SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Computer science/ Engineer
1.7 Form of education	Full time
1.8 Subject code	1.

2. Data about the subject

2.1 Subject name	***Mathematical Analysis I (Differential calculus)***				
2.2 Course responsible/lecturer	Prof. dr. Dumitru Mircea Ivan – mircea.ivan@math.utcluj.ro				
2.3 Teachers in charge of seminars/ laboratory/ project	Prof. dr. Dumitru Mircea Ivan – mircea.ivan@math.utcluj.ro				
2.4 Year of study	I	2.5 Semester	1	2.6 Type of assessment (E - exam, C - colloquium, V - verification)	E
2.7 Subject category	*DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară*				DF
	DI – Impusă, DOp – opțională, DFac – facultativă				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminars	2	Laboratory		Project	
3.2 Number of hours per semester	56	of which:	Course	28	Seminars	28	Laboratory		Project	
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										20
(b) Supplementary study in the library, online and in the field										5
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										8
(d) Tutoring										5
(e) Exams and tests										6
(f) Other activities:										0

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	44
3.5 Total hours per semester (3.2+3.4)	100
3.6 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	Basic knowledge of Differential Calculus and Set Theory
4.2 Competence	Competences in elementary Differential Calculus: elements of set theory, limits, sequences and series, derivatives

5. Requirements (where appropriate)

5.1. For the course	
5.2. For the applications	

6. Specific competence

6.1 Professional competences	**C1 –** Operating with basic Mathematical, Engineering and Computer Science concepts **C1.1 -** Recognizing and describing specific concepts to calculability, complexity, programming paradigms and modeling of computing and communication systems **C1.2 -** Using specific theories and tools (algorithms, schemes, models, protocols, etc.) for explaining the structure and the functioning of hardware,

	software and communication systems **C1.3 -** Building models for various components of computing systems **C1.4 -** Formal evaluation of the functional and non-functional characteristics of computing systems **C1.5 -** Providing theoretical background for the characteristics of the designed systems
6.2 Cross competences	N/A

7. Discipline objective (as results from the *key competences gained*)

7.1 General objective	A presentation of the concepts, notions, methods and fundamental techniques used in differential calculus.
7.2 Specific objectives	Use of the differential calculus in order to solve problems in engineering. Use of the differential calculus in modelling and solving practical problems concerning spatial forms.

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Elements of Set Theory. Set operations. Functions. Cardinal numbers.	2	Explanation Demonstration Collaboration Interactive activities	
General Topology. Topologies and topological spaces. Open and closed sets. Neighbourhoods. Interior and closure of a set. Limit points.	2		
Metric. Topology of a metric space. Sequences in metric spaces.	2		
Sequences of Numbers. Stolz-Cesaro criterion.	2		
Series of Numbers. Convergence tests for series. Infinite products.	2		
Continuity. Continuous mappings on topological, metric and Euclidean spaces.	2		
Differential Calculus for Functions of One Variable. Mean-value theorems. Taylor's formula for real functions of one variable. Differential of functions of one variable.	2		
Differential Calculus for Functions of Several Variables. Partial derivatives. Derivative of composite functions. Homogeneous functions. Euler's identity. Gradient. Directional derivative. Lagrange's mean value theorem. Differential of functions of several variables. Taylor's formula for functions of several variables.	6		
Functional Sequences and Series. Power series. Trigonometric and Fourier series.	4		
Implicit Functions. Existence theorems for implicit functions. Change of coordinates and variables.	2		
Extrema of Functions. Unconditional and conditional extrema.	2		
Bibliography 1. Mircea Ivan. Elemente de calcul integral. Mediamira, Cluj-Napoca, 2003. 2. Dumitru Mircea Ivan. Calculus. Editura Mediamira, Cluj-Napoca, 2002.			
8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Exercises related to: set operations, functions, cardinal numbers.	2	Explanation Demonstration Collaboration Interactive activities	
Exercises related to: topologies, open and closed sets, eighbourhoods, interior and closure of a set.	2		
Example of metrics with application in engineering.	2		
Exercises related to sequences of numbers.	2		
Exercises concerning convergence tests for series.	2		
Exercises related to continuous mappings.	2		
Exercises concerning mean-value theorems and Taylor's formula for real functions of one variable.	2		
Exercises related to: partial derivatives, derivative of composite functions, gradient, directional derivative, differential of functions of several variables, Taylor's formula for functions of several	6		

variables.			
Exercises related to power and Fourier series.	4		
Exercises related to implicit functions, change of coordinates and variables.	2		
Exercises concerning unconditional and conditional extrema.	2		

Bibliography

1. Dumitru Mircea Ivan, et al. Analiză matematică - Culegere de probleme pentru seminarii, examene şi concursuri. Editura Mediamira, Cluj-Napoca, 2002.
2. Mircea Ivan et al. Culegere de Probleme Pentru Seminarii, Examene şi Concursuri. UT Press, Cluj-Napoca, 2000.

** Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica şi etapele proiectului.*

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Collaboration with engineers in order to identify and solve problems raised by the market.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Abilities of understanding and using creatively the concepts and proofs	Written examination	30%
Seminar	Abilities of solving problems and applying algorithms	Written examination	70%
Laboratory			
Project			

Minimum standard of performance:
Ability to present coherently a theoretical subject and to solve problems with practical content.

Date of filling in:	**Titulari**	**Titlu Prenume NUME**	**Semnatura**
	Course	Prof.dr. Mircea Ivan	
	Applications	Prof.dr. Mircea Ivan	

Date of approval in the department	Head of department Prof.dr.ing. Rodica Potolea
Date of approval in the Faculty Council	Dean Prof.dr.ing. Liviu Miclea