



GOVERNMENT OF TAMILNADU

DIRECTORATE OF TECHNICAL EDUCATION, CHENNAI-25

**STATE PROJECT COORDINATION UNIT**

*(Established under Canada India Institutional Cooperation Project)*

**CURRICULUM**

Course Name	<b>SOLAR PHOTOVOLTAIC SYSTEM INSTALLATION</b>
Course Code	<b>EE/2020/006</b>
Course Duration	60 Hours
Minimum Eligibility Criteria	10 <sup>th</sup> /+2 /ITI/Diploma/Graduates
Pre-requisites (if any)	-
Course Objectives	<p>Training module has been designed for the participants to</p> <ul style="list-style-type: none"> <li>Understand AC and DC electricity and explain their differences.</li> <li>Describe the features of solar PV system configurations and applications: DC systems, stand-alone, Hybrid systems/grid connected</li> <li>Implement procedure of installation, operation and maintenance of solar PV systems.</li> <li>Interconnect Solar Panel with Balance of Systems</li> </ul>
Course Outcomes	<p>At the end of training, the trainees will be able to</p> <ul style="list-style-type: none"> <li>Explain the basic concept of Solar photovoltaic System</li> <li>Identify and describe basic functions of different components of PV systems.</li> <li>Explain the operation of various configuration of Solar PV System.</li> <li>Carry out Installation and Maintenance of Solar PV system.</li> </ul>
Expected Job Roles	Solar PV System Installer

TEACHING AND SCHEME OF EXAMINATION						
Course Code	Course Name	Hours		Assessment Marks		Duration of Examination
				Min	Max	
EE/2020/006	SOLAR PHOTOVOLTAIC SYSTEM INSTALLATION	Theory	24	10	20	3 Hours
		Practical	36	40	80	
		Total	60	50	100	

**DETAILED SYLLABUS**

Unit No	Modules	No.of.Hours	
		Theory	Practical
I	Introduction To Solar PV Systems	10 Hours	
1.1	Basic Electrical concepts	08	02
1.2	Definition of Voltage, Current, Resistance, Power and Energy		
1.3	Ohm’s Law		
1.4	Series and Parallel Circuit		
1.5	Electrical Measuring Instruments		
1.6	Fundamentals of semiconductors		
1.7	P-N junction diode		
1.8	Operating of Solar PV cell		
1.9	Electrical parameters of Solar PV Module		
1.10	Definition of Terms used in Battery		
1.11	Types of Battery		
1.12	Rating of Battery		
II	Solar PV Modules And Balance Of Systems	15 Hours	
2.1	Introduction of PV Modules & Balance of system	06	09
2.2	Inverters, Batteries, Charge controllers, Solar Inverters, Power conditioning Units		
2.3	Types of PV Modules & Balance of systems		
2.4	Functioning of PV Modules & Balance of systems		
2.5	Technical Specifications of PV Modules & Balance of systems		
2.6	Selection of PV Modules & Balance of systems		
2.7	Practical:Module Mounting Structures – Installation Practice		
2.8	Types & Specifications		
III	Types Of PV System And Configurations	10 Hours	
3.1	Direct coupled system	05	05
3.2	Off Grid system		
3.3	Grid Tied system		
3.4	Hybrid system		
3.5	Solar Net-metering system		
3.6	Practical:UPS to Solar Conversion Practice		
3.7	Roof Top system		
3.8	Ground mounted system		
3.9	Practical:Solar Tracking system		
3.10	Solar Water Pumping system		
3.11	Practical:Solar Street lighting system		
3.12	Solar Gadgets & Portables		

IV	Installation And Maintenance Procedures Of Solar PV Systems	25 Hours	
4.1	Introduction	05	20
4.2	Factors to be considered for Proper Installation		
4.3	Best suitable conditions for Solar PV systems		
4.4	<b>Practical:</b> Installation and Interconnection of PV Modules, Inverters, Batteries, Charge controllers, Solar Inverters, Power conditioning Units, ACDB		
4.5	Testing Procedures		
4.6	Operation & Maintenance schedule of solar PV power plants		
4.7	Safety of PV systems (MCB's, SPD's, Earthing & Lightning Arrestors)		
4.8	Do's & Don'ts of Solar PV systems		
4.9	Typical faults & Trouble shooting		
<b>Total Theory and Practical Hours</b>		<b>24</b>	<b>36</b>
<b>Total hours</b>		<b>60</b>	

#### HARDWARE REQUIREMENT

S.NO	LIST OF TOOLS /EQUIPMENTS
1	Electrical Tools Set, Multimeter, Angle Finder
2	Inverter, Battery, Charge Controller, DCDB, ACDB
3	Solar PV Panel – Mono and Poly Crystalline & Thin Film
4	Module Mounting Structure, Level Indicator, Direction
5	Laser Marker, Drilling Machine, Spanner Set
6	Personal Protective Equipments, First Aid Kit

#### SOFTWARE REQUIREMENT

NIL
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#### REFERENCE BOOKS

S.NO	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	Solar Photovoltaic System Applications: A Guidebook for Off-Grid Electrification	Parimita Mohanty, Tariq Muneer, Mohan Kolhe	Springer
2	Grid Integration of Solar Photovoltaic Systems	Majid Jamil, M Rizwan, D P Kothari	CRC Press.
3	Solar PV Power: Design, Manufacturing and Applications from Sand to	Rabindra Kumar Satpathy, Venkateswarlu Pamuru	Academic Press, 2020
4	Solar Photovoltaic Power Optimization	Michael Ginsberg	Routledge.

## ASSESSMENT AND CERTIFICATION

S.No	Criteria for assessment
1.	A trainee will be assessed based on the performance in End Examination for Theory and Practical conducted internally in the CIICP Project Polytechnic College for a duration of 3 hours
2.	A trainee must have 75% of attendance to appear for End examination in Theory and Practical.
3.	The assessment for theory part will be based on the marks scored in the end examination on the knowledge bank of questions (1 word/objective type questions)
4.	The assessment for practical part will be based on the marks scored in the end examination conducted by the CIICP Project Polytechnic and assessed by the Examiners approved by Strategic Plan Implementation Committee (SPIC) of the project polytechnic.
5.	The passing criteria for successful completion of training is every trainee should score 50% of marks in theory and practical examination.
6.	On successful completion of training, Certificate will be issued to the participants by the Directorate of Technical Education through the Project Polytechnics.

## END EXAMINATION

### ALLOCATION OF MARKS

S.NO	Description	Max. Marks
1.	Theory Examination	20
2.	Practical Examination	
	a)Objective and Circuit Diagram	20
	b)Procedure and Connections / Execution	20
	c)Result and Viva	20
	d) Record	20
<b>Total Marks</b>		<b>100</b>

## **THEORY MODEL QUESTION PAPER**

### **EE/2020/006 SOLAR PHOTOVOLTAIC SYSTEM INSTALLATION**

**(Maximum Marks: 20)**

**(N.B: Answer any Twenty questions)**

**20x1= 20 Marks**

1. Draw the symbol of PN junction Diode?
2. What are the Parameters that affect actual Generation in Solar PV Module?
3. What are the types of Solar Cell?
4. Draw the VI curve of Solar PV Cell.
5. Define Fill Factor.
6. What are the Standard Test Condition in Solar PV Module?
7. What are the advantages of Solar PV system?
8. What is meant by SoC in battery?
9. What is meant by C rating in battery?
10. What are the specifications of Solar PV Module?
11. What is function of charge controller?
12. What is function of Grid priority controller?
13. What is meant by Balance of System?
14. What is an inverter?
15. What are the types of charge controller?
16. Expand PCU.
17. What is meant by OFF Grid solar PV system?
18. What is meant by ON Grid solar PV system?
19. What is meant by Hybrid PV system?
20. What is function of solar net-meter?
21. Can the Solar Plant be Synchronized with Grid Power?
22. What is meant by Roof top solar PV system?
23. What are the advantages of Solar tracking system?
24. Expand ACDB.
25. What are the advantages of SMF batteries?