



T-867-POSY POWER SYSTEM OPERATION

8 ECTS

Year of study: First year MSc.
Semester: Fall.
Level of course: 5. Second cycle, intermediate.
Type of course: Core for MSc Electrical Power Engineering, elective for other programs.
Prerequisites: Power systems II (T-866-EPS2 or RT RAK2003) or a similar course.
Schedule: Runs for 12 weeks – 6 teaching hours a week.
Supervisor: Ragnar Kristjánsson.
Lecturer: Ragnar Kristjánsson.

Learning outcome:

Knowledge: *By the end of the course, the students will be able to;*

- Explain and use the mathematical formulation and use of symmetrical components.
- Model transformers, lines and cables in the positive, negative and zero sequences based on physical models
- Explain the impact of different earthing principles,
- Explain the main principles for modelling and analysis of power systems subject to symmetrical and unsymmetrical faults,
- Describe faulty system operation, balanced and unbalanced faults;
- Understand and explain basic protective methods;
- Use and explain principles for regular power flow and optimal power flow methods,
- Describe power system operation principles and basic functions in energy management system.

Skills: *By the end of the course, the students will be able to;*

- Apply methods for power system analysis in steady state operation and during grid faults
- Apply symmetrical components for unbalanced fault analysis;
- Apply basic system protection principles;
- Perform load flow calculations and use them for steady-state power system analysis;
- Model complex power system operation issues for economic and secure operation;
- Apply optimization techniques to solve fundamental operation problems;
- Perform N-1 steady state contingency analysis;
- Perform basic transmission lines transient operation calculations
- Apply basic methods of Insulation coordination.

Competence: *By the end of the course the students will be able to;*

- Describe, formulate, model and simulate in general power system operation main issues, including power flow calculations, unbalanced faults calculations, system protection and basic insulation coordination and simple transient calculation.
- Validate general power system operation issues, calculation and simulations outcome.

All course descriptions may be subject to change. Updated information on the course schedule, reading material, teaching and learning activities, and assessment methods will be introduced in the learning management system Canvas at the beginning of the semester.

**Content:**

Symmetrical components, Modelling of transformers, lines and cables in the positive, negative and zero sequences based on physical models, The impact of different earthing principles, Methods for power system analysis in steady state operation and during grid faults, Faulty system operation, balanced and unbalanced faults, Symmetrical components and unbalanced fault analysis, Basic protective methods and principles, Load flow calculations in steady-state power system analysis, Model complex power system operation issues for economic and secure operation, Load flow calculations in steady-state power system analysis, Model complex power system operation issues for economic and secure operation, Principles for regular power flow and optimal power flow methods, Power system operation principles and basic functions in energy management system. Optimization techniques to solve fundamental operation problems, N -1 steady state contingency analysis, Transmission lines Transient operation, Insulation coordination, Power system state estimation and the incorporation with phasor measurement units; (Smart Grids). Practical assignments solved in the numerical simulation program Power World.

Reading material: *Power System Analysis & Design*, Glover, Sarma and Overbye, 2012.

Teaching and learning activities: Lectures and practical sessions.

Assessment methods: Written exam 70%, Project 30%.

Language of instruction: English.

All course descriptions may be subject to change. Updated information on the course schedule, reading material, teaching and learning activities, and assessment methods will be introduced in the learning management system Canvas at the beginning of the semester.