

## DESCRIPTION OF THE COURSES

- Course code: ARR3315
- Course title: TESTING AND IMPROVEMENT OF ELECTRICAL ENERGY QUALITY
- Language of the lecturer: polish

<i>Course form</i>	<i>Lecture</i>	<i>Classes</i>	<i>Laboratory</i>	<i>Project</i>	<i>Seminar</i>
<i>Number of hours/week*</i>	2		1		
<i>Number of hours/semester*</i>	30		15		
<i>Form of the course completion</i>	exam		final test		
<i>ECTS credits</i>					
<i>Total Student's Workload</i>					

- Level of the course (basic/advanced): advanced
- Prerequisites: Electrical metrology, theoretical electrotechnology
- Name, first name and degree of the lecturer/supervisor: Jerzy LESZCZYŃSKI, Ph.D.
- Names, first names and degrees of the team's members: Grzegorz KOSOBUDZKI, Ph.D.
- Year:..... Semester:.....
- Type of the course (obligatory/optional): optional
- Aims of the course (effects of the course):
- Form of the teaching (traditional/e-learning): traditional

Course description: Quality of electrical energy – energetic law, requirements, norms. Influence of electric disturbances on the quality of electric energy parameters. Sources of disturbances. Influence of course deformations on energetic devices, measurement equipment, losses in transformation lines. Methods of controlling and localising sources of deformations. Methods and devices limiting the content of higher harmonics. Influence of unstable receivers on voltage quality. The laboratory makes: measurements of values describing voltage quality, analysis of voltages courses, currents. Registers courses and register of deviations from the assumed parameters. Studies on the influence of courses on the correctness of functioning of measurement devices (transformers, energy meters). Studies of sources of deformations. Research on receivers resistance to deformations.

- Lecture:

<i>Particular lectures contents</i>	<i>Number of hours</i>
1. Electromagnetic compatibility, parameters characterising quality of supply voltages, presentation of the influence of deformations on the process of energy receiving.	2
2. Definite parameters defining energy quality – measurement conditions.	2
3. Quality of energy in terms of legal norms and regulations.	2
4. The notion of power in systems with distorted courses – calculation example.	2
5. Influence of distortions on electric devices and electromagnetic network.	2
6. Voltage deviations and flickers – flicker propagation.	2
7. Methods of limiting deformations – examples.	2
8. Methods of harmonic and interharmonic measurements.	2
9. Problems of energy quality in the area of Wrocław – examples.	2
10. Higher harmonic filters, examples efficiency analyses of filters efficiency – calculation example.	4
11. Losses of energy resulting from courses distortions.	2

12. Legal gap related to normalisation of electric energy quality.	1
13. Possibilities of studies of the quality of electric energy in the accredited research laboratory	2

- Classes – the contents:
- Seminars – the contents:
- Laboratory – the contents:
  1. Studies on voltage quality – designating voltage deviations, asymmetry, dips, breaks, signal voltages, harmonic and interharmonic – system MEMOBOX 686
  2. Analysis of current and voltage courses – designating harmonic and interharmonic values – system MEMOBOX 604.
  3. Studies of the influence of non-linear receivers on the distortion of courses.
  4. Register and analysis of electroenergetic courses (indirect method)
  5. Studies of the resistance of electric energy receivers on dips and short breaks of supply voltages.
  6. Examining higher harmonic emission by energy receivers.
  7. Power analysis in distorted circuits. – Topas system 1000.
- Project – the contents:
- Basic literature:
  1. R.C. Dugan, M.F. Mc Gramaghan, H. W. Beaty: Electrical Power System Quality, Wyd.
  2. MC Graww-Hill 1996
  3. Materiały konferencyjne, publikacje
  4. Raporty Instytutowe
  5. Normy i przepisy prawne
- Additional literature:
  1. Chwaleba A., Pomiński M., Siedlecka A.: Metrologia elektryczna
  2. Borodziejcz W., Jaszczak K.: Cyfrowe Przetwarzanie Sygnałów
  3. Podstawy elektrotechniki
- Conditions of the course acceptance/creditation:

\* - depending on a system of studies