COURSE DESCRIPTION CARD - SYLLABUS

Course name
Selected topics in mathematics

Course

Field of study
Electronics and Telecommunications

Year/Semester
1/2

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
english

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
45

Laboratory classes
0

Other (e.g. online)
0

Tutorials
45

Projects/seminars
0

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
mgr inż. Marcin Stasiak
marcin.stasiak@put.poznan.pl

Responsible for the course/lecturer:
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Prerequisites

Student should have basic knowledge from Calculus and Linear Algebra from first-cycle studies. Additionally student knows basic numerical methods algorithms.

Course objective

The aim of the subject is presentation of a few important problems of modern applied math. Curriculum of lectures and exercises classes includes basic knowledge from functional analysis, theory of Hilbert spaces and orthogonal functions. The theory of approximation and L2 projection will be presented. Course also includes the theory of boundary and initial value problems, given by ordinary, partial and integral equations.

Course-related learning outcomes

Knowledge

- student understand and is able to use orthogonal functions to solve given problems

- student is able to solve given ordinary, partial and integral equations, which are the models of real life problems
- student is able to create appropriate algorithm to approximate given function or set of discreet data

Skills

- student analyses problem given by differential or integral equation and is able to choose the appropriate method of solving
- student is able to extend his knowledge relying on literature given by lecturer

Social competences

- student single-handedly get additional knowledge relying on literature given by lecturer

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

To pass the subject student must get at least 50% of possible points, both from the lecture and exercise classes. Two tests are planned during the term and one final exam based on the knowledge given by lecturer. Student activity is additionally scored.

Programme content

Lectures:

- norm, normed spaces, inner product, Hilbert spaces, linear operators
- orthogonal functions, Gram-Schmidt orthogonalization process, general and trigonometric Fourier series
- L2 projection, the best approximation theorem
- cubic splines
- initial and boundary value problems
- curvilinear systems of coordinates
- differential operators: gradient, divergence, curl, Laplace operator and their properties
- partial differential equations, classification, canonical form, separation of variables
- integral equations of the I and II kind, classification and methods of solving

Exercise classes:

- norm, normed spaces, inner product
- orthogonal basis, Gram-Schmidt orthogonalization process, Legendre and Hermit differential equations
- initial and boundary problems given by second order ordinary differential equations
- differential operators: gradient, divergence, curl, Laplace operator and their properties
- partial differential equations, classification, canonical, separation of variables
- integral equations of the I and II kind, classification and methods of solving

Teaching methods

Lecture: traditional form given on the blackboard with discussion
Exercise classes: solving problems on the blackboard

Bibliography

Basic

- Elementary Functional Analysis, B. MacCluer, Springer 2009
- Elementary partial differential equations, R. Gribben, Van Nostrand Reinhold 1975
- Linear and nonlinear integral equations - methods and applications, A. Wazwaz, Springer 2011

Additional

- Beginning partial differential equations, P. O'Neil, 2008
- Partial differential equations, N. Asmar, Pearson Prentice Hall 2005
- Partial differential equations - an introduction, W. Strauss, John Wiley and Sons 2007

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	100	4,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	25	1,0

[1] delete or add other activities as appropriate