Syllabus: SMART Grids: Modeling

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1. Course overview

This course is an extension to the IEPG 1x, Smart Grids: The Basics course. This course provides a practical hands-on experience by using open-source simulation tool called OpenModelica. The instructor will provide step-by-step instructions in installing the software and making modifications to the built network through videos lectures. Simulation guides are also available with text and figures to provide all the necessary information to build the model in the simulation platform.

The course is divided into 6 modules. Each module contains a lecture video. The modules also contain recommended materials.

2. Learning objectives

 At the end of this course, you will be able to:

Simulate and analyze a 9-bus power system using OpenModelica software

Analyze the impact of power system controllers and the addition of renewable energy source on the power system performance

Evaluate the effect of several cyber-attacks on the power system performance

3. Course structure

The course is organized in 6 modules or weeks. A brief summary of each unit is presented below. Detailed instructions and resources will be provided during the course.

0. Getting started (Module 0)

In the Getting Started section you'll get to know the course structure, grading scheme, meet your fellow students and the moderator. These introductory tasks should be completed in the beginning of the course, after your first login.

1. Introduction to OpenModelica (Module 1)

In this section, you will be learning how to install the OpenModelica software through video lecture. To get familiarized with the simulation environment, some additional examples are also recommended.

2. Modeling and Simulating a Power System(Module 2)

In this module, you will build an IEEE 9-bus system in OpenModelica without any controllers. In addition to video lectures, a simulation guide is also provided that can be used as reference material while building the model.

3. Assessing Power Systems (Module 3)

In this module, you will modify the model built in module 2 by adding controllers. In addition to video lecture, a simulation guide is also provided that can be used as reference material while making the necessary modifications.

4. Adding a Renewable Energy Source (Module 4)

In this module, you will modify the model built in module 3 by adding a wind farm. In addition to video lecture, a simulation guide is also provided that can be used as reference material while making the necessary modifications.

5. Conclusion and Wrap Up (Module 5)

In this module, you will evaluate the impact of cyberattacks in the power system by simulating an already completed file provided by the course team.

This module marks the end of the course series.

4. Resources, Tools & Browsers

All educational resources will be available in the course. They consist of short videos and readings.

We support the following browsers: Chrome, Firefox and Safari.

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