

# Selected issues of circuit theory I - opis przedmiotu

| Informacje ogólne   |                                                                   |
|---------------------|-------------------------------------------------------------------|
| Nazwa przedmiotu    | Selected issues of circuit theory I                               |
| Kod przedmiotu      | 06.2-WE-ELEKTD-WybZagTObw I-Er                                    |
| Wydział             | <a href="#">Wydział Informatyki, Elektrotechniki i Automatyki</a> |
| Kierunek            | Elektrotechnika                                                   |
| Profil              | ogólnoakademicki                                                  |
| Rodzaj studiów      | Program Erasmus drugiego stopnia                                  |
| Semestr rozpoczęcia | semestr zimowy 2022/2023                                          |

| Informacje o przedmiocie        |                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Semestr                         | 1                                                                                                                                          |
| Liczba punktów ECTS do zdobycia | 5                                                                                                                                          |
| Typ przedmiotu                  | obowiązkowy                                                                                                                                |
| Język nauczania                 | angielski                                                                                                                                  |
| Sylabus opracował               | <ul style="list-style-type: none"><li>dr hab. inż. Radosław Kłosiński, prof. UZ</li><li>dr hab. inż. Zbigniew Fedyczak, prof. UZ</li></ul> |

| Formy zajęć  |                                         |                                        |                                            |                                           |                     |
|--------------|-----------------------------------------|----------------------------------------|--------------------------------------------|-------------------------------------------|---------------------|
| Forma zajęć  | Liczba godzin w semestrze (stacjonarne) | Liczba godzin w tygodniu (stacjonarne) | Liczba godzin w semestrze (niestacjonarne) | Liczba godzin w tygodniu (niestacjonarne) | Forma zaliczenia    |
| Wykład       | 30                                      | 2                                      | -                                          | -                                         | Egzamin             |
| Laboratorium | 30                                      | 2                                      | -                                          | -                                         | Zaliczenie na ocenę |

## Cel przedmiotu

- to familiarize students with basic concepts, methods, description and analysis of linear time-invariant analog and discrete systems;
- to familiarize with methods of description and analysis of circuits and signals in the time and frequency domains;
- to mastery by students ability to apply theory of linear time-invariant systems for the analysis of transient and steady states in electrical circuits;
- introduction to theory and mastery of the basic methods of discrete simulation of analog circuits;
- to give basic skills of observation of the behavior and take of characteristics of electric circuits;
- to give basic skills in the design of simple passive filters;

## Wymagania wstępne

Mathematical analysis, Linear algebra, Electrical engineering principles, Circuit theory.

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## Zakres tematyczny

*Flow diagrams of circuits.* Mason's signal flow diagrams. Flow diagram for electrical circuit construction. Flow diagram transformations. Mason's rules.

*Continuous linear time-invariant systems.* Circuit treated as an input output system. Differential equations of circuit. Linearity, causality, time-invariance. Transfer function, circuit operator. Impulse response, convolution. Stability. Periodic excitation, circular convolution, circular impulse response.

*Discrete time signals and systems.* Sampling of continuous signals. Z transformation. Digital signals filtering, Recursive and nonrecursive filters (IIR and FIR filters). Discrete systems impulse response and linear convolution. Digital filters stability. Periodic steady state of digital filters, circular convolution. Discrete simulation of continuous systems. Introductory discrete linear time-varying systems theory.

*Spectral analysis.* Continuous Fourier transformation. Time and frequency domain sampling. Other versions of Fourier transformation: Fourier series, discrete Fourier transformation. Frequency response of linear time-invariant continuous and digital filters.

*Signal vector representations.* Vector representations of three-phase sinusoidal and non-sinusoidal signals in a stationary and rotating coordinate system.

## Metody kształcenia

**Lecture:** conventional lecture, problem lecture, discussion.

**Exercises:** consultation, project method, accounting exercises.

**Laboratory:** working with source document, group work, laboratory exercises.

## Efekty uczenia się i metody weryfikacji osiągnięcia efektów uczenia się

| Opis efektu                                                                                                          | Symbol efektów | Metody weryfikacji                                                                                                                            | Forma zajęć                                                                 |
|----------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Creates discrete circuit models and performs their discrete simulation                                               |                | <ul style="list-style-type: none"><li>egzamin - ustny, opisowy, testowy i inne</li><li>kolokwium</li></ul>                                    | <ul style="list-style-type: none"><li>Wykład</li></ul>                      |
| Uses equipment to measure signals, parameters and characteristics of electrical circuits.                            |                | <ul style="list-style-type: none"><li>bieżąca kontrola na zajęciach</li><li>sprawdzian</li><li>wykonanie sprawozdań laboratoryjnych</li></ul> | <ul style="list-style-type: none"><li>Laboratorium</li></ul>                |
| Formulates equations and operator description of linear time-independent circuits.                                   |                | <ul style="list-style-type: none"><li>egzamin - ustny, opisowy, testowy i inne</li><li>kolokwium</li></ul>                                    | <ul style="list-style-type: none"><li>Wykład</li></ul>                      |
| Is able to design simple passive filters.                                                                            |                | <ul style="list-style-type: none"><li>bieżąca kontrola na zajęciach</li><li>sprawdzian</li><li>wykonanie sprawozdań laboratoryjnych</li></ul> | <ul style="list-style-type: none"><li>Laboratorium</li></ul>                |
| Knows basic concepts in description and analysis of time independent linear systems of continuous and discrete time. |                | <ul style="list-style-type: none"><li>egzamin - ustny, opisowy, testowy i inne</li><li>kolokwium</li></ul>                                    | <ul style="list-style-type: none"><li>Wykład</li><li>Laboratorium</li></ul> |

## Warunki zaliczenia

Lecture: The condition of pass is to obtain a positive assessment from the written examination.

Laboratory: a conditional of pass is to obtain positive grades from all laboratory exercises that are expected to be performed within the laboratory program.

Components of the final grade: lecture: 60% + laboratory: 40%

## Literatura podstawowa

- Orfanidis S.J.: *Introduction to Signal Processing*, Prentice Hall, 1999
- Oppenheim A.V., Schafer R.W., Buck J.R.: *Discrete-Time Signal Processing*, Prentice Hall, 1999
- Blackwell W.A., Grigsby L.L.: *Introductory network theory*, PWS Publishers, 1985
- Zieliński T.P.: „From theory to digital signal processing”. Dep. EAlE AGH, Kraków 2002. (in Polish)
- Oppenheim A.V., Willsky A.S., Nawab S.H.: „Signal & Systems”. Prentice Hall 1997.
- Papoulis A.: *Circuits and Systems. A modern Approach*. Holt, Rinehart and Winston, Inc. 1980.
- Lyons R.G.: „Understanding Digital Signal Processing”. Addison Wesley Longan, Inc. 2004.

## Literatura uzupełniająca

- Dąbrowski A.: *Signal processing by means of signal processors*. WPP, Poznań, 2000 (in Polish)
- Krakowski M.: *Theoretical electrical engineering, Vol. I, Linear and non-linear circuits*. PWN, Warszawa, 1983. (in Polish)
- Osiowski J., Szabatin J.: *Circuit theory principles*, WNT Warszawa 1998. (in Polish).

## Uwagi

Zmodyfikowane przez dr hab. inż. Zbigniew Fedyczak, prof. UZ (ostatnia modyfikacja: 13-04-2022 23:18)

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