

# Modelling and computer aided design - opis przedmiotu

| Informacje ogólne   |                                                                   |
|---------------------|-------------------------------------------------------------------|
| Nazwa przedmiotu    | Modelling and computer aided design                               |
| Kod przedmiotu      | 06.2-WE-ELEKTP-MandCAD-Er                                         |
| Wydział             | <a href="#">Wydział Informatyki, Elektrotechniki i Automatyki</a> |
| Kierunek            | Elektrotechnika                                                   |
| Profil              | ogólnoakademicki                                                  |
| Rodzaj studiów      | Program Erasmus pierwszego stopnia                                |
| Semestr rozpoczęcia | semestr zimowy 2020/2021                                          |

| Informacje o przedmiocie        |                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------|
| Semestr                         | 5                                                                                  |
| Liczba punktów ECTS do zdobycia | 5                                                                                  |
| Typ przedmiotu                  | obieralny                                                                          |
| Język nauczania                 | angielski                                                                          |
| Sylabus opracował               | <ul style="list-style-type: none"><li>prof. dr hab. inż. Igor Korotyeyev</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 | 15                                      | 1                                      | -                                          | -                                         | Zaliczenie na ocenę |
| Projekt      | 15                                      | 1                                      | -                                          | -                                         | Zaliczenie na ocenę |

## Cel przedmiotu

- familiarize with the basic problems of modeling and design
- familiarize with the basic modeling methods as well as shape skills of selection and application
- develop skills from region of programs using to assist in the design, modelling and analysis of circuits

## Wymagania wstępne

Mathematical Analysis, Algebra, Fundamentals of Electrical Engineering, Methods and Techniques for Programming I and II.

## Zakres tematyczny

Introduction. Basic concepts. Systems. Dynamics of systems. State equations and output equation. Balance and stability. Similarity and analogy of dynamic systems.

Mathematical models. Continues and discrete models. Static and dynamic models. Control models.

Models of elements. Models of switches. Static and dynamic characteristics of switches. Models of passive elements. Models of elements with magnetic coupling. Model of DC motor.

Topology of converter systems. Incidence matrix. Circuit matrix. Cut matrix. Modeling of nonlinear systems. Methods: small parameter, averaging, harmonic balance. Modeling feedback systems. Circuits with PWM. System stability. The phenomenon of chaos.

Methods of mathematical analysis. Solution of linear state equation of continuous system. Solution of differential equations by Laplace transform. Numerical solution of ordinary differential equations. Multistep methods. Stability of methods. Concept of stiffness of differential equations. Statistical methods. Characteristics of programs: Pspice, Matlab, Mathcad, Mathematica, Maple, Tcad. Comparison of accuracy, capabilities and application area. Topology description of the layout. Convergence and accuracy of calculations.

## Metody kształcenia

Lecture, laboratory exercises, project

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

| Opis efektu                                                                                                     | Symbol efektów | Metody weryfikacji                                                                       | Forma zajęć                                                  |
|-----------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| Can analyze transition states and established in electrical circuits                                            |                | <ul style="list-style-type: none"><li>sprawdzian</li></ul>                               | <ul style="list-style-type: none"><li>Projekt</li></ul>      |
| He knows and understands the basics of electrical and electrical systems modeling                               |                | <ul style="list-style-type: none"><li>egzamin - ustny, opisowy, testowy i inne</li></ul> | <ul style="list-style-type: none"><li>Wykład</li></ul>       |
| Can use software for calculations and engineering simulations as well as computer-generated measurement results |                | <ul style="list-style-type: none"><li>sprawdzian</li></ul>                               | <ul style="list-style-type: none"><li>Laboratorium</li></ul> |

| Opis efektu                                                                                          | Symbole efektów | Metody weryfikacji | Forma zajęć |
|------------------------------------------------------------------------------------------------------|-----------------|--------------------|-------------|
| Can use numerical and simulation methods for engineering tasks in electronics and telecommunications |                 | • kolokwium        | • Wykład    |

## Warunki zaliczenia

Lecture – obtaining a positive grade in written or oral exam.

Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

Project – the main condition to get a pass is acquiring sufficient marks for all project tasks as scheduled

Calculation of the final grade: lecture 40% + laboratory 30%+project: 30%

## Literatura podstawowa

1. [Richard Hamming](#). Numerical Methods for Scientists and Engineers. Courier Corporation, 2012
2. [Leon O. Chua](#), [Charles A. Desoer](#), [Ernest S. Kuh](#). Linear and Nonlinear Circuits. McGraw-Hill, 1987
3. John Keown. OrCAD PSpice and Circuit Analysis. Prentice-Hall, Inc. Upper Saddle River, NJ, USA, 2000

## Literatura uzupełniająca

1. Ramshaw, E., Schuurman, D.C. PSpice Simulation of Power Electronics Circuits. Springer, 1998.
2. [Dingyu Xue](#), [YangQuan Chen](#). System Simulation Techniques with MATLAB and Simulink. Wiley, 2013.

## Uwagi

Zmodyfikowane przez dr hab. inż. Paweł Szcześniak, prof. UZ (ostatnia modyfikacja: 25-04-2020 13:38)

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