COURSE DESCRIPTION CARD - SYLLABUS

Course name
Engineering data analysis [S1Mech2>ADI]

Course

Field of study
Mechatronics

Year/Semester
1/1

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
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

The student has basic knowledge of mathematics and probability. Has the ability to think logically and to perform basic mathematical calculations. Is aware of the need for teamwork, learning and acquiring new skills and knowledge.

Course objective

The aim of the course is to provide students with the basics of knowledge in the field of data analysis methods in engineering research, which includes methods for data description and presentation as well as their analysis and developing the skills of its practical application in solving specific tasks and engineering problems.

Course-related learning outcomes

Knowledge:
Student knows the basic definitions and concepts in the field of engineering statistics (can name the population, sample, feature, define basic statistical measures describing the sample and population, probability distribution and related parameters, knows the basic distributions for discrete and continuous features).

Student has knowledge of interval estimation (can define confidence intervals for population parameters: expected value, variance, fraction).
Student has knowledge of verifying parametric hypotheses (can define a research problem and design a study to verify statistical hypotheses, is aware of the mistakes he may make in this process).
Student has basic knowledge of linear regression and correlation.

Skills:
Student can describe a random sample using the known statistical measures and visualize the results of the sample using the known graphical methods. He can apply these skills in solving engineering problems.
Student can determine the probability of certain events using the known theoretical probability distributions describing the features shaped in the manufacturing processes. Is able to use for this purpose both formulas of probability distribution functions and uses statistical tables. He applies these skills on examples embedded in engineering issues.
Student can verify hypotheses regarding population parameters (expected value, variance, fraction) and compare two populations in terms of equality of these parameters. Can relate acquired skills to real engineering problems arising in industrial practice.
Student is able to examine the relationship of two phenomena and express the strength of this relationship. Is able to develop a linear regression model describing the relationship between two variables and assess its quality. He uses this skills in engineering issues.
Student is able to solve presented problem: starting from naming the population, determining its size, specifying the size of the sample, the method of selecting elements for the sample, through the selection of analysis tools, and ending with inference. The examples relate to real problems that can be encountered in industrial practice.

Social competences:
Student is aware of the impact of conclusions from statistical analyzes on engineering decisions.
Student is aware of the quality of data and statistical conclusions and is sensitive to any manipulation in statistical inference.
Student is aware of the role of statistical analyzes in engineering activities.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: credit based on a test, carried out at the end of the semester (the treshold of passing is 50%).
Tutorials: credit is given on a test, carried out at the end of the semester.
Students are informed about test schedule at the first meeting.

Programme content

Lecture:
1. Methods of describing and presenting data from engineering research.
2. Methods for assessing risk and probability in manufacturing processes.
3. Methods of estimation and inference about manufacturing processes and their assessment.
4. Methods for assessing the degree of relationship between product or process features.
Tutorials:
They rely on the team or individual use of knowledge of the subject provided in the lecture in solving engineering tasks and problems.

Course topics

Lecture:
1. Methods of describing and presenting data from engineering research (descriptive statistics - statistical measures from sample and population, graphical methods of data presentation - histogram, boxplot).
2. Methods for assessing risk and probability in manufacturing processes (probability distributions of continuous and discrete random variables - binomial, Poisson and normal distribution).
3. Methods of estimation and inference about manufacturing processes and their assessment (confidence intervals for mean and standard deviation, statistical hypotheses testing for mean).
4. Methods for assessing the degree of relationship between product or process features (correlation

and linear regression).
Tutorials:
They rely on the team or individual use of knowledge of the subject provided in the lecture in solving engineering tasks and problems.

Teaching methods

Lecture: multimedia presentation illustrated with examples given on the blackboard, active participation in classes; consultations.
Tutorials: solving tasks, practical exercises, discussion, case study.

Bibliography

Basic:
1. Aczel A.D., Statystyka w zarządzaniu, PWN, Warszawa 2000.
2. Bobrowski D., Probabilistyka w zastosowaniach technicznych, WNT Warszawa 1986.
3. Hamrol A: „Zarządzanie jakością z przykładami”, PWN Warszawa 2011

Additional:
1. Starzyńska W., Statystyka praktyczna, Wydawnictwo Naukowe PWN, Warszawa 2005.
2. Viking G.G., Statistical Methods for Engineers, Duxbury-Brooks/Cole, Pacific Grave, CA 1998.
3. Montgomery D.C. Introduction to Statistical Quality Control, Wiley 2008

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
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)	30	1,00