

PR SOLAR SYSTEMS AND TECHNOLOGY

Introduction – Development of photovoltaic(PV) power generation - Solar energy - Identification of critical parameters and design aspects of a silicon solar cell - Applications of solar power systems - Solar power sources for homes and commercial buildings - Solar module and panel installation requirements.

Solar cell devices - Theory of spectral response of p-n junction devices - Efficiency in the p region - Efficiency in the n region - Power output of the cell - Theoretical conversion efficiencies of single junction Si and GaAs solar cells – Net conversion efficiency and overall conversion efficiency of solar cells.

Performance capabilities of solar cells - Exotic materials based solar cells- Amorphous silicon solar cell devices - Thin films of copper indium diselenide (CIS) and copper indium diselenide gallium (CIGS) - Cadmium telluride (CdTe) solar cells - Nanotechnology concepts based solar cells - Silicon nanowires - Zinc oxide nanorods multi-junction.

Photovoltaic installation - Factors impacting installations - Optimization of solar electric system for specific applications – Photovoltaic solar energy converters - Fabrication materials - Performance degradation and failure mechanisms in solar modules - Roof-mounted solar panel installation scheme and system cost breakdown.

Photovoltaic power systems - Grid-connected PV - Stand-alone PV power systems - Design configuration and critical performance requirements for stand-alone PV power systems - Tower top focus solar energy collector system – Operating principle – Economic feasibility and impact of solar energy levels.

REFERENCES:

1. Sukhatme, S.P., Solar Energy Principle of Thermal Collection and Storage, 2nd ed., Tata McGraw Hill, 2000.
2. Rao, S. and Parulekar, R.B., Energy Technology - Nonconventional, Renewable and Conventional, Khanna Publishers, 1995.
3. Michael Boxwell, The Solar Electricity Handbook - A simple, practical guide to using electric photovoltaic panels and designing and installing photovoltaic PV systems, Greenstream Publishing, 2009.
4. Solar Energy International, Photovoltaics: design and installation manual: renewable energy education for a sustainable future, New Society Publishers, 2004.
5. Deutsche Gesellschaft für Sonnenenergie, Planning and installing solar thermal systems: a guide for installers, architects, and engineers, Earthscan Publishers, 2005.