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| Course name: Mathematics I | | |
| Type of study: Mathematics | type of study: full-time | Examination: Assignment |
| Course characteristic: Compulsory | Level: First (B.Sc.) | year: Autumn Semester |
| type of classes: lecture, tutorials | hours per semester: 2L, 3T | ECTS points: 6 ECTS |

COURSE DESCRIPTION

COURSE OBJECTIVE

- C1.** To introduce to the basics of linear algebra, to number sequence and number series theory, and differential calculus of one variable.
- C2.** To acquire the ability to perform operations on matrices and vectors, to solve the systems of linear equations, to analyse convergence of sequences and number series, and differential functions of one variable and to use basics of linear algebra and calculus.

PREREQUISITES/ ASSUMED BACKGROUND

- 1.** Knowledge on linear algebra and calculus.
- 2.** Knowledge on solving the elementary algebraic equations, operations on functions, calculations of easy limits of functions and sums of arithmetic and geometric sequences.

TEACHING-LEARNING OUTCOMES and COMPETENCES TO BE ATTENDED

- LO1.** Knowledge on the basics of linear algebra, properties of operations on vectors and matrices, properties of a determinant and a rank of matrix, systems of linear equations.
- LO2.** Knowledge on definitions and convergence tests of number series and sequences; Knowledge on the basic concepts, theorems, and applications of differential calculus of one variable.
- LO3.** Ability to perform operations on matrices and vectors, to calculate a determinant and a rank of a matrix, and an inverse of a matrix, to solve systems of linear equations with using Cramer theorem and Kroncker-Capelli theorem.
- LO4.** Ability to analyse convergence of number sequences and series; to calculate limits of functions and to find asymptotes; to calculate derivatives of first and higher orders of a function and apply them; to sketch the graphs of functions.

COURSE CONTENT

| Lectures - Topics | hours |
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| L1 - Matrices and determinants | 2 |
| L2 – Inverse of a matrix. Applications | 2 |
| L3 – Rank of a matrix | 2 |
| L4 – Systems of linear equations | 2 |
| L5 – Vector spaces | 2 |
| L6 – Number sequences | 2 |
| L7 – Number series | 2 |
| L8 – Limits of functions | 2 |
| L9 – Asymptotes | 2 |
| L10 – Continuity | 2 |
| L11 – Differentiation | 2 |
| L12 – Applications of first differentiation | 2 |
| L13 – Higher order derivatives. Applications | 2 |
| L14 – Sketching graphs of functions | 2 |
| L15 – Taylor formula | 2 |
| Σ | 30 |

| Tutorials - Topics | hours |
|--|--------------|
| T1 - Matrices and determinants | 3 |
| T2 – Inverse of a matrix. Applications | 3 |
| T3 – Rank of a matrix | 3 |
| T4 – Systems of linear equations | 3 |
| T5 – Vector spaces | 3 |
| T6 – Number sequences | 3 |
| T7 – Number series | 3 |
| T8 – Limits of functions | 3 |
| T9 – Asymptotes | 3 |
| T10 – Continuity | 3 |
| T11 – Differentiation | 3 |
| T12 – Applications of first differentiation | 3 |
| T13 – Higher order derivatives. Applications | 3 |
| T14 – Sketching graphs of functions | 3 |
| T15 – Taylor formula | 3 |
| Σ | 45 |

TEACHING TOOLS

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| 1 – lecture with using multimedia presentations |
| 2– tutorials |

RECOMMENDED AND ADDITIONAL BIBLIOGRAPHY

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| 1. Farlow J., Hall J.E., McDill J.M., West B.H, Differential Equations & Linear Algebra, Person Education Inc., 2007. |
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| 2. Robinson D.J.S, A Course in Linear Algebra with Applications, World Scientific Publishing, 2006. |
| 3. Ian Craw, Advanced Calculus and Analysis MA 1002, University of Aberden, 2000. |
| 4. Trench William F., Introduction to Real Analysis, Pearson Education, 2003. |
| 5. Bittinger Marvin L., Ellenbogen David J., Calculus and its Applications, Pearson International Edition, 2007. |
| 6. M. Klimek, Z. Domański, J. Błaszczuk, Mathematics I, 2009– a handbook in an electronic version |

TEACHERS

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ADDITIONAL NOTES

Links to course unit teaching materials can be found on the <http://www.pcz.pl/english/ects-subjects> website for current students.