COURSE DESCRIPTION CARD - SYLLABUS

Course name
Numerical methods in engineering [N2Eltech2>MNwT]

Course

Field of study
Electrical Engineering

Year/Semester
2/3

Area of study (specialization)
Drive Systems in Industry and Electromobility

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
10

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

mgr inż. Marcin Stasiak
marcin.stasiak@put.poznan.pl

Lecturers

Prerequisites

Calculus, linear algebra

Course objective

The main aim of the subject is mastering by a student basic knowledge and skills out of scope of basic numerical methods.

Course-related learning outcomes

Knowledge:
1. Has an expanded and in-depth knowledge of some mathematics fields, including elements of discrete and applied mathematics, necessary for modeling and analyzing the operation of advanced electrical devices and systems as well as describing and analyzing the operation and synthesis of complex electrical systems. [K2_W01]
2. Has an expanded knowledge of advanced numerical methods used to solve complex technical tasks in electrical engineering. Knows and understands English terminology related to the field of studies. [K2_W02]
3. Has extended knowledge of computer-aided design. Knows and understands ergonomic rules, health

and safety at work [K2_W18]

Skills:
1. Can obtain information from literature, database and from other sources as well as interpret, evaluate and critically analyze and formulate them with adding justified opinions [K2_U01]
2. Can work individually and as a part of a team, can drive the team in order to achieve deadlines; can determine directions of his and others further learning [K2_U02]
3. In formulating and solving engineering tasks, he can integrate knowledge from many sources and related disciplines. Can use analytical, simulation and experimental methods [K2_U16]

Social competences:
1. Recognizes the importance of knowledge in solving cognitive and practical problems and understands that in technology knowledge and skills quickly become obsolete and therefore require constant replenishment [K2_K01]
2. Is aware of the importance to develop professional achievements and comply with the rules of work ethics. [K2_K02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Test from lecture part. Final project summary of designed algorithms.

Programme content

1) Interpolation
- basics and methods
- polyfit and polyval
2) Spline interpolation and approximation
3) Numerical differentation
- basics of one and multivariable functions differentation (using Taylor theorem)
4) Numerical integration
- Newton-Cotes schemes
- Gauss schemes
5) Nonlinear equations and their systems
- bisection method
- fixed point method
- secant method
- Newton method

Teaching methods

Lecture: traditional form given on the blackboard with discussion
Lab classes: creating and algorithms and solving numerically given problems

Bibliography

Basic:
1. Metody numeryczne, Ewa Majchrzak, Bohdan Mochnacki, WPŚ, Gliwice 2004
2. Wstęp do metod numerycznych, Josef Stoer, PWN, Warszawa 1979
3. Wstęp do analizy numerycznej, Anthony Ralston, PWN, Warszawa 1975
4. Metody numeryczne zagadnień początkowych równań różniczkowych zwyczajnych, Andrzej Krupowicz, PWN, Warszawa 1986
5. Numerical Analysis, Richard Burden, Douglas Faires, Brooks/Cole, Boston 2011
6. Numerical Methods in Engineering with Matlab, Jaan Kiusalaas, Cambridge University Press, New York 2010
7. Numerical methods for ordinary differential equations, David Griffiths, Desmond Higham, Springer, London 2010
8. Analiza numeryczna, David Kincaid, Ward Cheney, WNT, Warszawa 2006

Additional:
1. Introduction to numerical ordinary and partial differential equations using Matlab, Alexander

Stanoyevitch, Wiley, New Jersey 2005
2. Numerical Methods and Modelling for Chemical Engineers, Mark E. Davis, John Wiley & Sons Canada 1984
3. Applied Numerical Methods with Matlab, Steven Chapra, McGraw-Hill, New York 2010

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	20	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00