COURSE DESCRIPTION CARD - SYLLABUS

Course name
Data analysis [S1Lot2-SLiPL>AD]

Course

Field of study
Aviation

Year/Semester
3/6

Area of study (specialization)
Aircraft Engines and Airframes

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

dr inż. Przemysław Grzymisławski
przemyslaw.grzymislawski@put.poznan.pl

Lecturers

Prerequisites

• Basic knowledge of mathematical statistics, probability theory, programming fundamentals, and research methodology. • Ability to design and conduct a simple experiment with data acquisition.

Course objective

To provide essential knowledge and skills in analyzing experimental data sets and statistical hypothesis testing.

Course-related learning outcomes

Knowledge:
Advanced knowledge of mathematics, including algebra, calculus, differential equations, probability, and analytical geometry, as well as physics (classical mechanics, optics, electricity and magnetism, solid-state physics, and thermodynamics), useful for solving complex engineering problems in aviation.
Theoretical and structured knowledge of key technical issues and specific aspects of air transport, including engineering techniques, methods, and tools used in aviation.
Ability to self-learn using modern educational tools, such as online lectures, databases, e-books, and educational software.

Skills:
Ability to gather, analyze, and critically evaluate information from various sources (literature, databases in Polish and English).
Proficiency in using information and communication technologies applicable to aviation projects.
Ability to plan and conduct experiments, including measurements and computer simulations, and correctly interpret results.
Capability to apply analytical, simulation, and experimental methods in solving aviation-related problems.
Ability to apply air traffic movement principles and design a runway in accordance with ICAO regulations.
Competence in probability theory and statistical analysis, with the ability to interpret and apply statistical methods in aviation engineering.
Ability to write a short scientific paper, select appropriate research methods, and analyze results.
Ability to collaborate and work in a team, taking on various roles and prioritizing tasks effectively.
Capability to plan and pursue lifelong learning, including opportunities for advanced studies and professional development.
Social Competencies:
Ability to work in a team, take on different roles, and prioritize tasks to achieve goals.
Awareness of the importance of continuous learning and knowledge of further education opportunities (Master's and PhD studies, postgraduate courses, professional training, and certifications).
Understanding of the social role of an engineering graduate, particularly in communicating scientific and technical advancements to the public.
Ability to identify and resolve ethical dilemmas in aviation and astronautics.

Social competences:
-

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Final exam (colloquium): Conducted in the last class, consisting of:
• 10 multiple-choice questions (1 point per correct answer, approx. 2 minutes per question).
• 10 short open-ended questions (graded 0-2 points each, approx. 5 minutes per question).
• A fully solved problem should include: problem scheme (if applicable), required formulas, numerical calculations, and unit conversions.
• Passing threshold: 50% of total points.
Project Evaluation:
• 5 to 7 project tasks based on lecture topics.
• Requires computational problem-solving using programming tools and specialized software.
• Tasks must be submitted via university email within 13 calendar days of assignment.
• Each task is graded 0-10 points, with grading criteria specified for each project.
• Late submissions or submissions from non-university emails receive 0 points.
• Plagiarism or copied work also results in 0 points.
• Passing criteria: 50% of total points and completion of 70% of assigned tasks.

Programme content

• The data analysis process includes:
• Data collection and preprocessing (cleaning, transformation).
• Exploratory analysis, modeling, and visualization.
• Interpretation and presentation of results.
• Introduction to Python programming:
• Syntax, data structures (lists, dictionaries, tuples).
• Control statements, functions, file handling, and object-oriented programming basics.
• Methods of analyzing experimental data:
• Experimental design and noise reduction.
• Regression analysis and error estimation

Course topics

• Introduction to Python 3.x programming
• Basics of statistics and probability, statistical hypothesis testing
• Analysis of experimental data
• Analysis of numerical experiment data
• Overview of Python 3.x libraries
• Visualization of multidimensional data sets

Teaching methods

Lecture with live coding examples.
Project-based exercises in a computer lab, using real-world datasets (e.g., Kaggle).

Bibliography

Basic:
Joel Gruss - Data Science from Scratch
Jake VanderPlas - Python Data Science Handbook
Peter C. Bruce, Andrew Bruce - Practical Statistics for Data Science

Additional:
-

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	0,50