



## COURSE DESCRIPTION

### 1. Program Information

1.1 University	“Alexandru Ioan Cuza” University, Iași
1.2 Faculty	Computer Science Department
1.3 Department	Computer Science
1.4 Study Domain	Computer Science
1.5 Study Cycle	Undergraduate
1.6 Study Program / Qualification	Computer Science

### 2. Course Information

2.1 Course Name	<b>Mathematics</b>						
2.2 Course Teacher	Conf. dr. Adrian Zălinescu						
2.3 Seminary Teacher	Conf. dr. Adrian Zălinescu						
2.4 Study Year	1	2.5 Semester	I	2.6 Evaluation	M	2.7 Course Status*	OB

\* OB – Compulsory / OP – Optional

### 3. Total estimated hours (hours per semester and didactic activities)

3.1 Hours per week	4	in which: 3.2 course	2	3.3 seminary/laboratory	2
3.4 Hours in curriculum	56	in which:: 3.5 course	28	3.6 seminary/laboratory	28
Time Distribution					ore
Manual study, Course support, Bibliography, and others					14
Supplementary Documentation in library, in electronic forums, and on the field					15
Seminaries/laboratories preparation, homeworks, reports, portfolios and essays					15
Tutoring					-
Evaluation					4
Other activities (consultations per student)					-
3.7 Total hours individual study					45
3.8 Total hours per semester					115
3.9 Credits					5

### 4. Preconditions (if necessary)

4.1 Of Curriculum	Algebra (IX - XII grades), Calculus (XI – XII grades), Analytic Geometry (XI grade)
4.2 Of Skills	Manipulate abstract mathematical concepts

### 5. Conditions (if necessary)

5.1 For Course Operation	-
5.2 For Seminary/Laboratory Operation	-

**6. Specific Skills Acquired**

<b>Competențe profesionale</b>	<p><b>C1.</b> The understanding and handling of specific concepts related to Mathematical Analysis, Algebra and Theory of curves and surfaces.</p> <p><b>C2.</b> The use of elementary notions for understanding more complex concepts.</p> <p><b>C3.</b> The application of learned mathematical notions for solving practical problems from the real world.</p> <p><b>C4.</b> The proper identification of theoretical elements for using in solving specific exercises and problems.</p>
<b>Competențe transversale</b>	<p><b>CT1.</b> The development of efficient individual and collective study skills through the application of academic rules of work.</p> <p><b>CT2.</b> Optimal use of information sources and communication resources in the process of assisted professional training.</p> <p><b>CT3.</b> Expressing a responsible attitude towards comprehension of mathematics in computer science and effective use of the acquired scientific potential.</p>

**7. Course Objectives** (from the grid of acquired specific skills)

<b>7.1 General Objective</b>	Presentation of some mathematical concepts useful in approaching the computer science disciplines provided in the undergraduate curriculum.
<b>7.2 Specific Objectives</b>	<p>At the end of this course, the promoted students will be able to:</p> <ul style="list-style-type: none"> <li>▪ explain the notions and main results from Mathematical Analysis, Algebra and the Theory of curves and surfaces (set, relation, function, sequence, series, linear space);</li> <li>▪ describe more complex notions as linear and quadratic forms, limits of functions, continuity, derivability and differentiability, proper and improper integrals, integrals with a parameter, multiple (double and triple) integrals;</li> <li>▪ use the above concepts in order to solve concrete problems from the real world.</li> </ul>

**8. General Description**

<b>8.1</b>	<b>Course</b>	<b>Teaching Methods</b>	<b>Observations</b> (hours and bibliographic references)
1.	Elements of set theory	Exposition, conversation, proof	2 hours - [1], [2], [8], [11]
2.	Sequences of real numbers and real functions. Remarkable inequalities in $\mathbf{R}$	Exposition, conversation, proof	2 hours - [1], [2], [8], [11]
3.	Series of real numbers. Series with positive terms	Exposition, conversation, proof	2 hours - [1], [2], [8], [11]
4.	Series of real numbers. Power series	Exposition, conversation, proof	2 hours - [1], [2], [8], [11]
5.	Linear spaces	Exposition, conversation, proof	2 hours - [3], [4], [11]
6.	Metric spaces	Exposition, conversation, proof	2 hours - [1], [2], [5], [11]
7.	Functions and linear mappings	Exposition, conversation, proof	2 hours - [3], [4], [9], [11]
8.	Review of the notions exposed in the first seven courses	Written test	2 hours



9.	Linear, bilinear and quadratic forms	Exposition, conversation, proof	2 hours - [3], [4], [11]
10.	Limits of functions. Continuous functions on $\mathbf{R}^n$	Exposition, conversation, proof	2 hours - [6], [7], [10], [11]
11.	Differentiability in $\mathbf{R}^n$	Exposition, conversation, proof	2 hours - [6], [7], [10], [11]
12.	Applications of differentiability. Extrema of functions	Exposition, conversation, proof	2 hours - [6], [10], [11]
13.	Integrability on the real line	Exposition, conversation, proof	2 hours - [7], [10], [11]
14.	Integrability in $\mathbf{R}^n$	Exposition, conversation, proof	2 hours - [7], [10], [11]

**Bibliography****Main references:**

- [1] A.Precupanu - Bazele Analizei Matematice, ed. a III-a, Polirom, Iași, 1998.  
 [2] E. Cioară, M. Postolache - Capitoale de analiză matematică, Ed. Fair Partners, București, 2010.  
 [3] R. Singh, M. Bhatt - Linear Algebra and Vector Calculus ( Ch. 2 ), Mc Graw Hill Ed., 2016  
 [4] S. Heilman - Linear Transformations and Matrices, UCLA Department of Mathematics, Los Angeles, 2016.  
 [5] A. Precupanu et al. – Spații Metrice. Probleme, Iași, 1990.  
 [6] Roger Heath-Brown - Analysis II. Continuity and Differentiability, Hilary Term, 2016.  
 [7] Sever Angel Popescu - Mathematical Analysis II. Integral Calculus, Conspress, Bucharest, 2011.

**Supplementary references:**

- [8] William F. Trench – Introduction to Real Analysis, Free Edition, Library of CCPD, 2009.  
 [9] David B. Massey - Worldwide Multivariable Calculus, Worldwide Center of Mathematics, LLC, 2015.  
 [10] Maria Polcerova - Mathematics II. Chapter 14: Multiple Integrals, FCH VUT v Brne, 2013.  
 [11] F. Iacob – Matematică ( unități de curs ), online: [https://profs.info.uaic.ro/~fliacob/An1/2017-2018/index\\_Anul1-zi\\_17-18.html](https://profs.info.uaic.ro/~fliacob/An1/2017-2018/index_Anul1-zi_17-18.html)

8.2	Seminary / Laboratory	Teaching methods	Observations (hours and bibliographic references)
1.	Elements of set theory	Exercise, conversation	2 hours - [1],[2],[3],[7]
2.	Sequences of real numbers and real functions. Remarkable inequalities in $\mathbf{R}$	Exercise, conversation	2 hours - [3], [4], [7]
3.	Series of real numbers. Series with positive terms. Evaluation test TS1	Exercise, conversation, evaluation	2 hours - [3],[4],[7]
4.	Series of real numbers. Power series	Exercise, conversation	2 hours - [3],[4],[7]
5.	Linear spaces	Exercise, conversation	2 hours - [1],[2],[3],[7]
6.	Metric spaces	Exercise, conversation	2 hours - [3],[7],[8]
7.	Functions and linear mappings in $\mathbf{R}^n$	Exercise, conversation	2 hours - [1],[2],[7]



8.	Review of the notions exposed in the first seven courses. Evaluation test TS2	Evaluation	2 hours
9.	Linear, bilinear and quadratic forms	Exercise, conversation	2 hours - [1],[2],[7]
10.	Limits of functions. Continuous functions on $\mathbf{R}^n$	Exercise, conversation	2 hours - [3],[5],[4],[7]
11.	Differentiability in $\mathbf{R}^n$ . Evaluation test TS3	Exercise, conversation, evaluation	2 hours - [3],[5],[4],[7]
12.	Applications of differentiability. Extrema of functions	Exercise, conversation	2 hours - [3],[5],[4],[7]
13.	Integrability on the real line	Exercise, conversation	2 hours - [6],[7]
14.	Integrability in $\mathbf{R}^n$	Exercise, conversation	2 hours - [6],[7]

**Bibliography:**

- [1] V.T.Borcea, C.I. Davideanu, C.Forăscu – Probleme de algebră liniară, Ed. Universității Tehnice „Gheorghe Asachi”, Iași, 2000.
- [2] E. Cioară – Algebră liniară. Geometrie analitică ( culegere de probleme ), Ed. Fair Partners, Buc., 2009.
- [3] I. Radomir, A.Fulga – Analiză matematică. Culegere de probleme, Ed. Albastră, Cluj-Napoca, 2005.
- [4] V. Postolică, G. Spătaru-Burcă – Analiză matematică. Exerciții și probleme, Ed. Matrix Rom, Buc. 2005.
- [5] C. Drăgușin – Calcul diferențial. Culegere de exerciții și probleme, Ed. Fair Partners, București, 2008.
- [6] M. Postolache ( coord. ), A. Pitea, D. Cioroboiu – Calcul integral. Exerciții și probleme, Ed. Fair Partners, București, 2010.
- [7] F. Iacob – Matematică ( exerciții și probleme ), online: [https://profs.info.uaic.ro/~filiacob/An1/2017-2018/index\\_Anul1-zi\\_17-18.html](https://profs.info.uaic.ro/~filiacob/An1/2017-2018/index_Anul1-zi_17-18.html)
- [8] A. Precupanu et al. – Spații Metrice. Probleme, Iași, 1990.

**9. Course content synchronization with the expectations of the community representatives, professional associations and employers from the program domain**

This course aims to accommodate the undergraduate students with the modern framework of Mathematical Analysis, Algebra and the Theory of curves and surfaces. The course acquisitions will be used throughout the undergraduate studies and beyond.

**10. Evaluation**

Activity Type	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 The weight of each evaluation form (%)
<b>10.4</b> Course			
<b>10.5</b> Seminary/ Laboratory	- scoring the seminary attendance - scoring the activity at the seminary - four written tests: TS1, TS2, TS3 and TS4 - scoring the participation at	The total score without bonuses (PTN) is computed as: PTN = (0,75*NFS1+NPS1+1,5*NTS1+1,7*NTS2) + (0,75*NFS2+NPS2+1,5*NTS3+1,8*NTS4), where	Seminary attendance - 15%  Activity at the seminars - 20%



	the consultations and other activities related to the domain (national and international mathematical contests for students, etc.)	<p>NFS1,NFS2 – the scores for the attendance at the seminars 1~7, respectively 9~14. NPS1,NPS2 - the scores for the activity at the seminars 1~7, respectively 9~14 NTS1-NTS4 - the scores obtained at tests TS1-TS4.</p> <p>To the PTN score one adds the bonuses for the participation at the consultations (BPC) as <math>BPC = 0,5*(NPC1+NPC2)</math> and the bonuses for other activities (BPA).</p> <p>Consequently, the total score (PTB) is computed as <math>PTB = PTN+BPC+BPA</math>.</p> <p>The final hierarchy among the promoted students (<i>i.e.</i>, satisfying conditions (C1) ~ (C4)) is established using ETCS rules, if the student fulfills the promotion conditions.</p>	Written tests results - 65%: TS1 - 15% TS2 - 17% TS3 - 15% TS4 - 18%
<b>10.6 Minimal performance standards</b>			
Promotion criteria : <b>(C1)</b> compulsory participation at the 4 tests <b>(C2)</b> $NTS1 + NTS2 + NTS3 + NTS4 \geq 12$ ( the sum of the tests' results should be at least 12 ) <b>(C3)</b> $PTN \geq 40$ <b>(C4)</b> $PTB \geq 45$			

Date

Course Teacher  
Conf. dr. Adrian ZălinescuSeminary/Laboratory Teacher  
Conf. dr. Adrian Zălinescu

Department Date of Approval

Director of the Department  
Prof. Dorel Lucanu, PhD