

Overview of the Course

This course explores hybrid renewable energy systems (HRES) in microgrids, focusing on remote locations and addressing technical and economic constraints. It highlights how combining photovoltaic (PV) and wind energy can reduce the adverse effects of individual RES on the grid or allow standalone operation. Topics include the benefits of HRES, optimization of capacity, stability challenges, protection schemes, and energy management systems for reliable micro grid performance.

The primary objectives of the course are as follows:

- i) Understand the core concepts of microgrids, including their main components, benefits, and operating principles within modern power systems.
- ii) Know how to integrate renewable energy sources in microgrids
- iii) Learn how to calculate the optimal size of the renewable energy sources in microgrid
- iv) Understand different control levels of microgrids
- v) Learn different operating modes in microgrids for islanded and grid connect mode of operation
- vi) Learn how to control voltage/frequency or power in microgrids
- vii) Know how to apply different control approaches for power electronic devices in microgrids
- viii) Understand how to improve power quality in microgrids.
- ix) Learn about the microgrid protection strategies during fault or disturbances.

Course contents

Day 1: Microgrid technology, exploring its components, configurations, benefits, and renewable integration, followed by the role of power converters in optimizing energy flow and stability in microgrid applications.

Day 2: The design, sizing, and control of PV systems in microgrids, including components, standalone, grid-connected, and hybrid setups, key simulation practices for power converters. Topics also include MPPT, grid synchronization, and PV performance evaluation.

Day 3: Explore PV system control within microgrids, MPPT algorithms, grid synchronization, active/reactive power management, and droop control, followed by an introduction to DSPACE and OPAL RT for inverter control, concluding with an experimental demonstration.

Day 4: Wind farm integration in microgrids, including fundamentals, components, turbine types, DFIGs, optimal sizing, and forecasting, MPPT tracking control for wind farms, power control, and LVRT. Power quality mitigation strategies in microgrids.

Day 5: Coordinated control of PV and wind in hybrid microgrids, focusing on system operation and protection strategies across grid-connected and islanded modes. The day will end with an examination, feedback, and closing remarks.

Who can attend?

- Scientists and researchers from government research organizations
- Faculty from academic institutes
- Engineers from industry
- Students at all levels (B.Tech/ M.Tech/ PhD)



शिक्षा मंत्रालय
MINISTRY OF
EDUCATION



Online Five-day GIAN course on Hybrid Renewable Energy Systems in Microgrids

(Course ID: 2412236)

**20-25 February 2025
(Online)**

**International Faculty
Prof. Saad Mekhilef,**

(IEEE and IET Fellow)

Swinburne University of Technology,
Australia

Coordinators

Dr. G. Siva Kumar

Dr. D. Sreenivasarao



Organized by

Department of Electrical Engineering
National Institute of Technology Warangal
(An Institute of National Importance)
Warangal-506 004, Telangana State, India

About the Institute

National Institute of Technology Warangal, formerly known as Regional Engineering College was established in 1959. Over the years it has developed into a premier institute of higher learning and is ranked among the top technical education institutions in India. There are 14 Departments offering eight undergraduate and 31 post-graduate programmes besides doctoral programmes. About 5000 students across the country and about 500 international students' study in the campus. It is a fully residential campus sprawling over 250 acres with excellent infrastructure.

About the Department

The Department of Electrical Engineering is one of the oldest departments of the National Institute of Technology, Warangal (NITW). Established as one of the major departments of the Institute, in 1959, the department has been actively engaged in teaching and research in diverse fields of Electrical Engineering. With excellent faculty, the department offers Under Graduate (B.Tech) program in Electrical and Electronics Engineering and Post Graduate (M.Tech) programmes in "Power Electronics & Drives", "Power Systems Engineering", "Smart Electric Grid", "Control and Automation" and also offers Ph.D. programme in Electrical Engineering. The department has well-equipped state-of-the-art laboratories to augment the coursework and enhance the research potentials. The department has a dynamic group of faculties with profound experience in academics, research and industry, dedicated in teaching-learning process and actively engaged in the cutting-edge R&D activities with broad areas of expertise like; Power Electronic & Drives, Application of Power Electronics to Energy Efficient Lighting Systems, DSP controlled Industrial Drives, Electric Vehicle & Wireless Power Transfer and Power Quality Improvement, State Estimation and Real Time Control of Power Systems, Applications of ANN and Fuzzy Logic in Power Systems,

Power System Deregulation, Power System Transients, Artificial Intelligence & Machine Learning etc.

About GIAN

About GIAN Course: Ministry of Human Resource Development (MHRD), Government of India (GoI) has launched an innovative program titled "Global Initiative of Academic Networks (GIAN)" in higher Education, in order to garner the best international experience. As part of this, internationally renowned Academicians and Scientists are invited to augment the Country's academic resources, accelerate the pace of quality reforms and elevate India's scientific and technological capacity to global excellence.

How to register for the course?

Fill out the Google form using the following link to complete the registration process.

<https://forms.gle/tS97E2UNjZUGFj4G7>

Candidates registering early will be given preference in shortlisting process.

Registration charges

Students & Research Scholars	Rs. 1,000/-
Faculty (Internal & External) and Scientists from R&D Labs	Rs. 1,250/-
Persons working in Industry/ Consultancy firms	Rs. 1,500/-
Students from abroad	US \$50
Faculty/Scientists/Industry Participants from abroad	US \$100

Note: The course fee is inclusive of 18% GST as per institute norm. In addition to the participation certificate, participants who require a grade sheet for the course will need to pay a fee of Rs. 500.

Last date for registration: 12.02.2025

Details for NEFT

Account Name	Director Research Account
Account No.	62266262236
Bank	State Bank of India
Branch	NIT Branch, Warangal
Branch Code	20149
IFSC	SBIN0020149
MICR Code	506002030
SWIFT Code	SBININBBH14

International Faculty



Prof. Dr. Saad Mekhilef is an IEEE and IET Fellow. He is a Distinguished Professor at the School of Science, Computing and Engineering Technologies, Swinburne University of Technology, Australia, and an Honorary Professor at the Department of Electrical Engineering, University of Malaya. He

authored and co-authored more than 800 publications in academic journals, proceedings, and five books with more than 54,000 citations, and more than 80 Ph.D. students who graduated under his supervision. He serves as an editorial board member for many top journals, such as IEEE Transactions on Power Electronics, IEEE Open Journal of Industrial Electronics, IET Renewable Power Generation, Journal of Power Electronics, and International Journal of Circuit Theory and Applications. Prof. Mekhilef has been listed by Thomson Reuters (Clarivate Analytics) as one of the world's Highly Cited (World's Top 1%) engineering researchers. He is actively involved in industrial consultancy for major corporations on power electronics and renewable energy projects

For any queries, please contact

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