

SYLLABUS

1. Course title:

Power System Control

2. Code:

EEMS203

3. Cycle of study:

1

4. ECTS credits:

6

5. Type of course: Mandatory Elective**6. Prerequisites:**

[EEMS101] Programming Tools in Power Engineering

7. Class restrictions:**8. Duration / semester:**

1

7

9. Weekly contact hours:

9.1. Lectures:

3

9.2. Seminars:

1

9.3. Laboratory/Practice classes:

1

10. Faculty:

Faculty of Electrical Engineering

11. Department/study program:

Electrical Engineering and Computer Science

12. Lecturer:

Ph.D. Suad Halilčević, full prof.

13. Lecturer's e-mail:

suad.halilcevic@untz.ba

14. Web site:**15. Course aims:**

To teach students for working in operational centers for power system control, control center of power plants, transition and distribution. Provide basics for future scientific-research work in this field of electrical engineering.

16. Learning outcomes:

At the end of the semester/course, successful students who continuously fulfilled their duties throughout the teaching period, will be able to work in operational centers for power system control, control center of power plants, transition and distribution.

17. Course content:

Modelling of Power Systems. Concept of Security. Network Model. Economy-Security Control. Power System State Variables. Graph Theory. Indices of Power System Reliability. The Automatic Control Systems. System Robustness. Technical and Economical Aspects of Power System Operation. The Frequency and Active Power Control. Primary, Secondary, and Tertiary Regulation of Frequency. Turbine regulation model. Dynamical Behaviour of Aggregate. Frequency-bias-tie-line Control. Phase-Shift Transformers. Generator Q-P diagram. Voltage and Reactive Power Management. Dynamic and Static Voltage Supporting Equipment. Relation Between Voltage, Active Power, and Reactive Power at a Node. Injection/Absorption of Reactive Power. Tap Changing Transformers. Booster Transformers. Voltage Stability. Power System State Estimation. The Least-Squares and Minimum-Norm Problems. DC State Estimator. Observability Analysis. Basic Topological Algorithm. Redundant Measurements. Addition Measurement to Improve Observability. Basic Techniques for Bad Data Processing. Multiple Bad Data Processing Techniques. AC State Estimator. Estimation Based on Multiple Scans of Measurements.

18. Learning methods:

Observation and reflection, creation of abstract concepts and active experimentation, concrete experience.

The most important learning methods are:

- Lectures with the use of multimedia resources, active learning techniques and with active participation and discussion of students;
- Auditive exercisers;
- Preparation and presentation of group and individual seminar papers.

Styles of learning: visual style, auditive, verbal, kinesthetic, logical-mathematical, social and independent.

19. Assessment methods:

Continuous assessment during the semester is performed through two periodical tests and final verbal exam.

20. Assessment components:

Arithmetic mean of assessment methods grades.

21. Required reading list:

A. Monticelli, State Estimation in Electric Power Systems, Kluwer Publisher, 2000.
R.H.Miller, J.H.Malinowski, Power System Operation, McGraw Hill, 1993
B.M. Weedy, Electric Power Systems, Wiley, 1987.
M.E.El-Hawary, Power System Control and Operation, John Willey and Sons, 1994.
F. Gubina, Delovanje Elektroenergetskih Sistemov, Univerza v Ljubljani, Fakulteta za elektrotehniko, 2004.
S Sivanagaraju, G Sreenivasan, Power System Operation and Control, Pearson, 2010.

22. Web sources:**23. Applicable starting from the academic year:**

2016/2017

24. Adopted in the Faculty/Academy session:

04.04.2016