

# Multiphysics Modelling & Analysis of Energy Technologies & Systems

## Overview

New and emerging energy technologies have strong synergies between interdisciplinary domains. Energy systems are often coupled with manifold physical phenomena, which are deduced from the fundamental principles of physics. Since the applied knowledge and practices in the engineering field are persistently evolving, it is requisite to use efficient research methods and modelling approaches for deploying emerging technologies and system designs.

This course is focused on the multiphysics based modelling and analysis of the energy technologies and systems that are frequently applied across solar, wind power generation plants, electric grid, standalone energy system and storage projects. System models are required as a reference to understand the physical behaviour and cross-coupling through physical variables between involved subsystems. Moreover, these system models are used for further development of simplified models required in control and optimization algorithms of various processes. The offered modules are designed for multiple engineering specializations, in particular for thermal, mechanical and electrical engineering, in such a manner that participants could learn the breadth of multiphysics modelling and acquire practical knowledge without having to dive into subject's depth. Furthermore, the course will deliver an overview of mathematical tools with a systematic modelling approach, which is useful in solving efficiently a wide range of interdisciplinary engineering problems. Dedicated lectures and hands-on sessions with problem-based learning methods will facilitate a faster learning process.

**Learning objectives:** The participants will acquire knowledge and develop skills in:

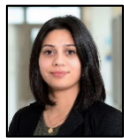
- Multiphysics modelling principles.
- Modelling approaches applied in an interdisciplinary research environment.
- Tools for modelling and analyzing different energy systems.
- Developing complex yet faster models for multidisciplinary energy technologies and systems.

<b>Modules</b>	<b>A: Multiphysics Modelling of Energy Technologies : August 10, 2020</b> <b>B: Modelling of Thermal Energy Process Systems : August 11, 2020</b> <b>C: Modelling of Mechanical Systems : August 12, 2020</b> <b>D: Modelling of Electrical Systems : August 13, 2020</b> <b>E: Application-Oriented Modelling of Energy Systems : August 14, 2020</b> <b>Exam : August 15, 2020</b> Pre-requisite: MATLAB-Simulink for hands-on session and tutorials.
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ You are a graduate student or a faculty from an academic institution interested in developing skills in multiphysics modelling approach.</li> <li>▪ You are a research scientist or an engineer in a governmental organization including R&amp;D laboratories or a private firm interested to gain hands-on knowledge of multiphysics modelling approach applied in many industrial domains.</li> <li>▪ You are an independent entrepreneur who is interested in working with the application of energy technologies of future relevance in your profession.</li> </ul>
<b>Fees</b>	The participation fees for taking the course is as follows: <b>Participants from abroad: US \$500</b> <b>Industry/ Research Organizations: INR 6,000/- (All modules) and INR 2,000/- (One module)</b> <b>Academic Institutions: INR 5,000/- (All modules) and INR 1,000/- (One module)</b> <b>Students: INR 1,000/- (All modules)</b> The above fee includes all instructional materials, assignments, free internet facility, and refreshment/tea during lecture breaks. Participants will be provided with accommodation on payment basis, subject to availability.
<b>Registration</b>	Last Date of Registration: July 10, 2020 All prospective participants need to do a compulsory web registration for the course on GIAN Portal ( <a href="http://www.gian.iitkgp.ac.in/GREGN">http://www.gian.iitkgp.ac.in/GREGN</a> ) After the mandatory web registration, the shortlisted participants will be informed by email the details to register for the course.

## The Faculty



**Prof. Dr. Florin Iov** is an Associate Professor at Aalborg University, Denmark. He has extensive research and industrial experience regarding grid integration of renewables. He has been technical lead in several research and industrial projects within this area including EU FP6/FP7/H2020. His expertise covers: monitoring, operation, control and protection of smart distribution/energy systems and model based design using cyber physical energy systems. He is the main architect and coordinator of the Smart Energy Systems Laboratory and vice leader of research programme in Intelligent Energy Systems and Active Networks at Aalborg University, Denmark.



**Dr. Shobhana Singh** is an Assistant professor in Thermal Energy Systems at the Department of Mechanical Engineering, IIT Jodhpur, India. She has received PhD degree in Solar Thermal from IIT Delhi. She has over six years of research and teaching experience working with Arizona State University, USA and Aalborg University, Denmark. She has worked on number of research projects with Industries, primarily on energy system analysis. Her current research encompasses numerical modelling and simulation of thermal energy components and their integration with smart energy systems.

Please send an email to course coordinator at [gian2020iitj@gmail.com](mailto:gian2020iitj@gmail.com) in case of any question.

## Course Co-ordinator

**Dr. Shobhana Singh**  
Phone: +91 291 2801520  
E-mail: [shobhana@iitj.ac.in](mailto:shobhana@iitj.ac.in)

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Registration link:  
<http://www.gian.iitkgp.ac.in/GREGN>