Course 702*

**Generator Dynamics Modeling and PSS Tuning**

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<th>Course objectives</th>
<th>To cover details about dynamics modeling parameters of each generator control components</th>
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| **Material covered** | • Advanced knowledge of generator dynamics modeling in PSS/E, PSLF and TSAT  
• Synchronous generator modeling and dynamic simulation consideration  
• Exciter-AVR modeling covering DC, AC (brushless) and static exciter characteristics and AVR control parameters  
• Turbine-governor modeling covering hydraulic, steam and gas turbine characteristics and governor control parameters  
• Power-system-stabilizer tuning and small-signal stability analysis  
• Model validation methods and principles based on field testing, PMU or digital fault recording  
• **Bonus material:** Inverter-based (wind and solar) generator dynamics modeling covering 2nd generation dynamic models |
| Who should attend | Transmission planners, power system study engineers |
| Background required | Course 701 or previous experience with power system simulations |
| Duration | 2 days |

**Part 1: Generator dynamics modeling background and overview**

1. Basics of power system operation  
2. Concepts of power system stability  
3. Testing and model validation methodology

**Part 2: Synchronous generator modeling and parameter testing**

1. Synchronous generator basic equations  
2. Base values and per unitization  
3. Generator standard and fundamental parameters  
4. Representation of generator saturation  
5. Typical standard models and parameter ranges

* The course will be offered only when minimum number of five registrants is met.*
6. Dynamic simulation consideration
7. Field testing methods and model validation studies

**Part 3: Excitation system modeling and parameter testing**

1. Common elements and types of excitation systems:
   - DC, AC (brushless) and static exciters
   - Automatic voltage regulators (AVR): transient gain reduction, PID, derivative feedback
2. Modeling of excitation systems
3. Typical IEEE standard models of different types of exciters
4. Dynamic performance measures and simulation consideration
5. Field testing methods and model validation studies

**Part 4: Turbine governor modeling and parameter testing**

1. Common types of turbines:
   - Hydraulic, steam, gas,
2. Modeling of turbine governor systems
3. Typical turbine governor models of different types of turbines
4. Permanent droop and deadband considerations
5. Dynamic simulation consideration
6. Field testing and system frequency event based model validation methods

**Part 5: Power system stabilizer tuning and testing**

1. Small signal stability
2. Principle of PSS design
3. Types of commonly used PSS
4. Excitation system suitability
5. PSS parameter tuning studies
6. PSS field tuning tests and performance verification
7. Dynamic simulation consideration

**Part 6 (bonus): Inverter-based generator dynamic modeling**

1. Types of wind turbine generators
2. 2nd generation renewable energy modeling
3. Aggregated power flow model
4. Field testing and PMU based model validation methods

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