Methodology basics sub-module
ECTS range: 29
Courses: 1) Learning and research methodology; 2) Business Communication; 3) Calculus; 4) Applied mathematics; 5) Business informatics; 6) Business statistics

Course: Applied Mathematics	**ECTS: 6**
Compulsory	
Ratio of theory – practice, %: 50% - 50%	
Type of lesson: lecture / seminar; number of lessons in semester of teaching: 30 + 30 ***Language of instruction: English*** **Specific techniques or methods in teaching** (if any e.g. specific software): Software, tools: Excel, Geogebra and other online tools for calculation	
Type of examination and course mark: colloquium Further methods of examination or mid/end term testing (e.g. project works): computer based assignments	
Semester: 2	
Preconditions of the course: Calculus	

Description of course content:

Objectives:
To prepare the students for investigating random phenomena. Based on the basic knowledge of students – learned about elementary probability theory - to understand the basic concept of it, to make them able to solve classical probability problems, to prepare them for understanding the issues of statistic.
To get familiar with vectors, matrixes, operations of them, definition and solution of linear equations, - using method of basis change. By the aim of basing the understanding of linear programming optimization problems.
Brief content, topics:
Definition and operations with probabilistic events, events algebra. Definition of probability, axioms, random variables, classical and geometrical probability fields, distributions. Independence of random variables, conditional probabilities, Bayes theorem. Discrete and continuous variables and properties of them. The most common probability distributions. Chebisev's theory and law of large numbers'.
Vectors; linear combinations, linear dependence & independence, vector space, linear space. Matrixes, operations with matrixes. Basis, change of basis in linear algebra. Rank and inverse of a matrix.

Compulsory and recommended literatures (2-5 pieces) with full bibliography

Compulsory literature:
Gilbert Strang: Introduction to Linear Algebra, Fifth Edition Wellesley-Cambridge Press, (2016) ISBN: 978-09802327-7-6
David J. Morin: Probability for Enthusiastic Beginner, Publisher: CreateSpace Independent Publishing Platform, Published: April 2016, ISBN-13: 9781523318674; ISBN-10: 1523318678
Sheldon Ross: First Course in Probability, 9th Edition, 2014. ISBN: 032179477X, 9780321794772, (10th Edition, 2018. ISBN-13: 978-0321794772 ; ISBN-10: 9780321794772
Boris V. Gnedenko: Theory of Probability, 6th Edition, London 2018, Imprint: Routledge, eBook ISBN: 9781351408592
Recommended literature:
Quick Tour of Basic Linear Algebra and probability theory presentation tutorial
http://snap.stanford.edu/class/cs246-2011/Recitation.pdf

Elements of Student Requirement System (KKK) that the course contributes to:

a) knowledge
- are familiar with the basic terminologies, techniques, algorithms of probability theory and linear algebra
- knows the techniques handling probabilistic cases
- know the terminologies of discrete and continuous probability distributions and density functions of the most common cases
- knows the Chebisev's law and the law of large numbers'
- familiar with the definitions, terminologies, operations of linear algebra.

- knows the terminology of system of linear equations and inequalities, are familiar with the solution algorithm – based on basis change – as well.

b) skills

- able to draw the graphs of the density and probability distributions functions.
- Able to calculate basic statistical calculations
- able to implement the mentioned calculations and visualization by the aid of MS Excel.
- Able to execute linear algebra operations, to solve systems of linear equations, and inequalities and to visualise the inequalities.
- able to use Linv and Geogebra for the problems above.
- able to understand and use online tutorials, platforms like www.MathXplain.com, or other.

c) attitude

- verifies the results, got from the calculation, either statistical or linear algebra. Not only able to do the verification but also needs it.
- not only implements the learned algorithms but interprets the results as well. Is able to decide about the feasibility, relevance of them.
- needs challenges, new information, techniques, algorithms. Is able to search and find tutorials, related materials to the topics of the course.

d) autonomy

- able to implement the learned algorithms alone,
- able to form a team for the learning process, for the evaluation, for decision making about the relevance of the result,
- open and able for collaboration,
- able to find the most relevant, for him/her most suitable way of learning. Presentation, online or paper book, video, etc.
- able to decide which tool is applicable for which problem solving, visualization.

Course leader: Dr Gyöngyi Bánkuti, PhD, associate professor

Further teachers involved: