



Introduction to Photovoltaic Systems

A Train-the-Trainer Program for Professional Educators

Florida Solar Energy Center – Southeast Solar Training Network

***1617 Clearlake Road
Cocoa, FL 32922***

October 25 – October 28, 2010

PRELIMINARY AGENDA

Course Description

This 4-day training program is targeted toward teachers and instructors who are presently or planning to offer introductory level courses on photovoltaic (PV) systems technology. This course provides an overview of PV systems, their design, configurations and installation, as well as an overview of the content, curriculum, learning objectives, assessments and other instructional resources



Course Objectives and Format

The objectives of this training program are to develop the participant's ability to teach quality PV training programs, and to engage students on appropriate career pathways to fill the numerous job opportunities expected in the PV industry. Specifically, this course will provide instructors with the methods, tools and resources to develop and deliver introductory level PV training programs, including:

- ▶ Textbook and instructor resources
- ▶ Critical tasks and learning objectives
- ▶ Strategies and instructional methods
- ▶ Problems, exercises and assessments
- ▶ Training equipment and facility requirements
- ▶ Applicable codes, standards and industry practices
- ▶ Key references and other instructional resources

Course Agenda and Schedule

Registration starts at 8 am. The course will begin at 8:30 am and conclude at 5 pm each day, and will consist mainly of presentation, demonstrations, hands-on laboratories and student exercises. Lunch break will be one hour and there will be a morning and afternoon break each day. Following are the major topic areas covered and schedule for this course:

Day 1

Presentations:

- PV Markets and Applications
- Safety Basics
- Electricity Basics
- Solar Energy Fundamentals
- Instructional Methods
- Laboratories*

Day 2

Presentations:

- PV Module Fundamentals
- System Components
- PV System Sizing Principles
- Laboratories

Day 3

Presentations:

- PV System Electrical Design
- PV System Mechanical Design
- Performance Analysis, Maintenance and Troubleshooting
- Laboratories

Day 4

Presentations:

- Continue PV Presentations and Labs
- Laboratories

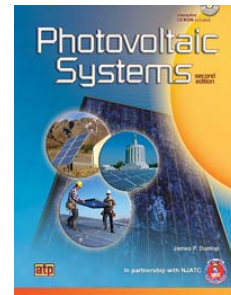
*Note that the laboratories will complement and reinforce the presentation material and will include the following labs:

- Solar Sitting (Pathfinder and Solmetric)
- I-V Curves
- Array/Mechanical Mounting
- Grid Connected Inverter Board/Grid Connected Inverter Lab (SMA 700Watt)
- Grid Connected Battery Inverter
- Battery Demonstration
- Safety

An introduction to the course will be presented on Day 1 by Dr. David Block and John Harrison. In addition, during each day's lunch hour the workshop attendees, program administrators and presenters will meet to eat lunch together and discuss various issues involved with developing solar training programs as well as administrative issues related to the current Southeast Solar Training Network.

Curriculum and Instructional Resources

The primary reference for this course is the textbook *Photovoltaic Systems* by James Dunlop, and will be provided to each participant. This text is the industry standard for PV systems training at all levels including, secondary schools, vocational/apprenticeship programs, community colleges and universities. The material will also be supplemented with laboratory demonstrations and hands-on activities.



In addition, the details and content of a new *Photovoltaic Systems Teacher's Resource Guide* will be provided. This resource includes a number of value-added instructional tools to compliment the Photovoltaic Systems textbook and other references, including:

- ▶ Teacher's Guide
- ▶ Lesson plans and objectives
- ▶ PowerPoint Presentations
- ▶ Worksheets and Forms
- ▶ Practice problems and exercises

Relationship to Certification Programs

This course is intended to help prepare instructors to teach introductory level courses on PV systems. Note that this training does not result in any certification from NABCEP, FSEC or otherwise. Participants will receive a course completion certificate, documenting the course objectives, content, and hours of training.

Instructor Biography

James Dunlop, PE is the lead instructor, and principal of Jim Dunlop Solar, serving the PV industry in the areas of workforce development and engineering services. Mr. Dunlop worked at the Florida Solar Energy Center for 21 years supporting all aspects of its programs in photovoltaic systems and engineering, having evaluated and tested numerous PV systems and components, and delivered hundreds of training programs to contractors, installers, designers and code officials. From 2006-2008, he worked for the National Joint Apprenticeship and Training Committee (NJATC), authoring the textbook *Photovoltaic Systems* and other curriculum and instructor resources in support of some 300 local electrical apprenticeship schools across North America. He holds a B.S. in Engineering from the University of Florida, is a licensed professional engineer in Florida.

Copies of the textbook *Photovoltaic Systems*, *Photovoltaic Systems Teacher's Resource Guide* and additional technical and instructional resources are available from the instructor's website: www.JimDunlopSolar.com

Dr. Barbara Martin was the principal instructional designer at the Florida Solar Energy Center where she was the lead educator in designing the photovoltaic (PV) certification test for the solar industry. Presently working in the renewable energy (RE) industry field on workforce development, she teaches courses and workshops in instructional design (ISD), criterion-referenced testing (CRT) and assessment. She consults with RE industry experts in developing task analyses and designing workshops, courses and instructional materials in PV, small wind systems, and solar thermal.

She is a former professor in the College of Education at the University of Central Florida and at Kent State University in educational technology and educational psychology. Dr. Martin has worked extensively in these fields and specializes in instructional design, criterion-referenced testing, evaluation strategies, distance education, and instructional theory. She has written articles on ISD and educational technology including a book on designing instruction for affective behaviors. Barbara has worked as an educational consultant with the Florida Solar Energy Center, the Interstate Renewable Energy Council, the New York State Energy Research and Development Authority, and the Department of Energy. She also consults for Darryl Sink and Associates, Inc. presenting workshops in ISD and CRT to a variety of clients.

Donard Metzger is a Senior Engineer and is the primary solar laboratory instructor at the Florida Solar Energy Center. He has been instrumental in the development of the training laboratories and instructional material. Mr. Metzger has also designed, installed and instrumented an inverter test facility and long term photovoltaic module test beds at FSEC. Mr. Metzger has also been instrumental in various photovoltaic related application and research projects at FSEC and is also a State of Florida Licensed Solar Contractor. In addition to the applications research work that Donard has conducted at FSEC, he also has invaluable experience in the design and installation of photovoltaic systems. This experience is most valued by those attending the FSEC photovoltaic workshops. Mr. Metzger is able to pass on that information to his students in a practical manner that is a benefit to all his students.

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