



Global Initiative on Academic Network (GIAN)

Course Title : Power Electronics for Renewable Energy Systems



08th December to 17th December 2016

Organised by Dept. of EEE, National Institute of Technology Goa.

Overview

This course has been designed to cover topics related to the design of alternative energy based systems. It is assumed that students will have some basic and broad knowledge of the principles of electrical machines, thermodynamics, electronics, and fundamentals of electric power systems. One of the main objectives of this course is to focus on the integration of the alternative sources of energy, including hydropower, wind power, photovoltaic, gas, biomass and energy storage for those systems.

The output of many renewable generators like photovoltaic cells, fuel cells, etc. is variable dc, which requires a dc/ac conversion stage for grid connection. For other renewable generators with variable ac output, like wind or sea-wave generators, one can at first convert the variable ac to dc and then do dc-ac conversion to connect to the utility line or use a direct ac-ac conversion. Therefore different types of power converters with a wide range of power rating are used. These power electronic converters help to utilize the energy in a more efficient way. The converters used for interfacing renewable sources to grid are supposed to perform complicated tasks like grid synchronization, protection while maintaining the standards of the utility grid.

Objective of this short course is to familiarize the attendees with the power converters for use in such energy systems. This course is planned to be offered for two credits and the course duration is 10 working days. Various aspects of the subject will be covered as part of the course with a proper blend of theory, simulation and experimentation.

Date	8th December 2016 – 17th December 2016 Number of participants for the course will be limited to fifty.
You Should Attend If...	<ul style="list-style-type: none"> ▪ You are an engineer and researcher from manufacturing, service and government organizations including R&D laboratories interested in designing converters for alternate energy sources. ▪ You are a student or faculty/staff member from an academic institution interested in learning how to do research on renewable energy or want to work with power converter for it.
Fees	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none"> • Participants from abroad : US \$300 • National Industries : INR 8000 • Academic Institutions(Students) : INR 2000, (for SC/ST students INR 1000) • Academic Institutions(Faculty)/ Research Organizations : INR 6000 <ul style="list-style-type: none"> ✓ The above fee includes all instructional materials, computer use for tutorials ✓ The participants will be provided with single bed accommodation on payment basis.

Course Instructor:



Prof. Marcelo Godoy Simoes, IEEE Fellow, received a B.Sc. degree from the University of São Paulo, Brazil, an M.Sc. degree from the University of São Paulo, Brazil, and a Ph.D. degree from The University of Tennessee, USA in 1985, 1990 and 1995 respectively. He received his D.Sc. degree (Livre-Docência) from the University of São Paulo in 1998. Dr. Simões was an US Fulbright Fellow for AY 2014-15, working for Aalborg University, Institute of Energy Technology (Denmark). He has been elevated to the grade of IEEE Fellow, Class of 2016, with the citation: "for applications of artificial intelligence in control of power electronics systems."

Prof. Simões is a pioneer to apply neural networks and fuzzy logic in power electronics, motor drives and renewable energy systems. His fuzzy logic based modeling and control for wind turbine optimization is used as a basis for advanced wind turbine control and it has been cited worldwide. His leadership in modeling fuel cells is internationally and highly influential in providing a basis for further developments in fuel cell automation control in many engineering applications. Prof. Simões made substantial and lasting contribution of artificial intelligence technology in many applications, power electronics and motor drives, fuzzy control of wind generation system, such as Fuzzy Logic based waveform estimation for power quality, Neural Network based estimation for vector controlled motor drives and integration of alternative energy systems to the electric grid through AI modeling based power electronics control.

Course Contents :

- 1- Introduction to Renewable Energy and Sustainability
- 2- Thermodynamics
- 3- Hydropower Systems
- 4- Wind Energy Systems
- 5- Thermo solar Systems
- 6- Photovoltaic Systems
- 7- Fuel Cell Systems
- 8- Biomass
- 9- Micro turbines
- 10- Geothermal Energy
- 11- Other Alternative Sources of Energy
- 12- Power Electronics for Renewable Energy Integration
- 13- Induction Generators
- 14- Permanent Magnet Synchronous Generators
- 15- Energy Storage
- 16- Grid Integration of Alternative Sources
- 17- Distributed Generation
- 18- Interconnection of Renewable Energy to the Grid
- 19- Standards
- 20- Optimization Based Design Using HOMER

Few Laboratory sessions on Simulation

Course Coordinators:

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