COURSE DESCRIPTION CARD - SYLLABUS

Course name
Programming I [S1MwT1>Progr1]

Course

Field of study
Mathematics in Technology

Year/Semester
1/2

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
15

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

mgr inż. Nadiia Bashova
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Prerequisites

The student starting this subject should have knowledge and skills of the course Introduction to Programming and Information Technologies from the first semester. Should know the limits of their own knowledge and understand the need for further education.

Course objective

The course will discuss Python libraries useful in numerical calculations: numpy (especially operations on matrices) and symbolic: sympy (e.g. operations on polynomials). The basic functions of the Pandas package dedicated to data analysis will also be reworked. The topic of working with files will also be discussed, especially the json and csv libraries. Attention will be paid to the usefulness of the dictionary data type. We will also cover the basics of plots creation using the matplotlib package.

Course-related learning outcomes

Knowledge
1. Student has extended and in-depth general knowledge of various branches of higher mathematics, including theorems and proofs, and advanced detailed knowledge about the application of mathematical techniques, methods and tools in engineering and technical sciences

2. Student has deepened and theoretically founded knowledge of computer science, including numerical methods; knows at least one software package or a programming language in detail. Student knows and understand selected tools of mathematics used in data mining [K_W06(P7S_WG), KW07(P7S_WG), KW08 (P7S_WG)]
Skills
1. The student is able to apply theoretical knowledge, in particular in mathematics, to process and analyze data and to formulate appropriate conclusions [K_U01 (P7S_UW)]
2. The student is able to collect / process data and evaluate their quality [K_U06 (P7S_UW)]
3. Student can construct an algorithm for solving a complex engineering task or a simple research problem and implement and test it in a selected programming environment
4. Student is able to use equipment and tools, in accordance with general requirements and technical documentation; knows how to apply the principles of health and safety at work
5. Studentis able to independently acquire knowledge and develop professional skills, independently designs the path of education and consistently strives to implement it, as well as is able to orient others in this regard
Social competences
1. Student is aware of the level of his knowledge in relation to research in technical sciences
2. Student is aware of the deepening and expanding knowledge to solve new technical problems
3. The student is ready to support other scientific units / industry, etc. in the field of mathematical modeling / statistical inference / data analysis and processing for the benefit of the social environment [K_K04 (P7S_KO), K_K05(P7S_KR)]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified in laboratory

Skills acquired as part of the laboratory are verified on the basis of developed projects and final test. Passing threshold: 50% of points.

Programme content

Selected elements of the Python language and selected libraries related to data analysis:

- exception handling
- dictionaries
- working with files (including csv files, json library)
- numerical calculations - numpy library
- symbolic calculations - sympy library
- data processing - pandas library

Teaching methods

1) lectures:
- lecture with presentation supplemented with examples given on the board,
- a lecture conducted in an interactive manner with formulating questions to a group of students or to specific students indicated,
- students' activity during classes is taken into account when issuing the final mark,
- during the lecture initiating the discussion,
- theory presented in close connection with practice,
- theory presented in connection with the current knowledge of students,
- presenting a new topic preceded by a reminder of related content known to students in other subjects.
2) laboratory:
- laboratories supplemented with multimedia presentations (including: drawings, photos, animations, sound, films),
- detailed reviewing of reports by the laboratory chair and discussions on comments,
- using tools that enable students to perform tasks at home (eg open source software),
- demonstrations,
- work in teams,

- computational experiments.

Bibliography

1. Wes McKinney:" Python for Data Analysis"
2.Larose,D. T." Data mining methods and models" the newest edition
3. Han J., Kamber M., Kaufman M.,Data Mining: Concepts and Techniques, 2000.
4. Hand J., Mannila H., Smyth P., Pricinciples of Data Mining, MIT Press, 2001.
Williams G., Data Mining With Rattle and R_ The Art of Excavating Data for Knowledge Discovery, Springer 2011

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00