COURSE DESCRIPTION CARD - SYLLABUS

Course name
Algorithms in electronics and telecommunications

Course

Field of study
Electronics and Telecommunications

Year/Semester
I / Sem. 1

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)

Tutorials
0

Projects/seminars
0/0

Number of credit points

6

Lecturers

Responsible for the course/lecturer:
dr inż. Paweł Sroka,
pawel.sroka@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

Student starting this course should have basic knowledge of the high school-level mathematics and physics. Moreover, a student should be acquainted with the use of a PC/notebook and should be able to create documents using any text editor. Finally, student should understand the necessity to acquire a new knowledge and skills stemming from a chosen field of studies.

Course objective

The aim is to teach a student the ways of solving basic computational problems by building appropriate algorithms, including introduction to basic numerical methods used in electronics and telecommunications. This knowledge is necessary to facilitate efficient learning of programming in high-level languages widely used in the chosen field of studies.

Course-related learning outcomes

Knowledge

1. Has a solid knowledge of construction of computational algorithms by means of a graphical description, syntax and programming using MATLAB.

2. Knows the limitations related to representation of numbers in binary system on machines.

3. Understands the rules of iterative solutions, recurrence and has basic knowledge in the most popular numerical methods (solving of nonlinear equations, sets of linear equations, numerical calculation of derrivatives and finite integrals).

Skills

1. Is able to develop computational algorithms in the form of graphical description for solving basic computational problems in the area of mathematics and engineering.

2. Is able to implement these algorithms using MATLAB programming environment.

3. Is able to convert a number from decimal to binary system and vice-versa.

Social competences

1. Is aware of the limitations of his/her current knowledge and skills.

2. Understands the need of further self-study, in particular in the field of programming using high level programming languages.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired in the lectures is verified in form of a written exam. The exam comprises 6-8 open-ended questions that are graded (with points) differently. The exam is passed if at least 45% of the total score is obtained.

The abilities acquired during the laboratories are verified with two tests that encompass two main blocks of study. The tests are performed with the use of computers and software used also during laboratory exercises and can be complemented with written parts. The tests are graded from 2 to 5 and the requirement to pass is to obtain at least 3 for both of them. Additionally, the final grade can be also influenced with the evaluation of student's level of knowledge and skills required to conduct the laboratories and with the homeworks.

Programme content

Lectures comprise the following topics:

- Introduction to representations of algorithms: textual and graphical description, basic block diagrams of graphical representation of algorithms, building simple algorithms in a graphical manner.

- Representation of numbers in binary system: conversion from decimal system to binary and vice versa for integers and real values (fixed-point and floating-point notations).

- Introduction to MATLAB programming environment: elements and syntax of MATLAB: data types, arithmetic operators and precedence of operators, input and output statements, loops, decisions, vectors and matrices, graphics, function M-files.

- Examples of an algorithmic approach to solve computational problems: representation of continuous functions as a sequence of samples, basic recursive methods (arithmetic and geometric series, finding GCD of two numbers, calculation of the value of a polynomial).

- Iterative techniques: criteria for stopping computations, application of recursive solutions to improve efficiency of algorithms.

- Basic numerical methods: solving of nonlinear equations, solving sets of linear equations, calculation of the derivative of a function, numerical integration, linear regression.

Laboratory classes focus on the following topics:

- Development of algorithms and their description in a graphical form (block diagrams): introduction to application of Magic Blocks software, operations on vectors and matrices.

- Conversion of decimal numbers to binary system and vice versa.

- Development of programming skills using MATLAB environment: basic expressions, creating scripts and functions, conditional expressions, loops and iterative techniques, graphical presentaion of results.

Teaching methods

Lecture: multimedia presentation supported with additional exercises/examples solved on a board.

Laboratories: practical exercises - students solve algorithmic problems formulated by the teacher using computers and installed software or in a written form, correct solutions are provided and explained by the teacher.

Bibliography

Basic

John H. Mathews, Kurtis D. Fink, "Numerical methods using MATLAB", Prentice Hall, 1999

Steven C. Chapra, "Applied Numerical Methods with MATLAB® for Engineers and Scientists", McGraw-Hill Education, 2011

Additional

R. Pratap, "Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers", Oxford University Press, 2009

B. D. Hahn, D. T. Valentine, Essential Matlab for Engineers and Scientists, Butterworth-Heinemann (Elsevier), 2007

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	75	3,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam, homeworks) [1]	75	3,0

[1] delete or add other activities as appropriate