COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mathematics

Course

Field of study

Civil Engineering

Year/Semester

1/1

Area of study (specialization)

Structural Engineering

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

English

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

0

Other (e.g. online)

0

Tutorials

30

Projects/seminars

0

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

Prerequisites

Basic knowledge in mathematical analysis, algebra of sets and probability theory

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

Student has extended and detailed knowledge of mathematics and mathematical statistics, forming theoretical principles appropriate to formulate and solve tasks related to building engineering

Student has structured and theoretically based knowledge of the processes in the full life cycle of building structures and their management rules. They also know and understand the need for systematic evaluation and maintenance of structure technical condition

Skills

Student is able to plan and perform lab experiments, using suitable methods and tools for evaluating the quality of applied materials and evaluating the strength of elements of selected building structures

Student, by utilizing the obtained knowledge, can select appropriate (analytical, numerical, simulation, experimental) methods and tools to solve technical problems

Student, by applying scientific rules and skills, is able to formulate and test hypotheses related to simple research problems, in order to solve engineering, technological and organisational problems in construction engineering; can prepare studies preparing for research work

Student can manage team work, cooperate with other people and take the leading part in teams

Social competences

Student takes responsibility for the reliability of working results and their interpretation

Student can realise that it is necessary to improve professional and personal competence; is ready to critically evaluate the knowledge and received content

Student is ready to obey the principles of professional ethics

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Exam - written test based on the material presented during the lectures and tutorials; the student has to collect at least 50% of possible points; Practical course (tutorials) - two tests comprising probability theory and mathematical statistics; the student has to collect at least 50% of possible points from each test; the first test is scheduled for the eighth class, and the secon one for the last class in the semester

Programme content

Lectures:

1. Elements of descriptive statistics

2. Probability theory definition of probability and its properties, independence, conditional probability, total probability, Bayes? theorem

3. Discrete random variable basic definitions, probability distributions (Benoullis, binomial, Poisson'), cumulative distribution function, expectation and standard deviation, fraction

4. Two-dimensional discrete random variable

5. Continuous random variable - basic definitions, probability distributions (uniform, exponential, normal) cumulative distribution function, expectation and standard deviation

6. Statistical inference: statistics and their distributions, Chi-square distribution, t-Student distribution

7. Statistical inference: point and interval estimation

8. Statistical inference: hypothesis testing

9. Comparing two or more populations

10. Regression analysis

11. Nonparametric hypotheses

Tutorials:

1. Elements of descriptive statistics

2. Probability theory definition of probability and its properties, independence, conditional probability, total probability, Bayes theorem

3. Discrete random variable basic definitions, probability distributions (Benoullis, binomial, Poisson'), cumulative distribution function, expectation and standard deviation, fraction

4. Two-dimensional discrete random variable 5

. Continuous random variable - basic definitions, probability distributions (uniform, exponential, normal) cumulative distribution function, expectation and standard deviation

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7. Statistical inference: point and interval estimation

8. Statistical inference: hypothesis testing

9. Comparing two or more populations

10. Regression analysis

11. Nonparametric hypotheses

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	100	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	1,5

[1] delete or add other activities as appropriate