SOLAR PHOTOVOLTAIC SYSTEM DESIGN

SYLLABUS:

1. **Introduction to PV system**.

2. **The Basics of Photovoltaic Cells, Modules and Arrays**
   - 2.1 Materials for Solar Cells
   - 2.2 Photovoltaic Technologies
   - 2.3 Photovoltaic Module
   - 2.4 Electrical Parameters of PV module
   - 2.5 Factors that influence the output of the PV module

3. **Photovoltaic Module Characteristics**
   - 3.1 V-I Characteristics of Solar Panel
   - 3.2 Temperature Effects on module characteristic
   - 3.3 Effects of electrical load mismatching
   - 3.4 Specifications of Solar Panel
   - 3.5 Series -parallel connections of Solar Panel

4. **Energy enhancement through Tracking**
   - 4.1 Sun Position Tracking
   - 4.2 Solar-powered (Passive) Sun Tracker
   - 4.3 Electric-powered (Active) Sun Tracker
   - 4.4 Single axis and two axis tracking
   - 4.5 Electronic Power Tracking
   - 4.6 Maximum Power Trackers for DC Motors

5. **PV System sizing (Load Estimation)**
   - 5.1 Daily load sizing
   - 5.2 Week Average load sizing
   - 5.3 Daily Load Demand
   - 5.4 Estimation of continuous surge power for complex systems
   - 5.5 Calculation of Ampere hours for AC loads
   - 5.6 Efficient loads
   - 5.7 Types of Lamps
   - 5.8 Electrical Efficiency and Lamp Efficacy

6 **System sizing (Array & Battery)**
   - 6.1 Array and Battery Sizing Principles
   - 6.2 Complete Battery sizing calculation

6.3 Basic Array Sizing Calculation
6.4 Complete Array sizing calculation
6.5 Losses estimation (shading, temperature)
6.5 Array sizing software

7. Other PV System Components:

7,1 Inverters
7.2 Charge Controllers
7.3 Battery storage
7.4 Balance of system (BoS)

8. PV System Applications

8,1 On-grid/off-grid systems
8.2 Microgrids
8.3 Solar pumping
8.4 Grid interfaces
8.5 Hybrid Systems

9 System wiring

9.1 Wire sizing based on ampacity
9.2 Wire sizing based on voltage drop
9.3 Different electrical configurations in Array wiring
9.4 Overcurrent Protection Devices
9.5 Equipment grounding for photovoltaic system
9.6 Lightning and Surge Protection
9.7 Grounding methods

10 Grid-Connected Solar PV Systems

10.1 Losses affecting the yield on the solar PV system
10.2 Components of Grid Connected PV system
10.3 Grid-connected PV system standards
10.4 Solar PV system lightning protection
10.5 Earthing of Inverter Poles with Modules