	Certified Journal	05 Marks	3	Viva	05 Marks	Sr. No.	Activity	Total 20 Marks	1	Skill testing related any one experiment.	10 Marks	2	Overall performance	05 Marks	3	Viva-Voce	05 Marks
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