**Nazwa przedmiotu:**

Circuits and Signals

**Koordynator przedmiotu:**

Marek Wojciech RUPNIEWSKI

**Status przedmiotu:**

Obowiązkowy

**Poziom kształcenia:**

Studia I stopnia

**Program:**

Computer Science

**Grupa przedmiotów:**

Technical Courses

**Kod przedmiotu:**

ECIRS

**Semestr nominalny:**

3 / rok ak. 2015/2016

**Liczba punktów ECTS:**

6

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

15 x 2h = 30h --- lectures
15 x20' = 5h --- reviews before lectures
15 x 1h = 15h --- tutorials
15 x 2h = 30h --- preparation for tutorials (problem solving)
 2 x 5h = 10h --- preparation for quizzes
 5 x 3h = 15h --- laboratory exercises
 5 x 3h = 15h --- laboratory preparation
 12h --- exam revision
 2h --- exam

total: 134h

**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:**

2

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

|  |  |
| --- | --- |
| Wykład:  | 30h |
| Ćwiczenia:  | 15h |
| Laboratorium:  | 15h |
| Projekt:  | 0h |
| Lekcje komputerowe:  | 0h |

**Wymagania wstępne:**

courses on mathematical analysis and linear algebra

**Limit liczby studentów:**

60

**Cel przedmiotu:**

The course objective is to familiarize the students with basic concepts and principles of electrical circuits, signals, and how circuits and signals are related.

**Treści kształcenia:**

The course introduces the basic concepts of the time and frequency analysis of electrical circuits, including constitutive circuit elements, time and frequency linear circuit equations, transient and steady state analysis, transfer function, transmission of signals. It also introduces fundamentals of analog signals representation and analysis.
The lectures provide the students with the explanation of the core material.
The tutorials have more quantitative approach and enable students to
apply the material introduced during the lectures to solve some problems.
The laboratory provides the students with hands-on experience.
Lecture schedule:

1. (2h) Basic circuit elements of linear time invariant circuits and their constitutive equations. Kirchhoff's laws.
2. (2h) Direct current analysis. Superposition principle.
3. (3h) Equivalent devices. Thevenin's and Norton's laws.
4. (2h) Power, energy. Passive and active elements.
5. (2h) Sinusoidal steady-state analysis of linear circuits.
6. (2h) AC power. Maximum power transfer.
7. (2h) Resonant circuits. Filtering.
8. (2h) Non-linear devices and small-signal analysis.
9. (2h) Periodic signals and Fourier series.
10.(2h) Fourier transform and its applications.
11.(2h) Time-domain circuit equations. Response of first order circuit.
12.(2h) Transient and steady state: second order circuits.
13.(2h) Laplace transform and its application to electrical circuits.
14.(2h) Transfer functions and frequency characteristics.
15.(2h) Computer aided circuit analysis. SPICE

**Metody oceny:**

There are three components of the assessment in this course:
 • Laboratory: 30 points for five exercises (5\*6).
 • Quizzes: 20 points for two short quizzes (2\*10).
 • Final examination: is a standard closed-book written one for 50 points.
The total is 100 points. The final result is based on the following pattern:
 • 5.0: 91-100 points
 • 4.5: 81- 90 points
 • 4.0: 71- 80 points
 • 3.5: 61- 70 points
 • 3.0: 51- 60 points
 • 2.0: 0- 50 points

**Egzamin:**

tak

**Literatura:**

1. W. A. Blackwell, L. L. Grigsby Introductory Network Theory, PWS Publishers, Boston Mass. 1985,
2. R.C.Dorf and J.A.Svoboda, Introduction ot Electric Circuits. 7th eds, Wiley, 2006,
3. Chi Kong Tse Linear Circuit Analysis, Addison-Wesley, 1998,
4. Erhan Kudeki and David C.Munson, Analog Signals and Systems. Prentice Hall, 2009,

**Witryna www przedmiotu:**

https://studia.elka.pw.edu.pl/priv/ECIRS.A

**Uwagi:**

## Efekty przedmiotowe

### Profil ogólnoakademicki - wiedza

**Efekt ECIRS\_W01:**

Student knows basic mathematical tools and techniques that are useful in electrical circuits analyses

Weryfikacja:

quizzes, final exam

**Powiązane efekty kierunkowe:** K\_W01

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

**Efekt ECIRS\_W02:**

Student knows basic techniques for circuit analysis in time and frequency domains.

Weryfikacja:

quizzes, lab. exercises, exam

**Powiązane efekty kierunkowe:** K\_W03, K\_W04

**Powiązane efekty obszarowe:** T1A\_W02, T1A\_W02

### Profil ogólnoakademicki - umiejętności

**Efekt ECIRS\_U01:**

Student is able to: 1) construct simple circuit according to a given circuit diagram, 2) measure electrical quantities and signal properties related to simple circuits, and 3) present results of the circuit measurements and analysis

Weryfikacja:

Laboratory exercises

**Powiązane efekty kierunkowe:** K\_U03, K\_U08, K\_U09

**Powiązane efekty obszarowe:** T1A\_U03, T1A\_U08, T1A\_U09, T1A\_U08, T1A\_U09

**Efekt ECIRS\_U02:**

Student is able to solve analytically problems on simple circuit analysis.

Weryfikacja:

quizzes, exam

**Powiązane efekty kierunkowe:** K\_U08

**Powiązane efekty obszarowe:** T1A\_U08, T1A\_U09