

Table S2.6.4. Form for the preparation of the course information sheets				
Name of the subject: Power System Control and Protection				
Code of the subject	Status of the subject	Semester	Number of ECTS credits	Class load
	Optional			
Study programme for which it is organized: PhD programme "Sustainable development"				
Dependency by other subjects: none				
Objectives of studying this subject: The objective of this course is to acquaint students with methods for design, analysis and evaluation of power system control and protection.				
Contents of the subject (teaching units, forms of students' individual work, forms of testing) presented per working weeks in the academic calendar:				
Preparatory week				
I week	Modelling, analysis and design of power system control and protection systems: normal operation, alert states and incidents.			
II week	Selected topics from the field of power system control within ENTSO-E union.			
III week	Load-frequency control (LFC): basic and advanced concepts, operation examples, optimization of reserves.			
IV week	Protection for rotating machines, power transformers and transmission lines: basic concepts, selectivity, protection schemes, settings examples.			
V week	Numerical protection: advanced protective algorithms, relays operation, fault analysis and secondary testing.			
VI week	Impact of unconventional elements on power system control and protection: wind and solar power plants, DC lines, FACTS devices, virtual lines, etc.			
VII week	Wide area measurement, control and protection in smart grids.			
VIII week				
IX week				
X week				
XI week				
XII week				
XIII week				
XIV week				
XV week				
Methods of education:				
<ul style="list-style-type: none"> • lectures, • experimental work, • seminar assignment. 				
Students' load				
<u>Weekly</u>			<u>In Semester</u>	
			<ul style="list-style-type: none"> • Lectures: 30 • Work: 30 • Individual work: 120 	
Students' obligations during the teaching:				

Literature:

- . Dolinar, B. Polajžer. *Dinamika EES*, UM-FERI, Maribor, 2010.
- A.R. Bergen, V. Vittal. *Power system analysis*, Second Edition, Prentice-Hall Series, New Jersey, 2000.
- J. Machowski, J.W. Bialek, J.R. Bumby. *Power System Dynamics: Stability and Control*, Second Edition, John Wiley & Sons, Chichester, 2008.
- B. Grčar. *Uvod v zaščito elementov EES*, UM-FERI, Maribor, 1999.
- J.L. Blackburn, T.J. Domin. *Protective Relaying: Principles and Applications*, Third edition CRC Press, Boca Raton, 2007.
- Y.G. Paithankar. *Transmission Network Protection: Theory and Practice*, Marcel Dekker, New York, 1998.

Learning outcomes (complied with the outcomes for the study programme):Knowledge and understanding:

On completion of this course the student will be able to

- demonstrate knowledge and understanding of fundamental concepts in power system control and protection,
- analyse, design and evaluate power system control and protection.

Transferable/Key skills and other attributes:

- *Communication skills*: written seminar assignment and oral examination.
- *Use of information technology*: use of software tools for analysis, design and implementation of control and protection systems.
- *Calculation skills*: modelling numerical simulation for power systems.
- *Problem solving*: analysis of power system operation and design of control and protection systems.

Forms of tests and evaluation:

- completed seminar assignment – 40%
- presentation of seminar assignment – 10%
- oral examination – 50%

Name and surname of teacher and associate:

Boštjan Polajžer

Particularities needed to be emphasized for the subject:

Note (if needed):