COURSE DESCRIPTION CARD - SYLLABUS

Course name
Applied mathematics [S2EJ1>MS]

Course

Field of study
Nuclear Power Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

4,00

Coordinators

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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 applied math.

Course-related learning outcomes

Knowledge:
Has broadened and in-depth knowledge in selected areas of mathematics, including elements of discrete and applied mathematics and optimization, necessary for modeling and analyzing the operation of advanced devices and energy systems and their synthesis. He has extensive knowledge in the use of mathematical models, numerical methods and computer-aided calculation systems to solve complex technical issues in the energy industry, including nuclear energy.

Skills:
Is able to apply and modify mathematical models in the analysis and design of processes, devices and

energy systems in normal and emergency operating states of the power system.
Is able to use numerical and simulation methods as well as IT tools to design and analyze the operation of energy systems, including individual elements of nuclear power plants

Social competences:
Is able to think and act in a creative and entrepreneurial way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Oral exam from lecture part.

Programme content

1) Norm, normed spaces
2) Inner product in vector and function spaces, orthogonality, orthogonal series
3) Interpolation and appriximation, bacis definitions, polynomial interpolation, spline interpolation (cubic and parametric)
4) Differential operators (gradient, divergence, curl and Laplace operator), curvilinear systems of coordinates (polar, cylindrical, spherical), Lame coefficients
5) IVP's and BVP's - idea, types of BC's
6) PDE's (II order), elliptic, hyperbolic, parabolic types, Fourier method
7) Integral equations of the I and II kind, Adomian method
8) Special functions, examples

Course topics

none

Teaching methods

Lecture: traditional form given on the blackboard with discussion

Bibliography

Basic:
1. Metody numeryczne, Ewa Majchrzak, Bohdan Mochnacki, WPŚ, Gliwice 2004
2. Numerical Analysis, Richard Burden, Douglas Faires, Brooks/Cole, Boston 2011
3. Introduction do optimization, Pablo Pedregal, Springer, New York 2004
4. An introduction to optimization, Edwin Chong, Stanislaw Zak, Wiley-Interscience, New Jersey 2008
5. Analiza numeryczna, David Kincaid, Ward Cheney, WNT, Warszawa 2006
6. Metody obliczeniowe optymalizacji, Władysław Findeisen, Jacek Szymanowski, Andrzej Wierzbicki, WPW, Warszawa 1972

Additional:
1. Podstawy optymalizacji statycznej, Przemysław Berowski, WKIE, Warszawaw 2008
2. Optimization in practice with Matlab, Achille Messac, Cambridge University Press, New York 2015

Breakdown of average student's workload

	Hours	ECTS
Total workload	102	4,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50