



CHRIST
COLLEGE (AUTONOMOUS)
IRINJALAKUDA, KERALA
Reaccredited by NAAC with 'A' grade

DEPARTMENT OF COMMERCE CERTIFICATE COURSE DETAILS

NAME OF THE COURSE

Solar Energy: Photovoltaic (PV) Technologies

COURSE CODE

CPCC09

COURSE DETAILS

30 hr course (30 hrs theory) 15 week course.

Two hrs. per week.

Mark distribution: Each assignment is counted as one credit. A minimum of 25 credits is required to pass. Project is given 2 bonus credits.

Certificate Grades : 30+2 credits -

Platinum Certificate : 30+ credits -

Gold Certificate : 28+ credits -

Silver Certificate: 25 + credits -

Bronze Certificate Course fee: Rs. 3000

PARTNERSHIP WITH

Solwatt Power Private Limited

Marathakkara- 680306

Thrissur, Kerala



COURSE COORDINATOR

Dr. Sudheer Sebastian K

OFFERED BY

PG Department of Physics

Christ College (Autonomous) Irinjalakuda

ABOUT COLLEGE

Christ College (Autonomous), Irinjalakuda established in the year 1956 by CMI fathers has always been a place where young generations are moulded towards a bright future. College has excellent infrastructure, with state of the art laboratories, seminar rooms and lecture halls. The campus is Wi-Fi enabled. Presently College is home for 4500+ students, 200 teaching staff and 45 supporting staff. The strength of the College lies in its hardworking and tech savvy teachers who are eager to involve in all matters of students. The lush green campus with gardens and open gym is moving towards the next phase on education both offline and online.

WHAT IS THE COURSE?

The course introduces students to photovoltaic technologies for conversion of solar energy into electrical energy. Various photovoltaic cells and their fabrication methods are discussed. Photovoltaic modules and various components of photovoltaic system is introduced. Design of on grid and off grid and hybrid photovoltaic system for home and industry is discussed.

SCOPE OF THE COURSE

Students completing this course can go for higher studies in solar energy related nonconventional energy resources field.
Can work in photovoltaic industry.
Can setup photovoltaic related start-ups

LEARNING OUTCOMES

To understand Solar energy
To understand photovoltaic fundamentals
To understand various types of photovoltaic cells.
To design on grid, off grid and hybrid photovoltaic systems for home and institutions.

COURSE OUTLINE

The course discusses solar energy and photovoltaic fundamentals. Various types of solar cells, PV modules and systems are introduced. Design of on grid, off grid and hybrid systems of home and institutions are discussed.

COURSE MODULES

Unit 1: Introduction to solar energy

Energy- Energy consumption-Methods of energy conversion-Renewable energy carriers-Electricity- Status and prospects of solar energy- The working principle of a solar cell.

5 hrs + 5 assignments

Unit 2: Photovoltaic fundamentals

Semiconductor junctions- The p-n junction under equilibrium-The p-n junction under applied voltage. The p-n junction under illumination- Solar Cell Parameters - External solar cell parameters- Standard test conditions- Short circuit current density- Open circuit voltage- Fill factor- Conversion efficiency- The external quantum efficiency- The equivalent circuit

5 hrs + 5 assignments

Unit 3: Crystalline silicon solar cells & Thin-film solar cells

Designing c-Si solar cells -Fabricating c-Si solar cells - High-efficiency concepts- Transparent conducting oxides - The III-V PV technology -Thin-film silicon technology-Chalcogenide solar cells - Organic photovoltaic - Hybrid organic-inorganic solar cells

5 hrs + 5 assignments

Unit 4: PV modules and systems

Working and characteristics of Solar PV modules, Introduction to different types of solar charge controllers, working, advantages & disadvantages. Different types of battery banks, advantages & disadvantages.

Off-grid systems Different types of solar chargers, working, advantages, and disadvantages. On-grid Systems Different types of on grid inverters, working, advantages and disadvantages. Hybrid Systems Different types of hybrid grid inverters, working, advantages and disadvantages.

Design of Photo voltaic systems -Understanding customer requirement, Feasibility, budget, return of investment, selection of power plant based on the requirement.

5 hrs + 5 assignments

Unit 5: Off grid & On grid System Design

Off grid System Design-Calculation of connected load - inverter selection, Power factor, back up time requirement- battery bank selection-PV string design- Solar charger selection and design of other accessories.

On grid System Design- Calculation of No of units (kWh) consumed per day (available from the utility bill)- Selection of power plant capacity based on the energy unit requirement. Selection of PV modules depending on the capacity and site conditions, selection of PV grid inverters, Single line drawing, design and selection of DBs, cables, breakers and fuses.

5 hrs + 5 assignments

Unit 6: Hybrid System Design and maintenance

Hybrid System Design -Calculation of No of units (kWh) consumed per day (available from the utility bill), Selection of power plant capacity based on the energy requirement. Selection of PV modules. Selection of hybrid inverter, back up calculation and battery bank, design and selection of DBs, cables, breakers and fuses.

Basic Maintenance & Troubleshooting Identifying the problem, by checking the system parameters, loose connections, routine check-up & cleaning etc. Off grid checking the voltages, current, battery acid gravity. On grid checking the PV voltage, Earth faults, SPD

5 hrs + 5 assignments

PV system design project:

Photovoltaic system industry visit to familiarize with PV system components and design and preparing a design of a PV system for home or an institution on paper.

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