

**ERASMUS 2012/2013**

Faculty/ Field of study: MATHEMATICS - the three-year studies of the first degree

Departmental Coordinator: ..... e-mail: .....

**Winter Semester 2012/2013**

Course name	Number of hours	ECTS	Teacher	Language
Calculus 1 - Semester 1	60 (Lec) + 60 (Ex)	6	Dr Svetlana MINCHEVA-KAMINSKA	English

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Date and signature of Coordinator

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Date and signature of Dean

**SYLLABUS**

**SUBJECT** Calculus 1 - Semester 1

**TEACHER** Dr Svetlana MINCHEVA-KAMINSKA

**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. Its aim is to provide for the students the first part of the theory and applications of the differential and integral calculus for functions of one variable. The students are expected to understand mathematical notions and use them in practice, i.e. master techniques of calculations. The program of the course is given below.

Elements of the theory of sets, relations and functions. Composite functions, one-to-one functions, inverse functions. Axioms and constructions of the sets of all natural, rational, real and complex numbers. Infimum (greatest lower bound) and supremum (least upper bound) of a set in  $\mathbf{R}$ . Metric spaces. Open, closed, compact, connected sets in metric spaces. Sequences and subsequences. 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. Calculations of sums of special numerical series. The absolute and conditional convergence of series. Theorems of Dirichlet, Abel and Leibniz. Operations on series. Cauchy's product of series. Infinite products. 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.

**ECTS - 6**

**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.

February 2012,

**Dr Svetlana MINCHEVA-KAMINSKA**

Date and signature of Academic Teacher