STUDY GUIDE

2009 - 2010

FACULTY OF MATHEMATICS
University "Alexandru Ioan Cuza"
IAŞI

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WHY MATHEMATICS?

Sometimes called the "Queen of Sciences", Mathematics is a unique field of study. The subject of Mathematics has many aspects: it can be challenging, beautiful, powerful, fascinating, even mysterious to some people, but above all it is **useful**. Mathematics interacts with other disciplines and makes essential contributions to Science, Medicine and Commerce, as well as to many important contemporary areas of technology such as Communications, Linguistics and Genetics. Wherever problems need to be solved, Mathematics has a role to play. In fact, many sciences rely so heavily on Mathematics that their most important questions are, fundamentally, mathematical.

Mathematics leads to perhaps more diverse potential careers than any other discipline because it is the language through which nature, technology and reality are described. It is thus essential for almost every sphere of knowledge and activity in the modern world. For these reasons, mathematics is a powerful and versatile specialisation. With a degree comprising quantitative methods courses (Mathematics, Statistics, Operations Research and Computing) you will have many opportunities for careers in industry, computer development, insurance, engineering, systems analysis, computer programming, statistics, biometrics or operations research, and many other fields. There is also a strong demand for Mathematics teachers. Mathematics majors are also strong candidates to pursue graduate studies in a variety of fields.

If you are specialising in Computer science, Economics, Political science, Psychology, or any other science, then you will find that the coursework in your specialisation relies heavily on Mathematics. In order to have the best opportunity to do well in those courses and absorb that material, it is very beneficial to identify and take the appropriate Mathematics courses. The courses offered by the Faculty of Mathematics have applications to many other fields.

If you are specialising in another subject but enjoy Mathematics, you might like to consider a double specialisation which includes Mathematics. Using Mathematics as a supplement to your primary specialisation will enhance your future career and professional life. It is our experience that your future prospects and employability in any other field are enhanced with significant mathematical content in your degree. The increased analytical ability, comprehension of abstract concepts and creative thinking that you gain from studying mathematics are highly valued in the business, industrial, social and academic worlds.

ABOUT OUR FACULTY

FACULTY OF MATHEMATICS
„Alexandru Ioan Cuza" University
Build A
Blvd Carol I, No 11
700506 – IASI

SHORT HISTORY

The "Alexandru Ioan Cuza" University is the oldest university of Romania; it was founded on October 26th, 1860, by a decree of Prince Alexandru Ioan Cuza, at the suggestion of Mihail Kogălniceanu. On May 23rd, 1893, in the presence of numerous celebrities, including Titu Maiorescu, Vasile Pogor (at that time, the mayor of Iaşi), C. Climescu (the dean of the Faculty of Sciences) the foundation act, printed on parchment, was signed and buried in the fundamental stone, at the basement of the new building of the University, exactly under the "Mihai Eminescu" Lecture Hall. The edifice of the University was built under the direction of the architect Louis Blanc, in eclectic style. Between 1950 and 1965 it was extended with one more building, according to the plans of I. Pompilian.

The Faculty of Mathematics has been part of the Al. I. Cuza University since its foundation in 1860. It was, initially, a section of the Faculty of Philosophy, then of the Faculty of Sciences. Later it became an independent faculty of the university.

Our faculty provides a fundamental training for the students, through courses in pure mathematics, applied mathematics and informatics. The students have also the possibility to specialize in various fields, by participating in special courses and master programs.

In time, the quality of the professors activating in our faculty has placed it among the best in the country. The main research directions have been initiated by celebrated scientists, members of the Academy, who were or still are professors of the Faculty of Mathematics in Iasi: A. Myller, O. Mayer, C. Popovici, S. Sanielevici, D. Mangeron, G. Vrânceanu, Gr. Moisil, M. Haimovici, C. Corduneanu, R. Miron, V. Barbu.

This tradition has a remarkable continuity, as several mathematicians with a recognized activity at national and international level are members of our faculty. Also, many of our former students are working in prestigious universities and research centers around the world, confirming the high standard of the school of mathematics in Iasi.

Our goal is to train specialists in mathematics and informatics. Our students have the possibility to work, after graduation, in universities, research centers, secondary schools and high schools (as mathematics teachers), IT industry, banks, private business etc.

The research as well as the teaching activity enjoys an important support from the "Al. Myller" Mathematical Seminar, one of the most complete mathematical libraries in the country.

DEGREES AND SPECIALISATIONS

DEGREES	FIELD	SPECIALISATION	Form of education
UNDERGRADUATE Bachelor of Science Studies	MATHEMATICS	Mathematics	Full time studies - 3 years
		Mathematics - Computer Science	Full time studies - 3 years
POSTGRADUATE Master of Science Studies	MATHEMATICS	Fundamental Mathematical Structures	Full time studies - 2 years
		Mathematical Models and Applied Statistics	Full time studies - 2 years
		Financial Mathematics	Full time studies - 2 years
		Scientific Calculus and Software Engineering	Full time studies - 2 years
DOCTORAL SCHOOL PhD Studies	MATHEMATICS		Full time studies/ No attendance

The Faculty of Mathematics offers, within the BSc in Mathematics Program, two main specialisations: Mathematics and Mathematics - Computer Science. The first-year students may opt for one of these specialisations at the end of the second semester. Moreover, at the end of the second semester, the students have the opportunity, offered by the implementation of the Bologna Program at the "Alexandru Ioan Cuza" University, to opt for a complementary specialisation in any BSc Program available at the faculties of the "Alexandru Ioan Cuza" University.

ACADEMIC AUTHORITIES

Dean: **PhD Prof. Ovidiu Cârjă**
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Chancellor: **PhD Assoc.Prof. Mihai Necula**
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Faculty Board:

PhD Prof. Mihai Anastasiei
PhD Prof. Viorel Arnăutu
PhD Prof. Liviu Florescu
PhD Prof. Cătălin Popa
PhD Assoc.Prof. Mircea Bîrsan
PhD Assoc.Prof. Mihai Necula
PhD Assist.Prof. Marius Durea
Stud. Alexandru Negrescu
Stud. Mădălin Zală
PhD Prof. Gheorghe Aniculăesei
PhD Prof. Ovidiu Cârjă
PhD Prof. Cătălin Lefter
PhD Prof. Aurel Răşcanu
PhD Assoc.Prof. Mihai Gontineac
PhD Assoc.Prof. Dănuţ Rusu
Stud. Laura Moisuc
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Administrative Director:

Eng. Mihai Teslariu
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ADMINISTRATIVE DEPARTMENT

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Head of departament: **PhD Prof. Gheorghe Aniculăesei**
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Scientific activity is organized by Department of Research of the Faculty.

Head of department: **PhD Prof. Mihai Anastasiei**
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SECRETARIAT

Faculty Senior Secretary: **Eng. Irina DECUŞ**
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ACADEMIC CALENDAR

Academic Year 2008 – 2009

A. Bachelor Studies, Full time Studies

1st Semester:

1st October – 21st December: 12 weeks teaching activities
22nd December – 4th January: Winter holiday
5th January – 18th January: 2 weeks teaching activities
19th January – 1st February: 2 weeks winter exam session
2nd February – 15th February: 2 weeks holiday
Between 2nd February and 15th February there can be scheduled a resitting and re-examination session
9th – 15th February – a resitting session for end of study exams

2nd Semester

1st and 2nd year

16th February – 24th May: 14 weeks teaching activities
Easter days will be free. The classes from the third day will berescheduled. The schedule will be available for the students.
25th May – 7th June: 2 weeks summer exam session
8th June – 28th June Practice period for the faculties that include such an activity
In this period there can be scheduled a resitting and reexamination session (7 days). The final study results for the 2008 – 2009 academic year will be finalized on the 28th June
29th June – 1st October Summer holiday

3rd and 4th year

16th February – 24th May: 14 weeks teaching activities
25th May – 7th June: 2 weeks exam session
8th June – 21th June: 3 weeks finalisation of the diploma paper
In this period there can be scheduled a resitting and reexamination session (7 days) Registration for the dissertation/ graduation/ diploma exams will take place in the last week of this period.
22nd June – 28th June: Dissertation/ graduation/ diploma exam

B. Postuniversity Studies (masterat, academic postgraduate studies)

Duration of study: 2 semesters/4 semesters

First Semester – Second Semester:

16th February – 24th May: 14 weeks teaching activities
25th May – 7th June: 2 weeks exam session
8th June – 21st June: 2 weeks finalisation of the diploma paper
In this period there can be scheduled a resitting and re examination session (7 days)
22nd June – 28th June: Dissertation exam

Duration of study: 3 semesters

First and Second Semester – the same structure as for Bachelor studies

Third Semester - the same structure as for the second semester from postuniversitary studies

1st October – 21st December: 12 weeks teaching activities
22nd December – 4th January: Winter holiday
5th January – 18th January: 2 weeks teaching activities
19th January – 1st February: 2 weeks winter exam session
2nd February – 15th February: 2 weeks holiday
Between 2nd February and 15th February there can be scheduled a resitting and re-examination session
9th – 15th February: a resitting session for end of study exams
16th February – 22th February: Dissertation exam

ADMISSION

Undergraduate - admission requirements
Baccalaureat diploma and academic-based competition:
34% - Cumulative average for Mathematics for all years of secondary school
33% - Baccalaureate mark for Mathematics or Computer Science
33% - General cumulative average in secondary school

Graduate - admission requirements
Bachelor`s degree diploma and entrance examination:
50% - cumulative average for all years of study in faculty;
50% - general average for the Bachelor`s degree examination

CURRICULA

UNDERGRADUATE – Mathematics
Bachelor of Mathematics

Full-time studies
6 semesters
60 ECTS credits/year
180 credits acumulated before final examination

No	Code	Subject	Hours/week				Crd	Examination type			
			C	S	L	Pr		P	Cv	E	M
1st year, 1st semester											
1		DIFFERENTIAL CALCULUS FOR FUNCTIONS OF ONE REAL VARIABLE	2	2	1	0	5	0	0	x	0
2		LINEAR ALGEBRA	2	2	0	0	5	0	0	x	0
3		Analytic Geometry	2	2	1	0	5	0	0	x	0
4		LOGIC AND SET THEORY	2	1	0	0	5	0	0	x	0
5		Algorithms and Programming. C Language	2	0	2	0	5	0	0	x	0
6		Foreign Language	1	1	0	0	5	0	x	0	0
		TOTAL	**11**	**8**	**4**	**0**	**30**	**0**	**1**	**5**	**0**
		Elective psyhopedagogical disciplines									
		Educational Psychology.	**2**	**2**	**0**	**0**	**5**	**0**	**0**	**x**	**0**
1st year, 2nd semester											
7		INTEGRAL CALCULUS	2	2	1	0	5	0	0	x	0
8		Fundamental Algebraic Structures	2	2	0	0	5	0	0	x	0
9		Algorithms and Data Structures	2	0	2	0	5	0	0	x	0
10		ARITHMETIC AND COMBINATORICS	2	2	0	0	5	0	0	x	0
11		Foreign Language	1	1	0	0	5	0	x	0	0
12		Internship	0	0	3	0	5	0	x	0	0
		TOTAL	**9**	**7**	**6**	**0**	**30**	**0**	**2**	**4**	**0**
		Elective psyhopedagogical disciplines									
		Pedagogy I. Fundamentals of Pedagogy + Curriculum Theory and Methodology	2	2	0	0	5	0	0	x	0
2nd year, 1st semester											
13		Differential Calculus for Several Real Variables Functions	2	2	0	0	5	0	0	x	0

14		Arithmetic over Rings and Modules Theory	2	2	0	0	5	0	0	x	0
15		DIFFERENTIAL EQUATIONS	2	2	0	0	5	0	0	x	0
16		Mathematical Software	2	0	2	0	5	0	0	x	0
17		GEOMETRY OF CURVES AND SURFACES	2	2	0	0	5	0	0	x	0
18		Foreign Language	1	1	0	0	5	0	x	0	0
		TOTAL	**11**	**9**	**2**	**0**	**30**	**0**	**1**	**5**	**0**
		Elective psyhopedagogical disciplines									
		Pedagogy II. Instructional Theory and Methodology + Evaluation Theory and Methodology	2	2	0	0	5	0	0	x	0
2nd year, 2nd semester											
19		Probabilities	2	1	1	0	5	0	0	x	0
20		Partial Differential Equations	2	2	0	0	5	0	0	x	0
21		Complex Analysis	2	2	1	0	5	0	0	x	0
22		Introduction to Commutative Algebra	2	2	0	0	5	0	0	x	0
23		Internship	0	0	3	0	5	0	x	0	0
24		Foreign Language	1	1	0	0	5	0	x	0	0
		TOTAL	**9**	**8**	**5**	**0**	**30**	**0**	**2**	**4**	**0**
		Elective psyhopedagogical disciplines									
		Mathematics Teaching Methodology	2	2	0	0	5	0	0	x	0
3rd year, 1st semester											
25		MECHANICS	2	1	1	0	5	0	0	x	0
26		Euclidian Geometry	2	2	0	0	5	0	0	x	0
27		COMPUTER GRAPHICS	2	0	2	0	5	0	0	x	0
28		OPTIMIZATION THEORY	2	1	1	0	5	0	0	x	0
29		Numerical Calculus	2	1	1	0	5	0	0	x	0
30		Multiple integrals	2	2	0	0	5	0	0	x	0
		TOTAL	**12**	**7**	**5**	**0**	**30**	**0**	**0**	**6**	**0**
		Elective psyhopedagogical disciplines									
		School Group Psychosociology	1	2	0	0	4	0	x	0	0
		Teaching Practice	0	0	3	0	5	0	x	0	0
3rd year, 2nd semester											
31		Astronomy	2	0	1	0	5	0	0	x	0
32		STATISTICS	2	1	1	0	5	0	0	x	0
33		Mathematical Models in Sciences	2	1	0	0	5	0	0	x	0
34		Differentiable Manifolds	2	2	0	0	5	0	0	x	0
35		Functional Analysis	2	2	0	0	5	0	0	x	0
36		Scientific research technique	0	0	0	4	5	0	x	0	0
		TOTAL	**10**	**6**	**2**	**4**	**30**	**0**	**1**	**5**	**0**
		Elective psyhopedagogical disciplines									
		Teaching Practice	0	0	3	0	5	0	x	0	0
		Licence	**0**	**0**	**0**	**0**	**5**	**0**	**x**	**0**	**0**

Obs: *Disciplines written in capital letters are part of the complementary courses offered by our faculty*.

UNDERGRADUATE – Mathematics - Computer Science

Bachelor of Mathematics and Computer Science

Full-time studies
6 semesters
60 ECTS credits/year
180 credits acumulated before final examination

No	Code	Subject	Hours/week				Crd	Examination type			
			C	S	L	Pr		P	Cv	E	M
1st year, 1st semester											
1		DIFFERENTIAL CALCULUS FOR FUNCTIONS OF ONE REAL VARIABLE	2	2	1	0	5	0	0	x	0
2		LINEAR ALGEBRA	2	2	0	0	5	0	0	x	0
3		Analytical Geometry	2	2	1	0	5	0	0	x	0
4		LOGIC AND SET THEORY	2	1	0	0	5	0	0	x	0
5		Algorithms and Programming. Language C.	2	0	2	0	5	0	0	x	0
6		Foreign Language	1	1	0	0	5	0	x	0	0
		TOTAL	**11**	**8**	**4**	**0**	**30**	**0**	**1**	**5**	**0**
		Elective psyhopedagogical disciplines									
		Educational Psychology	**2**	**2**	**0**	**0**	**5**	**0**	**0**	**x**	**0**
1st year, 2nd semester											
7		INTEGRAL CALCULUS	2	2	1	0	5	0	0	x	0
8		Fundamental Algebraic Structures	2	2	0	0	5	0	0	x	0
9		Algorithms and Data Structures	2	0	2	0	5	0	0	x	0
10		ARITHMETIC AND COMBINATORICS	2	2	0	0	5	0	0	x	0
11		Foreign Language	1	1	0	0	5	0	x	0	0
12		Practice	0	0	3	0	5	0	x	0	0
		TOTAL	**9**	**7**	**6**	**0**	**30**	**0**	**2**	**4**	**0**
		Elective psyhopedagogical disciplines									
		Pedagogy I. Foundations of Pedagogy + Curriculum Theory and Methodology	2	2	0	0	5	0	0	x	0
2nd year, 1st semester											
13		Differential Calculus for Several Real Variables Functions	2	2	0	0	5	0	0	x	0
14		Computer Architecture and Operating Systems	2	0	2	0	5	0	0	x	0
15		DIFFERENTIAL EQUATIONS	2	2	0	0	5	0	0	x	0
16		Programming Techniques in C++.Object Oriented Programming	2	0	2	0	5	0	0	x	0
17		Computational Geometry	2	2	0	0	5	0	0	x	0
18		Foreign Language	1	1	0	0	5	0	x	0	0
		TOTAL	**11**	**7**	**4**	**0**	**30**	**0**	**1**	**5**	**0**
		Elective psyhopedagogical disciplines									
		Pedagogy II.Instruction Theory and Methodology + Evaluation Theory and Methodology	2	2	0	0	5	0	0	x	0
2nd year, 2nd semester											
19		Probabilities	2	1	1	0	5	0	0	x	0
20		Partial Differential Equations	2	2	0	0	5	0	0	x	0
21		CRYPTOGRAPHY	2	1	2	0	5	0	0	x	0
22		Windows Programming I Visual C++	2	0	2	0	5	0	0	x	0
23		Practice	0	0	3	0	5	0	x	0	0
24		Foreign Language	1	1	0	0	5	0	x	0	0

		TOTAL	**9**	**5**	**8**	**0**	**30**	**0**	**2**	**4**	**0**
		Elective psyhopedagogical disciplines									
		Informatics Teaching Methodology	2	2	0	0	5	0	0	x	0
3rd year, 1st semester											
25		Windows Programming II Language Visual Basic	2	0	2	0	5	0	0	x	0
26		Numerical Calculus (M)	2	1	1	0	5	0	0	x	0
27		COMPUTER GRAPHICS	2	0	2	0	5	0	0	x	0
28		OPTIMIZATION THEORY	2	1	1	0	5	0	0	x	0
29		Formal Languages	2	1	1	0	5	0	0	x	0
30		C Sharp Programming	2	0	1	0	5	0	0	x	0
		TOTAL	**12**	**3**	**8**	**0**	**30**	**0**	**0**	**6**	**0**
		Elective psyhopedagogical disciplines									
		Psychology of scholar groups	1	2	0	0	4	0	x	0	0
		Teaching Practice	0	0	3	0	5	0	x	0	0
3rd year, 2nd semester											
31		Computer Networks	2	0	2	0	5	0	0	x	0
32		STATISTICS	2	1	1	0	5	0	0	x	0
33		Java Programming	2	0	2	0	5	0	0	x	0
34		Web Programming (HTML, PHP,CSS, CGI, JavaScript)	2	0	2	0	5	0	0	x	0
35		Fractals	2	0	1	0	5	0	0	x	0
36		Scientific research technique	0	0	0	4	5	0	x	0	0
		TOTAL	**10**	**1**	**8**	**4**	**30**	**0**	**1**	**5**	**0**
		Elective psyhopedagogical disciplines									
		Teaching Practice	0	0	3	0	5	0	x	0	0
		Licence	**0**	**0**	**0**	**0**	**5**	**0**	**x**	**0**	**0**

Obs: *Disciplines written in capital letters are part of the complementary courses offered by our faculty*.

GRADUATE – FUNDAMENTAL MATHEMATICAL STRUCTURES

Master of Mathematics

Full-time studies
4 semesters
60 ECTS credits/year
120 credits acumulated before final examination

No	Subject	1st year - 1st semester					1st year - 2nd semester				
		C	S	L	Exam	Credits	C	S	L	Exam	Credits
1	Functional Analysis	2	2	-	E	9					
2	Measure Theory	2	2	-	E	9					
3	Opţional I Elective Course I	2	2	-	E	6					
4	Opţional II Elective Course II	2	2	-	E	6					
A	Ecuaţii integrale Integral Equations										
B	Measures in Geometry										
C	Algebraic Structures and Applications										
TOTAL		8	8	-	4E	30					
Elective Psychopedagogical Disciplines											
	Psycho-pedagogy of adolescents young and adults	2	1	0	E	5					
	Elective Course Psychopedagogic	1	2	0	E	5					
5	Partial Differential Equations						2	2	-	E	9
6	Analytical Mechanics and Continuous Media Mechanics						2	2	-	E	9
7	Elective Course III						2	2	-	E	6
8	Elective Course IV						2	2	-	E	6
A	Semigroup Theory										
B	Special Topics in Mathematical Analysis										
C	Special Topics in Geometry										
TOTAL							8	8	-	4E	30
Elective Psychopedagogical Disciplines											
Planning and management of education programs							2	1	0	E	5
Elective Course Psychopedagogic							1	2	0	E	5
Total hours/week		8	8	-	4E		8	8	-	4E	-
		16				30	16				30

5	Numerical Analysis of Partial Differential Equations	-	-	-	-	-	2	2	-	E	9
6	Homological Algebra	-	-	-	-	-	2	2	-	E	9
7	Elective Course VII	-	-	-	-	-	2	2	-	E	6
8	Scientific Research Technique	-	-	-	-	-	-	-	4	C	6
A	Potential Theory										
B	Algebraic Geometry										
C	Stochastic Analysis										
TOTAL							6	6	4	3E+1C	30
Elective Psychopedagogical Disciplines											
Graduation exam-the 2nd level									3	C	5
Total hours/week		8	8	-	4E		6	6	4	3E+1C	-
			16			30		16			30
Dissertation		-	-	-	-	-	-	-	-	P	5

No	**Subject**	**2nd year – 1st semester**					**2nd year – 2nd semester**				
		C	**S**	**L**	**Exam**	**Credits**	**C**	**S**	**L**	**Exam**	**Credits**
1	Probability Theory	2	2	-	E	9	-	-	-	-	-
2	Differential Geometry	2	2	-	E	9	-	-	-	-	-
3	Elective Course V	2	2	-	E	6	-	-	-	-	-
4	Elective Course VI	2	2	-	E	6	-	-	-	-	-
A	Mathematical Methods in Signal Processing										
B	Nonlinear Analysis										
C	Elasticity Theory										
D	Modern Methods in Mathematical Analysis										
	TOTAL	8	8	-	4E	30					
	Elective Psychopedagogical Disciplines										
	Mathematics Teaching Methodology	2	1	0	E	5					
	Teaching practice			3	C	5					

GRADUATE – MATHEMATICAL MODELS AND APPLIED STATISTICS

Master of Mathematics

Full-time studies
4 semesters
60 ECTS credits/year
120 credits acumulated before final examination

No	Subject	1st year – 1st semester					1st year – 2nd semester				
		C	S	L	Exam	Credits	C	S	L	Exam	Credits
1	Functional Analysis	2	2	-	E	8	-	-	-	-	-
2	Measure Theory	2	2	-	E	8	-	-	-	-	-
3	Elective Course I	2	2	-	E	7	-	-	-	-	-
4	Elective Course II	2	2	-	E	7	-	-	-	-	-
A	Scientific Calculus with Matlab										
B	Nonlinear Analysis										
C	Graph Theory										
D	Coding Theory										
	TOTAL	8	8	-	4E	30					
	Elective Psychopedagogical Disciplines										
	Psycho-pedagogy of adolescents young and adults	2	1	0	E	5					
	Elective Course Psychopedagogic	1	2	0	E	5					
5	Differential Systems and Applications in Biology, Economy and Physics	-	-	-	-	-	2	2	-	E	8
6	Partial Differential Equations	-	-	-	-	-	2	2	-	E	8
7	Elective Course III	-	-	-	-	-	2	2	-	E	7
8	Elective Course IV	-	-	-	-	-	2	2	-	E	7
A	Analytical Mechanics and Continuous Media Mechanics										
B	Combinatorial Optimization										
C	Administration Systems for Databases (MySQL, XML)										
D	Algebraic Foundations of Informatics										
TOTAL							8	8	-	4E	30
Elective Psychopedagogical Disciplines											
Planning and management of education programs							2	1	0	E	5
Elective Course Psychopedagogic							1	2	0	E	5
Total hours/week		8	8	-	4E		8	8	-	4E	-
		16				30	16				30

No	Subject	2nd year – 1st semester					2nd year – 2nd semester				
		C	S	L	Exam	Credits	C	S	L	Exam	Credits
1	Probability Theory	2	2	-	E	8	-	-	-	-	-
2	Mathematical Methods in Signal Processing	2	2	-	E	8	-	-	-	-	-
3	Elective Course V	2	2	-	E	7	-	-	-	-	-
4	Elective Course VI	2	2	-	E	7	-	-	-	-	-
A	Variational Calculus and Optimal Control Theory										
B	Economic Processes Optimization										
C	Elasticity Theory										
D	Advanced Elements of Computer Graphics										
	TOTAL	8	8	-	4E	30					
	Elective Psychopedagogical Disciplines										
	Mathematics Teaching Methodology	2	1	0	E	5					
	Teaching practice			3	C	5					
5	Numerical Analysis of Partial Differential Equations	-	-	-	-	-	2	2	-	E	8
6	Applied Statistics	-	-	-	-	-	2	2	-	E	8
7	Elective Course VII	-	-	-	-	-	2	2	-	E	7
8	Scientific Research Technique	-	-	-	-	-	-	-	4	C	7
A	Financial Mathematics										
B	Generalized Models in Mechanics and Applications										
TOTAL							6	6	4	3E+1C	30
Elective Psychopedagogical Disciplines											
Graduation exam-the 2nd level									3	C	5
Total hours/week		8	8	-	4E		6	6	4	3E+1C	-
			16			30		16			30
Dissertation		-	-	-	-	-	-		-	P	5

GRADUATE – FINANCIAL MATHEMATICS
Master of Mathematics

Full-time studies
4 semesters
60 ECTS credits/year
120 credits acumulated before final examination

No	Subject	Code	1st year, 1st semester					1st year, 2nd semester				
			C	S	L	Exam	Credits	C	S	L	Exam	Credits
1.	Probability Calculus		2	2	-	E	9					
2.	Microeconomics and Macroeconomics		2	2	-	E	9					
3.	Elective Course I		2	2	-	E	6					
4.	Elective Course II		2	2	-	E	6					
A	Scientific Calculus with Matlab											
B	Graph Theory											
C	Capital Markets and Portofolium Management											
	TOTAL		8	8		4E	30					
	Elective Psychopedagogical Disciplines											
	Psycho-pedagogy of adolescents young and adults		2	1	0	E	5					
	Elective Course Psychopedagogic		1	2	0	E	5					
5.	Applied Statistics							2	-	2	E	9
6.	Combinatorial Optimization							2	-	2	E	9
7.	Elective Course III							2	2	-	E	6
8.	Elective Course IV							2	2	-	E	6
A	Differential Systems and Applications in Biology, Economy and Physics											
B	Company Appraisal											
C	Financial Risk Management											
TOTAL								8	4	4	4E	30
Elective Psychopedagogical Disciplines												
Planning and management of education programs								2	1	0	E	5
Elective Course Psychopedagogic								1	2	0	E	5
Total hours/week			8	8		4E	30	8	4	4	4E	30
			16					16				

No	Subject	Code	2nd year, 1st semester					2nd year, 2nd semester				
			C	S	L	Exam	Credits	C	S	L	Exam	Credits
1.	Economic Processes Optimization		2	-	2	E	9					
2.	Modeling in Financial Market		2	2	-	E	9					
3.	Elective Course V		2	2	-	E	6					
4.	Elective Course VI		2	2	-	E	6					
A	Variational Calculus and Optimal Control Theory											
B	Advanced Elements of Scientific Calculus with Matlab											
C	European Financial Markets											
D	Econometry/Insurances											
	Elective Psychopedagogical Disciplines											
	Computer Science Teaching Methodology	2	1	0	E	5						
	Teaching practice			3	C	5						
	TOTAL		8	6	2	4E	30					
5.	Financial Mathematics							2	2	-	E	9
6.	Financial Economy							2	2	-	E	9
7.	Elective Course VII							2	2	-	E	6
8.	Scientific Research Technique							-	-	4	C	6
A	Administration Systems for Databases (MySQL, XML)											
B	Financial Risk Management											
								6	6	4	3E+1C	30
Elective Psychopedagogical Disciplines												
Graduation exam-the 2nd level										3	C	5
Total hours/week			16					16				
Dissertation			-	-	-	-	-	-	-	-	P	5

GRADUATE – SCIENTIFIC CALCULUS AND SOFTWARE ENGINEERING

Master of Mathematics

Full-time studies
4 semesters
60 ECTS credits/year
120 credits acumulated before final examination

No	Subject	1st year, 1st semester					1st year, 2nd year				
		C	S	L	Exam	Credits	C	S	L	Exam	Credits
1	Scientific Calculus with Matlab	2	-	2	E	8					
2	Graph Theory	2	2	-	E	8					
3	Elective Course I	2	2	-	E	7					
4	Elective Course II	2	2	-	E	7					
A	Coding Theory										
B	Advanced Elements of Computer Graphics										
C	Probability Calculus										
	TOTAL	8	6	2	4E	30					
	Elective Psychopedagogical Disciplines										
	Psycho-pedagogy of adolescents young and adults	2	1	0	E	5					
	Elective Course Psychopedagogic	1	2	0	E	5					
5	Algebraic Foundations of Informatics						2	2	-	E	8
6	SO Linux						2	-	2	E	8
7	Elective Course III						2	2	-	E	7
8	Elective Course IV						2	2	-	E	7
A	Analytical Mechanics and Continuous Media Mechanics										
B	Combinatorial Optimization										
C	Administration Systems for Databases (MySQL, XML)										
D	Process Algebra										
TOTAL							8	6	2	4E	30
Elective Psychopedagogical Disciplines											
Planning and management of education programs							2	1	0	E	5
Elective Course Psychopedagogic							1	2	0	E	5
Total hours/week		8	6	2	4E		8	6	2	4E	-
		16				30	16				30

No	Subject	2nd year, 1st semester					2nd year, 2nd semester				
		C	S	L	Exam	Credits	C	S	L	Exam	Credits
1	Denotational Semantics - Domain Theory	2	2	-	E	8	-	-	-	-	-
2	Functional Programming Technics	2	-	2	E	8	-	-	-	-	-
3	Elective Course V	2	2	-	E	7	-	-	-	-	-
4	Elective Course VI	2	2	-	E	7	-	-	-	-	-
A	Mathematical Methods in Signal Processing										
B	Economic Processes Optimization										
C	Advanced Elements of Scientific Calculus with Matlab										
D	Elasticity Theory										
	Elective Psychopedagogical Disciplines										
	Computer Science Teaching Methodology	2	1	0	E	5					
	Teaching practice			3	C	5					
	TOTAL	8	6	2	4E	30					
5	Compiler Theory	-	-	-	-	-	2	-	2	E	9
6	Applied Statistics	-	-	-	-	-	2	2	-	E	9
7	Elective Course VII	-	-	-	-	-	2	2	-	E	6
8	Scientific Research Technique	-	-	-	-	-	-	-	4	C	6
A	Numerical Analysis of Differential Equations										
B	Generalized Models in Mechanics and Applications										
TOTAL							6	4	4	3E+1 C	30
Elective Psychopedagogical Disciplines											
Graduation exam-the 2nd level									3	C	5
Total hours/week		8	6	2	4E		6	4	4	3E+1 C	-
			16			30		14			30
Dissertation		-	-	-	-	-	-	-	-	P	5

COURSES: UNDERGRADUATE AND GRADUATE STUDIES

1.
Course name: Algorithms and programming
Degree: Undergraduate; 1st year; 2nd semester; Mathematics / Mathematics and Computer Science
Type: obligatory; **Credits:** 5
Taught by: Lecturer Ph Gabriela Tănase
Objectives: The aims of the course are: to form the ability of working with dynamical data structures and to assimilate the basic programming techniques and the fundamental algorithms for searching and sorting.
Contents: Structures and types defined by the user; cin and cout streams; symply chained lists, stacks, queues; circular symply and duble chained lists: creation, acces, inseration, deletion of a node; files: creation, opening, reading, writing, positioning, closure; fundamental algorithms for sorting; programming techniques. During the laboratories the students will implement the methods and examples of the course. Using also the pseudo-codes, they and will test their programs on different examples.
Lecture, by presenting the basic definitions, with examples and applications leading to the write of pseudo-codes of the problems proposed to be implemented. During the laboratories the technique endowment will be used.
Bibliography: F. Iacob, Programarea calculatoarelor, Editura MATRIXROM, Bucureşti, 2007; I. Ignat, C. L. Ignat, Programarea calculatoarelor. Descrierea algoritmilor si fundamentele limbajului C/C++, Editura Albastră, Cluj-Napoca, 2005; L. Negrescu, Limbajele C si C++ pentru incepatori. Limbajul C., Vol. I, P. a II-a, Editura Albastră, Cluj-Napoca, 2000; M. Şerban, Algoritmi fundamentali in utilizarea structurilor de date, Editura Albastră, Cluj-Napoca, 2006.
Examination: written and oral exam

2.
Course name: Differential Calculus
Degree: Undergraduate; 1st year; 1st semester; Mathematics / Mathematics and Computer Science
Type: obligatory; **Credits:** 5
Taught by: Lecturer Ph Marius Durea
Objectives: After this course the students should be familiar with the basic concepts and techniques of one-variable diferential calculus. Specifically, the students should have a good knowledge on working with Cauchy sequences, the uniform convergence of the sequences of functions and the properties of differentiable real-valued functions.
Contents: Real numbers system; Neighborhoods, interior points, limit points. Sequences and series of real numbers; The limit of a real-numbers sequence; The properties of convergent sequences; Sequences having the limit + or - infinity; Fundamental results: theorem of convergence of monotone sequences; Theorem of Cantor; Cesaro's Lemma; Theorem of Cauchy; Convergent series, general properties; Series with positive terms; Convergence criteria; Series with arbitrary terms; Convergence criteria; Absolute convergent series; The Cauchy product of two series; Sequences and series of functions: uniform convergence; Uniform convergence criteria. One real-variable functions: limits and continuity; The limit of a function at a limit point. Fundamental limits; Continuous functions at a point and on a set: characteristic properties, general properties. Operations with continuous functions; Uniform continuous functions. The continuity of elementary functions. Continuous functions on compact sets: Theorems of Weierstrass and Cantor; Darboux property; Limit and continuity transfer for sequences and series of functions. Derivability for one real-variable functions; Derivable functions, general properties; Derivability of elementary functions; Fundamental results: Theorems of Fermat, Rolle, Lagrange, Darboux; L'Hospital rule; Taylor's formula. Derivability transfer for sequences and series of functions. The tematics of the seminaries will follow to fix the notions and the results of the course by solving exercises.
Bibliography: G. E. Silov, *Mathematical Analysis - one real-variable functions*, Ed. Stiintifica si Enciclopedica, Bucuresti, 1985 (in Romanian); M. Nicolescu, S. Marcus, N. Dinculeanu, *Mathematical*

Analysis – vol. I, Ed. Didactica si Pedagogica, Bucuresti, 1980 (in Romanian); B. P. Demidovici, *Problems and exercise soft mathematical analysis,* Ed. Tehnica, Bucuresti, 1956 (in Romanian)
Examination: written and oral exam

3.
Course name: Linear Algebra
Degree: Undergraduate; 1st year; 1st semester; Mathematics / Mathematics and Computer Science
Type: obligatory; **Credits:** 5
Taught by: PhD Prof. Ioan Tofan, Lecturer Ph. Marius Tărnăuceanu
Objectives: The main goal of this course is to realize an introduction into the study of linear algebra. It will be very useful in studying some future courses of algebra, as well as courses in other mathematical domains.
Contents: Chapter I. Preliminaries. Preliminary notions: sets, relations, functions. Some algebraic structures involved by linear algebra: rings, fields. Rings of matrices and rings of polynomials. Determinants: definition, rules of calculation, remarkable examples. Linear equation systems: study of compatibility, finding solutions. Homogeneous linear equation systems. Chapter II. Linear spaces. Linear spaces: definition, examples, general properties, linear dependence and linear independence, systems of generators. Finitely generated linear spaces: basis, dimension. Linear subspaces: definition, general properties, examples, operations with subspaces. Chapter III. Linear operators. Linear operators: definition, examples, general properties, kernel, image, associated matrix. Isomorphisms of linear spaces. Invariant subspaces, eigenvalues, proper vectors. The theorem of Hamilton-Cayley and their applications. The Jordan canonical form of a linear operator. Chapter IV. Bilinear forms and quadratic forms. Bilinear forms: definition, examples, associated matrix. Symmetric bilinear forms. Quadratic forms. Hermitian forms. Euclidian spaces: definition, examples, scalar product, norm. Ortogonal bases, orthogonal matrices. In the seminars some examples and applications (problems) concerning to the course thematic will be presented.
Bibliography: Becheanu, M., Dincă, A., Ion, I. D., Niţă, C., Purdea, I., Radu, N., Ştefănescu, M., Vraciu, C., *Algebră pentru perfecţionarea profesorilor*, Editura Didactică şi Pedagogică, Bucureşti, 1981; Ion, I. D., Radu, N., *Algebră*, Editura Didactică şi Pedagogică, Bucureşti, 1991; Ion, I. D., Radu, N., Niţă, C., Popescu, D., *Probleme de algebră*, Editura Didactică şi Pedagogică, Bucureşti, 1981 ; Leoreanu, V., *Fundamente de algebră*, Editura Matrix Rom, Bucureşti, 2001; Spircu, T., *Structuri algebrice prin probleme*, Editura Ştiinţifică, Bucureşti, 1991; Tărnăuceanu, M., *Probleme de algebră*, vol. II., Editura Universităţii "Al. I. Cuza", Iaşi, 2004; Tofan, I., *Algebră liniară*, note de curs. Volf, A. C., *Algebră liniară*, Editura Universităţii "Al. I. Cuza", Iaşi, 2002.
Examination: written and oral exam

4.
Course name: Fundamental Algebraic Structures
Degree: Undergraduate; 1st year; 2nd semester; Mathematics / Mathematics and Computer Science
Type: obligatory; **Credits:** 5
Taught by: PhD Assoc Prof. Violeta Fotea, Lecturer Ph. Marius Tărnăuceanu
Objectives: The main goal of this course is to realize an introduction into the study of linear algebra. It will be very useful in studying some future courses of algebra, as well as courses in other mathematical domains.
Contents: Chapter I. Algebraic operations. Semigroups. Monoids. Algebraic operations: definition, examples, general properties. Semigroups and monoids: definitions, examples, general properties. The general associativity theorem. Positive integer powers in a monoid. The general commutativity theorem. Submonoids. The submonoid generated by a set. Homomorphisms of monoids. The free monoid generated by a set. Chapter II. Groups. Groups: definition, examples, general properties. Subgroups, operations with subgroups. Normal subgroups, factor groups, direct products of subgroups. The order of an element in a group, cyclic groups (the structure of the groups Z and Z*n*). Homomorphisms of groups, theorems of isomorphism. Permutation groups. Chapter III. Rings. Fields. Rings and fields: definitions, examples, general properties. Subrings, ideals, factor rings, the characteristic of a ring. Homomorphisms of rings, theorems of isomorphism. Prime ideals and maximal ideals. Rings of polynomials. Rings of quotients, the field of quotients associated to a domain. In the seminars some examples and applications (problems)

concerning to the course thematic will be presented.
Bibliography: Becheanu, M., Dincă, A., Ion, I. D., Niţă, C., Purdea, I., Radu, N., Ştefănescu, M., Vraciu, C., *Algebră pentru perfecţionarea profesorilor*, Editura Didactică şi Pedagogică, Bucureşti, 1981; Dragomir, A., Dragomir, P., *Structuri algebrice*, Editura Facla, Timişoara, 1984; Ion, I. D., Radu, N., *Algebră*, Editura Didactică şi Pedagogică, Bucureşti, 1991; Ion, I. D., Radu, N., Niţă, C., Popescu, D., *Probleme de algebră*, Editura Didactică şi Pedagogică, Bucureşti, 1981; Leoreanu, V., *Fundamente de algebră*, Editura Matrix Rom, Bucureşti, 2001; Năstăsescu, C., Niţă, C., Vraciu, C., *Bazele algebrei*, vol. I., Editura Academiei, Bucureşti, 1986; Spircu, T., *Structuri algebrice prin probleme*, Editura Ştiinţifică, Bucureşti, 1991; Tărnăuceanu, M., *Probleme de algebră*, vol. I., Editura Universităţii "Al. I. Cuza", Iaşi, 2003
Examination: written and oral exam

5.
Course name: <u>Analytical Mechanics and Mechanics of Continua</u>
Degree: Graduate; 1st year; 2nd semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Prof. Dorin Iesan
Objectives: Study of some mechanical models of interest from the mathematical point of view. To provide the nonlinear equations which govern the behavior of continua.
Contents: Mechanical systems.Generalized coordinates. Principle of virtual displacements. Lagrange's equations. Hamilton's equations. Variational principles. Canonical transformations. Hamilton-Jacobi equation. Stability. Theory of deformation. Principles of mechanics of continua. Elastic bodies. Fluid mechanics. Navier-Stokes equations. Mechanical systems subjected to constraints. Lagrange equations. Special problems. Hamilton's equations. Applications.Compatibility equations. Plane strain. Extension and bending of elastic cylinders. Torsion. Flexure. Waves. The plane steady motions of fluids. The complex representation. Applications.
Bibliography: L. Dragos, *Principiile mecanicii analitice*, Editura Tehnica, Bucuresti,1979; C. Iacob, *Mecanica teoretica*, Editura didactica si pedagogica, Bucuresti, 1980; L. Dragos, *Principiile mecanicii mediilor continue*, Editura tehnica, Bucuresti 1983; D. Iesan, *Mecanica*, Univ."Al.I.Cuza", 2004; A. Radu, *Probleme de mecanica*, Editura didactica si pedagogica, Bucuresti, 1978.
Examination: written and oral exam

6.
Course name: <u>Statistics</u>
Degree: Undergraduate; 3rd year; 2nd semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Prof. Mihai Turinici
Objectives: Exposition of some basic problems from mathematical statistics with a special emphasis on the specific algorithms for solving them. Practical usefulness of the proposed algorithms for solving the statistical tests.
Contents: Discrete and continuous probabilistic distributions arising frequently in practice; Asymptotic problems: large numbers law and central limit theorem Descriptive statistics and selection theory; Pointed and confidence interval estimation; Statistical hypotheses testing; parametric and non-parametric tests. The same as before. In addition, a covering of the course programme with exercises and problems is being intended.
Bibliography: G. Ciucu, *Elemente de Teoria Probabilităţilor şi Statisticã Matematicã*, Ed. Did. Ped., Bucureşti, 1963; M. Iosifescu, G. Mihoc, R. Teodorescu, *Teoria Probabilităţilor şi Statisticã Matematicã*, Ed. Tehnicã, Bucureşti, 1966; E. Nenciu., *Teoria Probabilităţilor şi Statisticã Matematicã*, Univ. „A. I. Cuza", Iaşi, 1984; G. Ciucu, V. Craiu., I. Sãcuiu, *Culegere de Probleme de Teoria Probabilităţilor*, Ed. Tehnicã, Bucureşti, 1967; G. Ciucu., V. Craiu., *Probleme de Statisticã Matematicã*, Ed. Did. Ped., Bucureşti, 1968
Examination: written and oral exam

7.
Course name: Statistics
Degree: Graduate; 1st year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Prof. Mihai Turinici
Objectives: Exposition of some basic problems from linear and nonlinear optimization theory, with special emphasis on the specific algorithms for solving them. The economic interpretation of the proposed problems and the discussion of their practical utility.
Contents: Linear programming and game theory: Basic algorithms; Optimization over graphs: economic applications; (Nonlinear) Convex Programming: kuhn-tucker conditions; Discrete and continuous dynamic Models: bellman principle. The same as before. In addition, a covering of the course programme with exercises, problems and reports is being intended.
Bibliography: A. Stefanescu and C. Zidaroiu, *Cercetari Operationale* (Romanian), Ed. Did. Ped., Bucuresti, 1981; C. Berge, *Theorie des Graphes et ses Applications,* Dunod, Paris, 1967; A. Seierstad and K. Sydsaeter, *Optimal Control Theory with Economic Applications*, North Holland, Amsterdam, 1987; G. Demange et A.C. Rochet, *Methodes Mathematiques de la Finance*, Economica, Paris, 2005.
Examination: written and oral exam

8.
Course name: Probability Calculus
Degree: Graduate; 1st year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Prof. Aurel Rascanu
Objectives: We present the basic notions of the theory of probability. The aim of seminaries is to develop the capacity of students in the analysis and the synthesis for mathematical modeling of random experiences.
Contents: Basic concepts: field of probability, random variables, functional and numerical characteristics, stochastic independence. Asymptotic behavior: weak and strong laws of large numbers, central limit problem; Applications: Monte Carlo Methods. The seminaries will follow closely the course with problems and exercises designed to illustrate the applicability of theoretical results. Random experiences will be modeled. The computer will be used for simulation and numerical approximation of random experiences.
Bibliography: G. Ciucu, C. Tudor: *Probabilităţi si procese stocastice*, vol I, Editura Academiei Romane, Bucureşti, 1978; M. Dumitrescu, D. Florea, C. Tudor: *Probleme de teoria probabilităţilor si statistică matematică,* Editura tehnica, Bucureşti, 1985; Gh. Mohoc, N. Micu, *Teoria probabilităţilor si statistică matematică,* Bucuresti, 1980; M. Iosifescu, C. Moineagu, V. Trebici, E. Ursianu: *Mică enciclopedie de statistică,* Ed. stiintifica si enciclopedica, Bucuresti, 1985; Ioan Cuculescu: *Teoria probabilităţilor,* Ed. All, 2004.
Examination: written and oral exam

9.
Course name: Advances in Computer graphics
Degree: Graduate; 1st year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Assoc. Prof. Marian Ioan Munteanu
Objectives: Students shoud know: fundamental notions and algorithms of triangulation; applications of triangulation; algebraic curves in CAGD; basic notions of digital image.
Contents: Triangulations; Algorithms of triangulation of a simple polygon: Graham Scan algorithm; Algorithms of triangulation of a set of points; point insertion method
Delaunay triangulation and Voronoi diagrams; Location problems; Kirkpatrick algorithm; Triangulation of curved surfaces; geometry of curves and surfaces in cagd: Bezier, splines, B-spline, NURBS and Pythagorean Hodographs; Digital imaging

Bibliography: Φyvind Hjelle, Morten Daehler, *Triangulations and Applications*, Springer, 2006. M.I. Munteanu, A.I. Nistor, *Algoritmi de triangulare*, Casa editoriala Demiurg, 2008. M. Galer, L. Horvat, *Imaginea digitala*, Ad Libri, 2004. J. Stillwell, *Geometry of Surfaces*, Springer 1992. F.P. Preparata, M.I. Shamos, Computational Geometry – An Introduction, Springer 1985. Revista: *Computer Aided Geometric Design*.
Examination: written and oral exam

10.
Course name: Measures in geometry
Degree: Graduate; 1st year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Assoc. Prof. Marian Ioan Munteanu
Objectives: Students shoul know: how some groups of matrices are used in geometry; different types of geometries and differences between them; basic notions in different types of geometries (as distance, angles, triangles); how cuaternions are used in the study of 3-dimensional rotations.
Contents: Groups of matrices used in geometry: the general linear group, the special linear group, the orthogonal group, the special orthogonal group, the complex general linear group, the complex special linear group, the unitary group, the symplectic group, the quaternionic group, the 3-dimensional sphere. Some isomorphisms between them. The Euclidean, spherical and hyperbolic geometries the Euclidean geometry, geodesics and isometries; the elliptic geometry, real projective spaces, stereographic projection, geodesics and isometries for the n-dimensional sphere; hyperbolic geometry: models for hyperbolic plane, representation and relations between them, geodesics, the modular group. Parallel postulate. Applications of quaternions in the study of 3-dimensional rotations
Bibliography: L. Ornea, A. Turtoi, *Introducere in Geometrie*, Theta, 2000; L. Ornea, *Concepte algebrice in geometrie*, note de curs; A. Ramsey, R.D.Richtmyer, *Introduction in Hypoerbolic geometry*, Springer 2001; N. Mihaileanu, *Geometrie diferentiala neeuclidiana*, Ed. Academiei 1964; J.W. Anderson, *Hyperbolic Geometry*, Springer 2005; M. Crasmareanu, O. Constantinescu, M.I. Munteanu, *Elemente de geometrie superioara*, Matrix Rom 2007.
Examination: written and oral exam

11.
Course name: Numerical calculus
Degree: Undergraduate; 3rd year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: Lecturer PhD Gabriela Tănase
Objectives: The aims of the course are: form the ability of passing from the calculus of functions in infinite spaces to the one in finite dimensional spaces (discrete calculus) by using numerical approximations and to assimilate the basic numerical methods for function, derivatives and integrals approximations.
Contents: Lagrange and Hermite interpolation, divided diferencies, finite diferencies, Newton formulas medium quadratical approximation, Legendre, Cebycev, Laguerre and Hermite polynomials spline interpolations numerical approximations numerical integration, Newton-Cotes, Gauss and Lobatto formulas. Seminaries will concern both the solving of exercises meant to be concrete applications of the methods presented at the course, in order to understand their applicability to diverse situations, and construction of pseudo-codes for the implementation of the methods during the laboratories, followed by examples to be tested. The collaboration of the students will be requested to obtain the solutions of the problems, followed by examples to be solved alone, that will be corrected afterwards, if needed. During the laboratories the students will implement the numerical methods of the course, using also the pseudo-codes from the seminaries and will test their programs on different examples.
Bibliography: C. Ignat, C. Ilioi, T. Jucan, Elemente de Informatica si calcul numeric, vol. I Editura Univ. „Al. I. Cuza", Iaşi, 1989; V. Iorga, B. Jora, Metode numerice, Editura Albastră, Cluj-Napoca, 2004; I. Toma, I. Iatan, Analiza numerica, Editura MATRIXROM, Bucureşti, 2005.
Examination: written and oral exam

12.
Course name: Statistics
Degree: Undergraduate; 3rd year; 2nd semester;
Type: obligatory; **Credits:** 5
Taught by: Lecturer Ph I. Stoleriu
Objectives: Students will get used with the Statistical Mathematical terminology and will be able to use the computer to solve problems from Statistics; Students will be able to use Statistical methods to solve some inter-disciplinary problems.
Contents: Brief review of Probability Theory; Selection theory; Parameter estimation (method of moments, maximum likelihood estimation, confidence intervals); Statistical hypothesis testing; Linear regression and correlation; Multiple regression; Non-parametrical tests; Applications of Statistics in Finance. During the labs, the students will use MATLAB to implement the theoretical notions learned at the class. Students can also present at the blackboard essays on various applications of Statistics in Sciences.
Bibliography: Gh. Mihoc, N. Micu: Teoria probabilităţilor si statistică matematică, Bucuresti, 1980; E. Nenciu: Lectii de statistica matematica, Universitatea A.I.Cuza, Iasi, 1976; P. Blaga, Statistica… prin Matlab, Presa universitara clujeana, Cluj-Napoca, 2002; D. Ştefanoiu, Ghid de utilizare MATLAB, Editura Transilvania, Braşov, 1994.
Examination: written and oral exam

13.
Course name: Financial Mathematics
Degree: Graduate; 1st year; 2nd semester;
Type: obligatory; **Credits:** 5
Taught by: Lecturer Ph I. Stoleriu
Objectives: Students will get used with terms from Finance and Stock exchange; They will be able to understand the mathematical models proposed for financial markets and use/addapt them to various practical exercises; The students will be introduced into Stochastic Calculus and its applications in Finance.
Contents: Financial derivatives (forwards, futures, options…); Discreet model for a financial market (the Cox-Ross-Rubinstein model); Introduction into Stochastic Calculus (Brownian motion, martingales…); Ito integration; Ito formula; Continuous models for financial markets; The Black-Scholes model; Hedging with financial derivatives; Portfolio optimization (discreet and continuous models). During the tutorials, the students will use MATLAB to implement the theoretical notions learned in the lecture theatre. Students can also present at the blackboard essays on financial market models.
Bibliography: Matematici financiare, Ion Purcaru, vol I, II, Editura Economică, Bucureşti (1992, 1993, 1998); Options, Futures and Other Derivatives, 5th Edition, John C. Hull, Prentice Hall (2002). The Mathematics of Financial Derivatives, A Student Introduction, P. Wilmot, S. Howison and J. Dewynne, Cambridge University Press (1995). Stochastic Differential Equations: An introduction with applications, 5th Edition, B. Øksendal, Springer-Verlag (1999). An Introduction to Financial Option Valuation: Mathematics, Stochastics and Computation, D. Higham, Cambridge University Press (2004).
Examination: written and oral exam

14.
Course name: Practical applications in the elementary mathematics
Degree: Undergraduate; 2nd year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Prof. Stan Chirita
Objectives: Making the student to be able to use the analytic and differential methods in the study of various applications in the elementary mathematics. Endeavouring the student with basic techniques and methods for treating the problems in elementary mathematics.
Contents: Applications in algebra: Cayley Hamilton theorem, inner product, etc.; practical applications in geometry and mechanics: geometry of masses and applications to the geometry of triangles and

tetrahedrons; applications in mathematical analysis: approximate formulae in the calculus, applications of the integral calculus. Each seminar will start by recalling the basic notions and formulae introduced at the course lesson. Then some exercises and problems will be solved in order to exemplify and fix the arguments, formulae and the methods of study treated in the course lesson. Other exercises and problems will be proposed for the individual study. The students will elaborate and present some scientifical and didactical reports concerning specific arguments.
Bibliography: S. Chirita, Aplicatii practice in matematica elementara, Universitatea Al. I. Cuza, Iasi, 2007 (Romanian, electronic); S. Chirita, M. Ciarletta, Calcolo volume 1, Algebra lineare, geometria analitica e calcolo differenziale ed integrale, Ed. Zanichelli, Bologna, 2002 (in Italian); 3. S. Chirita, M. Ciarletta, Calcolo volume 2, Geometria differenziale, integrali multipli ed equazioni differenziali, Ed. Zanichelli, Bologna, 2003 (in Italian); C. Iacob, Matematica aplicata si mecanica, Editura Academiei, Bucuresti, 1989 (in Romanian); C. Iacob, Elemente de analiza matematica si mecanica, Manual pentru clasa a XII a reala, Ed. Didactica si Pedagogica Bucuresti, 1968 (in Romanian).
Examination: written and oral exam

15.
Course name: Mechanics
Degree: Undergraduate; 3rd year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Prof. Stan Chirita
Objectives: Making the student to be able to use the analytic and differential methods in the study of some natural phenomena. The study of some classical models of mechanics with both mathematical and practical importance.
Contents: Cinematics; Dynamics of a material point; Dynamics of a constrained material point; The motion of a material point with respect to a non-inertial reference system; dynamics of the systems of material points; dynamics of a rigid body. Each seminary will start with a short recall of the notions and results presented to the course. Then will be solved some exercises and problems chosen in such way to exemplify and fix the notions, formulae and methods presented to the course. So they will treat the following arguments: Cinematics of the material point; Cinematics of the rigid body; Dynamics of the free material point; Central forces; Dynamics of the constrained material point; Statics of the material point; Relative motions; Geometry of masses; System of forces; Systems of material points; Special motions of a rigid body
Bibliography: C. Iacob, Mecanica teoretica, EDP, Bucuresti, l971 (in Romanian); C.I. Bors, Lectii de Mecanica, Univ. Iasi, l983 (in Romanian); A. Radu, Mecanica rationala, vol.I, Univ.Iasi, 1991 (in Romanian).
Examination: written and oral exam

16.
Course name: Arithmetics and combinatorics
Degree: Undergraduate; 1st year; 2nd semester;
Type: obligatory; **Credits:** 5
Taught by: Associate PhD Prof. Ioan Bucataru, Associate PhD Prof. Razvan Litcanu
Objectives: Within this course we will study aspects concerning the arithmetic of integer and natural numbers, counting problems as well as some principles useful to solve problems of number theory.
Contents: The main topics of the course are listed below: The set of natural numbers: Peano axioms, the principle of induction, numeration systems; divisibility, prime numbers, the fundamental theorem of arithmetic, Euclid's algorithm; classes of remainders, theorems of Fermat, Euclid, Wilson, diophantine equations, Chinese Remainder Lemma; Arithmetic functions, Euler function; combinatorial numbers, combinatorial identities; Elementary principles for counting: Dirichlet's box principle, Inclusion-exclusion Principle; the number of configurations invariant under a goup of permutations, burnside Theorem. During seminar hours we will solve problems related to the topics discussed in the course. These problems are posted on the webpage. We encourage the students to try to solve these problems and we will discuss those

that could not be solved. There is a set of compulsory problems as well as a set of problems addressed to gifted students.
Bibliography: M.A. Armstrong, Groups and Symmetry, Springer, 2000; I. Cucurezeanu: Problems of arithmetic and number theory (in Romanian), Editura Tehnica, Bucuresti, 1976; I. Creanga, C. Cazacu, P. Minut, Gh. Opait, C. Reischer: Introduction to number theory (in Romanian), Editura Didactica si Pedagogica, 1965; C. Popovici: Number Theory (in Romanian), Editura Didactica si Pedagogica, 1978; I. Tomescu: Introduction to combinatorics (in Romanian), Editura Tehnica, 1972; I. Tomescu: Problems of combinatorics and graph teory (in Romanian), Editura Didactica si Pedagogica, 1978.
Examination: written and oral exam

17.
Course name: Web Programming
Degree: Undergraduate; 2nd year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: Lecturer PhD Razvan Raducanu
Objectives: The student should be able to design a web site which wimplements PHP and Js technologies; the site should also impelement basis with Mysql databases using the HTML forms.
Contents: variables, expessions, control instructions, functions, HTML forms and HTML controls, basis elements of mysql, elements of js. Lots of examples will be discussed in detail at the lab.
Bibliography: Răzvan Răducanu, Programare Web, în curs de apariţie; Sterling Hughes, PHP Developer's cookbook, Second Edition, 2001.
Examination: written and oral exam

18.
Course name: Object Oriented Programming. Visual Basic Language
Degree: Undergraduate; 3rd year; 2nd semester;
Type: obligatory; **Credits:** 5
Taught by: Lecturer PhD Razvan Raducanu
Objectives: At the end of this course the students should: be familiar with the basic concepts of object oriented programming; know the programming environment and the basic elements of Visual Basic.NET language; know the main scape names and classes of .NET Framework; be able to write small application which shloud be fully functional and should have a medium degree of complexity.
Contents: The basic concepts of object oriented programming and Visual Basic.NET language; The elements of Visual Basic.NET language; The class System.Windows.Forms.Form; The object browser of the platform .NET Framework; Usual controls; Message boxes; Exceptions; Menus and other controls; Working with data base in VB.NET – ADO.NET; Working with graphic objects in VB.NET; Execution threads; Examples. The use of the programming environment Visual Basic.NET; Mini-applications VB.NET which should reflect the course thematic.
Bibliography: *MSDN Library* - msdn.microsoft.com/; Kris Jamsa, *Visual Basic .NET* , Editura BIC ALL, Bucuresti, 2003 (in Romanian); Harold Davis, *Visual Basic for Windows*, Editura Corint, Bucuresti, 2004 (in Romanian).
Examination: written and oral exam

19.
Course name: Variational calculs and optimal control theory
Degree: Graduate; 2nd year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: PhD Prof. Catalin Lefter
Objectives: The understanding of various theoretical and applicable aspects in the calculus of variations and optimal control theory.

Contents: Euler-Lagrange equations, Hamiltonian systems; Controllability of linear systems; Optimal control problems; maximum principle of Pontriaghin, dynamic programming principle; Elements of geometric control theory. Exercises and problems for the understanding of the theory.
Bibliography: Catalin Lefter, Calculul variatiilor si control optimal, Editura Alexandru Myller 2006; I.M. Gelfand, S.V. Fomin, Calculus of variations, 2000; L.Hocking, Optimal control, Oxford University Press, 1991.
Examination: written and oral exam

20.
Course name: Optimization Theory
Degree: Undergraduate; 3rd year; 1st semester;
Type: obligatory; **Credits:** 5
Taught by: Assoc. PhD Prof Mircea Birsan
Objectives: Learn to elaborate and study mathematical models of programming (optimization) for the main types of problems which appear in practice, problems in economy, decision problems etc.; Learn the theoretical foundations of the methods for solving the optimization models; Learn some algorithmic methods for solving the important classes of problems in the theory of optimization**.**
Contents: Linear programming: simplex method, duality; nonlinear programming: convexity, the Kuhn-Tucker optimality conditions, duality for nonlinear optimization problems; approximation techniques: line search methods, gradient methods, search methods on admissible directions; variational problems: the Euler-Lagrange equations. Present more details and examples for the solution procedures established during the course; develop and solve some mathematical optimization models for practical problems; solve the optimization problems with the help of the computer, using MATLAB.
Bibliography: P. Pedregal, Introduction to optimization, Springer-Verlag, New York, 2004; C. Amihaesei, A course on operations research (in rom.), Univ. Cuza Iasi, 1988; Optimization Toolbox for Use with MATLAB, User's Guide. The MathWork Inc., 2002.
Examination: written and oral exam

21.
Course name: Astronomy
Degree: Undergraduate; 3rd year; 2nd semester;
Type: obligatory; **Credits:** 5
Taught by: Lecturer PhD C. Gales
Objectives: Studies on the motion of celestial bodies; The positions, distances and dimensions of the celestial bodies; Studies on the astronomical time systems; The structure of the Solar system and the structure of the universe; The origin and the evolution of celestial bodies**.**
Contents: Astrometry. The Earth-shape, dimensions, coordinates; Spherical geometry and spherical trigonometry; Fundamental circles on celestial sphere; Coordinate systems and related problems: transformation of one coordonate system into another, rising and setting times; Timekeeping systems. Perturbations of coordinates. Refraction; Aberration of light; Parallax and distances;. Precession and nutation. The Solar System. Planets, moons, asteroids, comets, interplanetary dust; Aparent motions; Phases of the Moon and planets. Celestial mechanics. Two body problem; Ephemeris calculus; The restricted three body problem. Astrophysic. Photometric concepts and magnitudes; stellar spectra; binary stars. Cosmology and cosmogony. The origin and evolution of Galaxies; The formation of the Solar system. Laboratory thematics: observations of the planets, Moon, stars and galaxies; analysis of observational data; exercises; simulations of astronomical phenomena using the Planetarium.
Bibliography: V. Ureche, Universul vol. I, II, Ed. Didactica si pedagogica, Bucuresti, 1982; C. Dramba, Elemente de mecanica cereasca, Biblioteca Societatii de Stiinte, 1958; A. Pal, V. Pop, V. Ureche, Astronomie, Culegere de probleme, Presa Univ. Clujeana 1998; Nadolschi, Astronomie generala, Ed. Didactica si Pedagogica, Bucuresti 1963; N. Coculescu, Curs de astronomie teoretica, Ed. Casa Scoalelor, Bucuresti 1927; H. Karttunen, P. Kroger, H. Oja, M. Poutanen, K. Donner, Fundamental astronomy, Springer 2007; A. E. Roy si D. Clarke, Astronomy. Principles and practice, 2003.

Examination: written and oral exam

22.
Course name: C Sharp Programming
Degree: Undergraduate; 3rd year; 2nd semester;
Type: obligatory; **Credits:** 5
Taught by: Lecturer PhD C. Gales
Objectives: The objective of the courses is the assimilation of the new facilities offered by the C sharp language. Thus, there are studied object oriented programming techniques and concepts such as: properties, delegates, events, arrays implemented as objects, etc. Moreover, Windows programming techniques are approached**.**
Contents: C# data and operators; controlling program flow; classes and objects; methods, arrays, indexers, properties; interfaces, structures, enumerators; delegates, events, namespaces; inheritance; polymorphism; handling problems; creating Windows forms and Windows applications**.** The Visual Studio .NET is used in order to exemplify the C# commands and stuffs and to elaborate on C# applications. The students must realize C# programs for some imposed tasks.
Bibliography: Herbert Schildt, *C#: A Beginner's Guide, (2001)*; Herbert Schildt, *C#*, Ed.Teora (traducere, 2002); Bradley L. Jones, *SAMS Teach Yourself the C# Language in 21 Days*, (2004); Philip Syme si Peter Aitken, *SAMS Teach Yourself the C# Web Programming in 21 Days*, (2002); Kris Jamsa si Lars Klander, *Totul despre C si C++ Manualul fundamental de programare in C si C++*, Ed. Teora, (traducere 2007).
Examination: written and oral exam

STUDENT SUPPORT SERVICES

SERVICE	LOCATION	CONTACT DETAILS
Accommodation	"Titu Maiorescu", Targusor Copou, Codrescu Campus	Eng. Mihai Teslariu (+40 232)201234
Health Services	"Titu Maiorescu" Campus, Building C8, room 1	MD Paraschiva Gâscă MD Carmen Carare (+40 232)201324 uaic_medical7@yahoo.com
International Students' Information Centre	UAIC, Building A, Blv. Carol I, no 11, Iaşi	Livia Dimitriu (+40 232)201022 livia.vranescu@uaic.ro (+40 232)201201 relint@uaic.ro
Careers Centre	Codrescu Campus, Street Gh. Asachi, no 7, Building C11, et. 1, rooms 28-29, 52-53, Iaşi 700843, România	Ec. Alma-Roxana Andrei alma.andrei@uaic.ro (+40 232)201576 (+40 232)201579
Student Information Centre	Codrescu Campus, Building C11, room 54	(+40 232)201581 infostudenti@gmail.com
Scholarships Office	Codrescu Campus, Building C11	Roxana Rosu (+40 232)1577
University Library	Păcurari Street, no 4, Iasi	(+40 232)264245 bcuis@bcu-iasi.ro www.bcu-iasi.ro
Faculty Library	UAIC, Building B	(+40 232)201561
Digital Communication Department	UAIC, Building A	(+40 232)201002 support@uaic.ro http://www.dcd.uaic.ro