SYLLABUS

SUBJECT Calculus 1 - Semester 1

TEACHER Prof. dr hab. Andrzej KAMIŃSKI

COURSE DESCRIPTION

The course is the first part of Calculus 1 and will be continued in Semester 2 and, as Calculus 2, in Semesters 3 and 4. The aim of the course is to provide for the students a knowledge of the theory and applications of the differential and integral calculus for functions of one variable (the first part). The students are expected to understand mathematical notions as well as to use them in practice, i.e. to master techniques of calculations.

The program of the course contains the following: Elements of the theory of sets, relations and functions. Composite functions, one-to-one functions, inverse functions. Axioms and constructions of the sets **N**, **Q**, **R** and **C** of natural, rational, real and complex numbers. Infimum (g.l.b.) and supremum (l.u.b.) of a set in **R**. Metric spaces. Open, closed, compact, connected sets in metric spaces. Sequences and subsequences – numerical and in metric spaces. Monotonous (numerical), bounded, Cauchy and convergent sequences. Limits, upper and lower limits, arithmetic of limits, improper limits, limits of special sequences. Bolzano-Weierstrass and related theorems. Limits and continuity of functions. Limits at infinity Properties of limits and continuity; computations. Continuity of elementary functions. Pointwise and uniform convergence. Uniform continuity. Compactness, connectedness and continuity. Discontinuities. Asymptotes. The maximum-value and intermediate-value theorems. The derivative of a function and its interpretations. Computations of derivatives - formulas and rules. Antiderivatives. Rolle's and Lagrange's (the mean-value) theorems. Local and global extremes and applications; graphing functions. Higher derivatives of functions. The Taylor formula. Concavity of functions. Physical interpretation of derivatives. Logarithmic, exponential, trigonometric and inverse trigonometric functions, hyperbolic functions and their inverses. L'Hôspital's rules. Implicit differentiation. Differential.

LEARNING OUTCOMES

The examination at the end of the semester will consist of two parts: written and oral exams.

GRADING POLICY

To pass the written exam it is necessary for a student to get more than 50 % of the total possible points. Students who fail the written part still have chance to pass the examination during the oral part. The oral exam is obligatory for all who get not more than 60 % of the total possible points in the written part. Students who get more than 60 % of the total possible points during the written part are released from the oral exam unless they want to improve their grades from the written exam. The grades will be given according to the following rule:

the amount of the received points			
in the limits 75.1 % - 100 %	of the total possible points	corresponds to the grade	5 (A)
70.1 % - 75.0 %		corresponds to	4.5 (B)
65.1 % - 70.0 %		corresponds to	4 (C)
60.1 % - 65.0 %		corresponds to	3.5 (D)
50.1 % - 60.0 %		corresponds to	3 (E)
0 % - 50.0 %		corresponds to	2 (F)

TIMETABLE

The two-hour lectures will be given on a fixed day every week. The exact time and place will be given later.

TEXTBOOK AND REQUIRED MATERIALS

The main textbook:

[*] Walter Rudin, *Principles of Mathematical Analysis*, McGraw-Hill Book Company, New York, the 1953, 1964, 1976 or further editions (ISBN 0-07-054235-X).

Additional(optional) bibliography:

[1] J. Dieudonné,
Foundations of Modern Analysis, Academic Press, New York, 1960.

[2] C. Kuratowski,
Introduction to Calculus, Oxford, the 1961 or further editions.

[3] E. G. H. Landau,
Foundations of Analysis, Chelsea, New York, 1960.

[4] J. Mikusiński, P. Mikusiński,
An Introduction to Analysis. From Number to Integral,
John Wiley & Sons, Inc., New York, 1993 (ISBN 0-471-58988-8).

[5] W. Rudin,
Real and Complex Analysis, McGraw-Hill Book Company, New York,
the 1974 or further editions.

[6] George F. Simmons,
Calculus with Analytic Geometry, McGraw-Hill Book Company, New York,
the 1976, 1985 or further editions (ISBN 0-07-057419-7).

PREREQUISITES:
The knowledge of elementary mathematics on the level of secondary school and the knowledge from the other parallel courses.