COURSE DESCRIPTION CARD - SYLLABUS

Course name
Computerization of design in electrical engineering [S1Eltech1>KPwE1]

Course

Field of study
Electrical Engineering

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

News in mathematics and physics at the matriculation level. Basic knowledge of computer science and programming. Ability to understand and interpret the transmitted messages and effective self-education in the field related to the chosen field of study.

Course objective

Understanding selected numerical methods in application to solve problems in the field of circuit theory and power engineering, learning examples of tools for design in the field of broadly understood electrical engineering.

Course-related learning outcomes

Knowledge:
Knows computer methods used for numerical calculations (integration, solving equations and systems of linear, nonlinear and differential equations, basic optimization methods).

Skills:
Is able to apply knowledge of numerical methods to solve selected issues in the field of electrical circuits

and power engineering necessary to carry out project tasks. He can obtain information from literature and the Internet, work individually, solve tasks in the field of design computerization.

Social competences:
Is able to think and act in an entrepreneurial manner in the field of creating IT applications for design in the field of electrical engineering.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified during an exam consisting of 20-25 different type equally scored questions. Passing threshold: 50% of points. Final issues, on the basis of which questions are prepared, are shared through the eKursy platform. In addition, students can earn bonus points by showing activity and commitment during the semester.

Programme content

Basic issues regarding numerical methods and optimization used in electrical engineering and their implementation in the MS Visual Studio C# or Matlab Simulink environment. Basic issues related to artificial intelligence and its application in electrical engineering.

Course topics

Lecture:
Representation of numerical values in various digital systems. Examples of approximation and interpolation methods and their application in technical issues (e.g. Lagrange interpolation, mean square approximation). Numerical interpretation of the derivative of a function at a point. Computer methods enabling the analysis of current flow in electric circuits in steady states containing linear elements (Jacobi method, Gauss-Siedl method, SOR simple iteration method) and non-linear (Newton method), as well as in transient states (Euler and Rune-Kutta method). Basic methods for optimization in technique, local optimization methods (gradient and non-gradient), global optimization methods (e.g. simulated annealing method, genetic algorithm, particle swarm method). Basic issues related to artificial neural networks (basic definitions, neuron models, network structures, learning methods) and their application in electrical engineering, e.g. prediction of energy yield in renewable energy sources. Examples of implementation of the presented numerical and optimization methods in the MS Visual Studio C# or Matlab Simulink environment.

Teaching methods

Multimedia presentation, illustrated with examples on the board, initiating discussions during the lecture. Additional materials will be placed in the eKursy platform.

Bibliography

Basic:
1. Spałek D.: Metody numeryczne w elektrotechnice, WPŚ, Gliwice 2020.
2. Fortuna Z., Macukow B., Wąsowski J.: Metody numeryczne, WNT, Warszawa 2015.
3. Kącki E., Małolepszy A., Romanowicz A.: Metody numeryczne dla inżynierów, WPŁ, Łódź 2008.
4. Pańczyk B., Łukasik E., Sikora J., Guziak T.: Metody numeryczne w przykładach, WPL, Lublin 2012.
5. Bolkowski S.:Teoria obwodów elektrycznych, WNT, Warszawa 2017.
6. Pikoń A.: AutoCAD 2021 PL. Pierwsze kroki, Helion, Warszawa 2020.

Additional:
1. John Sharp: Microsoft Visual C# 2017 krok po kroku, APN Promise, Warszawa 2018.
2. Guziak T.: Metody numeryczne w elektrotechnice, WPL, Lublin 2002.
3. Jaskulski A.: AutoCAD 2021 PL/EN/LT. Metodyka efektywnego projektowania, Helion Warszawa 2020.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	35	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00