COURSE DESCRIPTION CARD - SYLLABUS

Course name
Statistical methods in scientific research

Course

Field of study
Engineering management

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes

Other (e.g. online)

Tutorials
15

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Katarzyna Filipiak

Institute of Mathematics

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Responsible for the course/lecturer:

Prerequisites

Basic knowledge in mathematical analysis, algebra of sets and descriptive statistics

Course objective

The aim of this course is to give the opportunity to learn and discuss basic problems of probability theory and methods of statistical inference. Presented material should give the opportunity to solve selected engineering problems.

Course-related learning outcomes

Knowledge

1. The student has extended and in-depth knowledge of statistical modelling and its applications to processes appearing in organizations

2. The student has extended and in-depth knowledge of collecting statistical data and of the behavior of market participants

Skills

1. The student can apply theoretical knowledge about statistical modelling to describe and analyze social processes and phenomena

2. The student can express opinions, can collect the data properly and analyze the data

3. The student can formulate problems and use statistical measures and estimators for statistical analysis of social phenomena; can interpret the results and write conclusions

4. The student can formulate statistical hypotheses and interpret the results

5. The student can model and prognose the behavior of complex social processes, can describe the relations between social phenomena

Social competences

1. Understanding of interdisciplinary of knowledge and abilities of identification and solving basic problems related to the direction of the studies; understanding of necessity of creating interdisciplinary teams

2. Ability of formulating questions precisely in order to deepen his own understanding of a given subject or ability to recognize missing elements of reasoning

3. Understanding of the importance of professional behave, obeying the rules of ethics and respecting for diversity of views and cultures

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

- Practical course (tutorials) - test comprising probability theory and mathematical statistics; the student has to collect at least 50% of possible points; the test is scheduled for the last class in the semester

- Lecture - theoretical test based on the material presented during the lectures; the student has to collect at least 50% of possible points; the test is scheduled for the last lecture in the semester

Programme content

Lecture:

1. Discrete random variable: notation and definitions, discrete distributions, binomial distribution

2. Continuous random variable: notation and definitions, continuous distributions, exponential distribution, normal distribution

3. Inference about populations: statistics and their distributions, t-Student distribution, chi-square distribution

4. Statistical inference: point and interval estimation of population mean, variance and proportion

5. Statistical inference: testing hypotheses about population mean, variance and proportion

6. Analysis of variance

7. Correlation and regression

Tutorials:

1. Basic concepts of probability: definition of probability and its properties, independence, conditional probability, total probability, Bayes' theorem

2. Discrete random variable: notation and definitions, discrete distributions, binomial distribution2. Continuous random variable: notation and definitions, continuous distributions, exponential distribution, normal distribution

3. Continuous random variable: notation and definitions, continuous distributions, exponential distribution, normal distribution

4. Inference about populations: statistics and their distributions, t-Student distribution, chi-square distribution

5. Statistical inference: point and interval estimation of population mean, variance and proportion

6. Statistical inference: testing hypotheses about population mean, variance and proportion

7. Analysis of variance

Teaching methods

Lectures (multimedia presentations) - presenting the theory connected with a current students' knowledge, presenting a new topic preceded by a reminder of related content known to students from other subjects

Practical course (tutorials) - solving examples on the blackboard, discussions in groups, applications of statistical methods to solve real problems in groups an individually

Bibliography

Basic

1. Krysicki, W., J. Bartos, W. Dyczka, K. Królikowska and M. Wasilewski: Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, wydanie 8. PWN Warszawa, 2012

2. Bobrowiski, D. and K. Maćkowiak-Łybacka: Wybrane metody wnioskowania statystycznego. Wyd. PP, Poznań, 2004

Additional

1. Devore, J.L.: Probability and Statistics for Engineering and Sciences, Brooks/Cole, 2012

2. Ross, S.M.: Introductory Statistics, Elsevier, 2010

Breakdown of average student's workload

	Hours	ECTS
Total workload	70	3,0
Classes requiring direct contact with the teacher	30	1,5
Student's own work (literature studies, preparation for tutorials, preparation for tests/final test from theoretical knowledge) [1]	40	1,5

[1] delete or add other activities as appropriate