DESCRIPTION OF THE COURSES

- Course code: **ELR2520**
- Course title: **POWER SYSTEM MODELLING**
- Language of the lecturer: **Polish, English**

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	**2**			**1**	
*Number of hours/semester**	**30**			**15**	
Form of the course completion	**Test**			**Reports on individual projects**	
ECTS credits					
Total Student's Workload					

- Level of the course (basic/advanced): **advanced**
- Prerequisites: **credits for courses: Linear algebra, Fundamentals of power systems**
- Name, first name and degree of the lecturer/supervisor:
  Kazimierz Wilkosz, PhD, DSc./Professor
- Names, first names and degrees of the team's members:
  dr. Robert Łukomski
- Year: **1** Semester: **3 (the second-level study)**
- Type of the course (obligatory/optional): **optional**
- Aims of the course (effects of the course):
  - **familiarising with modern concepts of power system modeling,**
  - **competence in solving the problems of the power system state estimation and estimation of loads in distribution system,**
  - **enhancing practical skills in performing projects,**
  - **providing students with a theoretical background for further study in science and applications in the field of power system modelling.**
- Form of the teaching (traditional/e-learning): **traditional**
- Course description:
  The course is intended to acquaint students with modern concepts of power system modelling. Modelling of steady states and modelling of transients, off-line modelling and real-time modelling are considered. Attention is paid also to power system model reduction. The course provides students with a theoretical background for further study in science and applications.
- Lecture:

Particular lectures contents	*Number of hours*
1. Introduction. General principles of modelling.	2
2. Models for steady states analyses - scope of utilisation.	2
3. Models for transient analyses - scope of utilisation.	2
4. Power system model reduction: types of equivalents. Network	2

transformation.	
5. Power system model reduction: aggregation of generating units, equivalent model of the external subsystem.	2
6. Real-time modelling of power system: need of real-time modelling, main problems, general approaches.	2
7. Test. Weighted least squares (WLS) power system state estimation	2
	2
8. Alternative formulations of the power system state estimation.	2
9. Network observability analysis.	2
10. Bad data detection and identification.	2
11. Network parameter estimation. Topology error processing.	2
12. State estimation using ampere measurements.	2
13. State estimation of distribution system - specific problems.	2
14. Estimation of loads in distribution system	1
15. Final test.	

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
- Project – the contents:
  During the project students complete individual tasks aimed at deep familiarisation with the specific problems of power system modelling. It is expected that Matlab will be used for certain calculations.
- Basic literature:
  1. **Abur A., Exposito A. G., Power system state estimation. New York, Marcel Dekker, Inc. 2004.**
  2. **Machowski J., Białek J.W.,Bumby J. R., Power system dynamics and stability, New York, John Willey & Sons 1997.**
- Additional literature:
  Papers in professional journals.
- Conditions of the course acceptance/credition:
  ***Lectures*: positive final test**
  ***Projects*: positive evaluation of performed projects**

***** - depending on a system of studies