DESCRIPTION OF THE COURSES

- Course code: **ARR2204**
  - Course title: **THE SYSTEMS OF ENGINEERING SUPERVISION AND CONTROL IN ELECTRICAL ENERGY SYSTEMS**
- Language of the lecturer: **polish**

Course form	***Lecture***	***Classes***	***Laboratory***	***Project***	***Seminar***
*Number of hours/week**	**2**		**1**		
*Number of hours/semester**	**30**		**15**		
Form of the course completion	**Colloquium**		**Completion**		
ECTS credits	**2**		**1**		
Total Student's Workload	**60**		**30**		

- Level of the course (basic/advanced): **basic**
- Prerequisites: **Electrical Power Systems, Power System Relaying**
- Name, first name and degree of the lecturer/supervisor: **Wilhelm Rojewski, Ph.D.**
- Names, first names and degrees of the team's members: **Witold Dzierżanowski, Ph.D.**
- Year:....**I/II degree**..... Semester:.....**1**.....
- Type of the course (obligatory/optional): **obligatory**
- Aims of the course (effects of the course): **understanding of principles and functions of engineering supervision and control in electrical energy systems**
- Form of the teaching (traditional/e-learning): **traditional**
- Course description:

Description of power system as an object of control and engineering supervision. Objectives and requirements. Data acquisition and telemetering. SCADA/EMS systems. Emergency control of power system. Decentralised and centralized dispatcher control.

- Lecture:

Particular lectures contents	*Number of hours*
1. Power system as an object of engineering supervision and control	**2**
2. Classification of automatics in power system. Wide-Area Measurement Systems (WAMS)	**2**
3. Basis of data transmission	**2**
4. Telemetry systems	**2**
5. SCADA/EMS systems	**2**
6. Frequency load-shading and voltage load-shading	**2**
7. The other kinds of emergency control of power system	**2**
8. Loads control	**2**
9. Power system parameters monitoring	**2**
10. Cooperation of Power System Operator with Power Plants	**2**

11. Supervision and control system of substation of 110kV/MV	**2**
12. Supervision and control of Regional Power Networks	**2**
13. Centralized supervision and control system	**2**
14. Didactic excursion	**2**
15. Colloquium	**2**

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:

Examination of AVR of generator and controller of Under Load Tap Changer (ULTC) of transformer. Synchronization of generator. Examination of capacitor bank controller.

- Project – the contents:
- Basic literature:
    1. **Machowski J., Bernas S., Stany nieustalone i stabilność systemu elektroenergetycznego, WNT, 1989.**
    2. **Machowski J., Bialek S., Bumby J.: Power system dynamics and stability. John Wiley and Sons 1998.**
    3. **Synal B. Rojewski W., Dzierżanowski W., Elektroenergetyczna automatyka zabezpieczeniowa. Podstawy, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2003.**
    4. **Praca zbiorowa pod red. B. Synala, Automatyka elektroenergetyczna, ćwiczenia laboratoryjne. Cz. II, Układy automatyki zabezpieczeniowej i regulacyjnej, Wyd. PWr. 1991.**
    5. **Kowalik R., Pawlicki C.: Podstawy teletechniki dla elektryków, Oficyna Wydawnicza Politechniki warszawskiej. Warszawa 2006.**
    6. **Instrukcja ruchu i eksploatacji sieci przesyłowej (IRiESP), PSE SA. Internet.**
- Additional literature:
    1. **Kożuchowski J., Sterowanie systemami elektroenergetycznymi, PWN, 1994**
- Conditions of the course acceptance/credition: **Colloquium and completion of Lab**

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