**Nazwa przedmiotu:**

Electrical and Computer Engineering Laboratory

**Koordynator przedmiotu:**

Grzegorz Tarapata

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Computer Science

**Grupa przedmiotów:**

Technical Courses

**Kod przedmiotu:**

EECEL

**Semestr nominalny:**

2 / rok ak. 2015/2016

**Liczba punktów ECTS:**

6

**Liczba godzin pracy studenta związanych z osiągnięciem efektów uczenia się:**

30h- lectures
30h- laboratories
12h- consultations in laboratory
20h- self education for labs
3h- tests
8h- preparation for tests
20h- self education /lectures program/
15h- consultations

**Liczba punktów ECTS na zajęciach wymagających bezpośredniego udziału nauczycieli akademickich:**

4

**Język prowadzenia zajęć:**

angielski

**Liczba punktów ECTS, którą student uzyskuje w ramach zajęć o charakterze praktycznym:**

3

**Formy zajęć i ich wymiar w semestrze:**

|  |  |
| --- | --- |
| Wykład:  | 30h |
| Ćwiczenia:  | 0h |
| Laboratorium:  | 30h |
| Projekt:  | 0h |
| Lekcje komputerowe:  | 0h |

**Wymagania wstępne:**

Physics funamentals- especially electricity

**Limit liczby studentów:**

45

**Cel przedmiotu:**

Education for arrangement of experimental works in engineer practice. Increasing abilities in arrangement and procedure of the experiment with proper method applying is the main task of the subject.
Also, self-control with results quality analysis as well as
the form of results presentation /comprehencible /are required.

**Treści kształcenia:**

Lectures
1. Introduction (0.5h): topics of the lectures presentation, lecture syllabus and laboratory experiments, literature and assessment rules.
2. Instrumentation of Electronic Measurement Laboratory (1h): measuring instruments, standards, and auxiliary equipment.
3. Experiments description (1h): Report content, tasks presentation, measuring method description, diagram of measuring setup, results presentation forms – tabular and graphs forms, errors estimation, remarks.
4. Measuring process (0.5h): Quality, quantity, value of quantity, observation and measurement, disturbances, data conversion.
5. Schematic diagram (0.5h): Ideal sources, cables, operational amplifier.
6. Basic instrumentation (2h): stabilized DC power supply, function generator, DC electromechanical meter, digital voltmeter, digital multimeter.
7. Oscilloscope (2h): Cathode ray tube, block diagram, deflection systems, synchronization modes.
8. Measurement process (1.5h): SI units, quality and errors – rules of calculation, exemplary calculations of limiting errors.
9. Fundamental electrical quantities (0.5h): resistance, current, voltage, charge, electric and magnetic fields.
10. Electrical circuits (4h): circuits classification, ideal sources properties, equivalency of ideal sources, Kirchhoff’s laws, branch current method, mesh current method, node voltage method, superposition method.
11. DC voltage measurements (1.5h): direct voltage measurement, loading effect, compensation method
12. Resistance measurement (2h): Ohm’s law, indirect method, spurious elements, comparison and substitution methods, Wheatstone bridge.
13. Electric signals (1h): classification of signals, harmonic signal parameters, periodic signals.
14. Time and frequency measurement (1h): reference frequency sources, frequency counter, ratemeter, Lissajous method.
15. Parameters of periodic signals (1h): amplitude, average and absolute average and RMS values, crest and form factors.
16. Signal integration (1h): RC circuit, time constant, operational integrator.
17. AC Voltmeters (4h): diode properties, average responding meter, peak responding meters, RMS meter.
18. AC circuits analyze (2h): time and complex number domains, phasor, linear operations.
19. Capacitance measurement (2h): immitance, equivalent circuits, loss factor, indirect method, transformer bridge method.
20. Inductance measurement (0.5h): mutual inductance, magnetic core permeability, Maxwell-Wien bridge.
21. Q-meter (0.5h): resonant circuit, Q-factor, L and C measurement.

Laboratory:
The laboratory consists of 7 experiments and 3 introductory sessions:
Introductory sessions (not obligatory) allow students to be more familiar with laboratory equipment being in use soon.
1. First preliminary session
2. DC supply and generators investigation
3. DC voltage measurement
4. Second introductory session (with TEST 1)
5. AC voltage measurements
6. Resistance measurement
7. Third preliminary session
8. Capacitance measurement
9. Time & Frequency measurement
10. Inductance measurement

**Metody oceny:**

Short test before every lab - up to 3 pts.
Laboratory report assessment -up to 7 pts.
First test /lecture program/ - up to 10 pts.
Second test /lecture program/ - up to 20 pts.
Retake test /first and second cancelled/ - up to 30 pts.
Totoal score - up to 100 pts.
Acceptance level 50 pts.

**Egzamin:**

nie

**Literatura:**

1. Floyd T.L.: Principles of Electric Circuits. Prentice Hall, 2000
2. Ramotowski M., Śliwa L.: ECE Laboratory. Oficyna Wydawnicza PW, 2000

**Witryna www przedmiotu:**

http://studia.elka.pw.edu.pl

**Uwagi:**

## Efekty przedmiotowe

### Profil ogólnoakademicki - wiedza

**Efekt EECEL\_W01:**

Student has basic knowledge of signals, electrical components and circuits.

Weryfikacja:

Tests, labs

**Powiązane efekty kierunkowe:** K\_W03

**Powiązane efekty obszarowe:** T1A\_W02

**Efekt EECEL\_W02:**

student has ordered knowledge of basic information about the measurements and their inaccuracies

Weryfikacja:

Labs, testes

**Powiązane efekty kierunkowe:** K\_W01

**Powiązane efekty obszarowe:** T1A\_W01, T1A\_W02, T1A\_W03, T1A\_W07

### Profil ogólnoakademicki - umiejętności

**Efekt EECEL\_U01:**

Student knows how to convey measurements, connect the measuring circuits and use the basic electronic laboratory equipment.
 to determine the uncertainty in the direct measurement. Student has ordered knowledge of basic information about the measurements and their inaccuracies

Weryfikacja:

Labs

**Powiązane efekty kierunkowe:** K\_U02, K\_U04, K\_U05, K\_U06, K\_U14

**Powiązane efekty obszarowe:** T1A\_U02, T1A\_U04, T1A\_U05, T1A\_U06, T1A\_U11

**Efekt EECEL\_U02:**

Student acquires the skill of proper documentation of experimental results

Weryfikacja:

Labs

**Powiązane efekty kierunkowe:** K\_U01, K\_U03, K\_U15

**Powiązane efekty obszarowe:** T1A\_U01, T1A\_U03, T1A\_U14

**Efekt EECEL\_U03:**

Student is able to assess measurement errors and deliberately choose methods to minimize them

Weryfikacja:

Labs, tests

**Powiązane efekty kierunkowe:** K\_U01

**Powiązane efekty obszarowe:** T1A\_U01