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	Videoprojector
5.2. For the applications	Videoprojector

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 variables.	6		
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 și 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.

Course responsible
Prof.dr. Mircea Ivan

Head of department
Prof.dr.eng. Rodica Potolea

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	2.

2. Data about the subject

2.1 Subject name		***Linear Algebra***			
2.2 Course responsible/lecturer		Prof. dr. Ioan RASA Ioan.Rasa@math.utcluj.ro			
2.3 Teachers in charge of seminars/ laboratory/ project		Conf. dr. Daniela Inoan Daniela.Inoan@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				DD

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										4
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										17
(d) Tutoring										
(e) Exams and tests										3
(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 Linear Algebra and Analytic Geometry
4.3 Competence	Competences in elementary Linear Algebra and Analytic Geometry: matrices, determinants, linear systems, vectors and lines in plane

5. Requirements (where appropriate)

5.1. For the course	Blackboard, videoprojector
5.2. For the applications	Blackboard, videoprojector

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 linear algebra and analytic geometry.
7.2 Specific objectives	Use of the matriceal calculus (in the general context of linear algebra) in order to solve problems in engineering. Use of the vectorial calculus (in the general context of analytic geometry) in modelling and solving practical problems concerning spatial forms.

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Linear spaces. Definition. Linear subspaces. Examples.	2	Explanation Demonstration Collaboration Interactive activities	
Linear independence. Basis. Dimension. Change of basis.	2		
Inner - product spaces. Definition, properties, Schwarz' inequality. Examples	2		
Linear transformations. Definition, elementary properties, Kernel and Image.	2		
The matrix associated to a linear transformation. The standard construction. Expresions in terms of coordinates.	2		
Eigenvalues and eigenvectors. Definitions, invariant subspaces, characteristic polynomials.	2		
The diagonal form. Canonical forms, diagonalizability.	2		
The Jordan canonical form. Construction of a Jordan basis and a Jordan matrix.	2		
Functions of a matrix. The n-th power of a matrix. Elementary functions of a matrix.	2		
The adjoint operator. Definition, properties, examples.	2		
Self-adjoint operators, unitary operators, properties of the eigenvalues and eigenvectors.	2		
Bilinear forms, quadratic forms. The associated matrix.	2		
The canonical form. Reduction to a canonical form. The method of eigenvalues and Jacobi's method.	2		
Conics and quadrics. Reduction to a canonical form. Geometric properties.	2		

Bibliography

1. D. Cimpean, D. Inoan, I. Rasa, An invitation to Linear Algebra and Analytic Geometry, Ed. Mediamira, 2012
2. V. Pop, I. Rasa, Linear Algebra with Applications to Markov Chains, Ed. Mediamira, 2005

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Determinants, matrices, geometric vectors	2	Explanation Demonstration Collaboration Interactive activities	
Linear spaces, bases, dimension	2		
Inner-product spaces	2		
Linear transformations. Examples	2		
Linear transformations characterized in terms of matrices	2		
Invariant subspaces, eigenvalues, eigenvectors	2		
Diagonalizable linear transformations	2		
Jordan bases, Jordan canonical forms	2		
Elementary functions of a matrix, examples	2		
The adjoint operator	2		
Special classes of operators	2		
Bilinear forms, quadratic forms	2		

Reduction to a canonical form	2		
Conics and quadrics, reduction to a canonical form	2		

Bibliography

1. D. Cimpean, D. Inoan, I. Rasa, An invitation to Linear Algebra and Analytic Geometry, Ed. Mediamira, 2012
2. V. Pop, I. Corovei, Algebra pentru ingineri. Culegere de probleme, Ed. Mediamira, 2003.

**Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și 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.

Course responsible
Prof.dr. Ioan Rasa

Head of department
Prof.dr.eng. Rodica Potolea

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	3.

2. Data about the subject

2.1 Subject name				***Special Mathematics I***	
2.2 Course responsible/lecturer				Prof. dr. Daniela ROŞCA Daniela.Rosca_at_math.utcluj.ro	
2.3 Teachers in charge of seminars/ laboratory/ project				Prof. dr. Daniela ROŞCA Daniela.Rosca_at_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										12
(b) Supplementary study in the library, online and in the field										28
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										14
(d) Tutoring										11
(e) Exams and tests										4
(f) Other activities:										0

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	69
3.5 Total hours per semester (3.2+3.4)	125
3.6 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	Algebra, highschool level (real profile)
4.4 Competence	Notions of combinatorial theory (arrangements, permutations, combinations); sets and operations with sets; notions of mathematical logic; mathematical induction method, calculations with matrices

5. Requirements (where appropriate)

5.1. For the course	Blackboard, videoprojector, computer, graphic tablet
5.2. For the applications	Blackboard, videoprojector, computer, graphic tablet

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 and fundamental methods used in counting and discrete probability theory. A presentation of basic concepts and properties in graph theory, basic algorithms and theorems based in graph theory, and their mathematical proof.
7.2 Specific objectives	Develop and apply strategies for solving combinatorial problems; Identification of patterns in solving combinatorial counting problems; Modeling and formulation, in terms of probability theory and specific notations, of concrete problems coming from random experiments and random processes; Identify standard discrete distributions of probability for solving probabilistic problems; Interpretation of numerical results in the problems modeled using random variables; Modelling of concrete problems using graph theory notions and concepts; Application of specific algorithms to problems modeled by classical graph theory (trees, minimum spanning trees, coding and decoding trees, construction Eulerian trails and Hamiltonian paths, the Chinese postman problem, flow problems, etc..).

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Principles of counting and counting methods.	2	Windows Journal software for graphic tablet , videoprojection Explanation Demonstration Collaboration	
Recursions and generating functions.	2		
Introduction to graphs. Definitions, notations, general properties. Connectivity. Graphs and digraphs representation.	2		
Trees, sorting and searching: roted trees, decision trees, sorting trees.	2		
Binary trees and binary codes. Huffman codes.	2		
Spanning trees. Depth-first search, breadth-first search. Minimum spanning tree in weighted graphs - Prim's and Kruskal's algorithm.	2		
Minimum spanning trees in directed graphs - Chu-Liu-Edmonds algorithm. Shortest path - Dijkstra's algorithm. Greedy algorithms. General properties and greedy algorithm for the maximum weight problem.	2		
Bipartite graphs. Matchings. Matchings in bipartite graphs. Maximum matchings.	2		
Eulerian graphs and Hamiltonian graphs. The postman's problem.	2		
Networks, flows and cuts. Max flow min cut theorem.	2		
Introduction to discrete probabilities: the axioms of probabilities, conditional probabilities, total probability and Bayes' formula.	2		
Probabilistic schemes: binomial, multinomial, Poisson, geometric, negative binomial, Poisson's urns.	2		
Random variables, examples of discrete random variables, operations with random variables.	2		
Expected value and variance. Covariance. Chebyshev's theorem and weak law of large numbers.	2		

Bibliography

1. T. Toadere, Grafe, Teorie, algoritmi, aplicatii, Ed. Microinformatica, Cluj, 2002.
2. N. Vornicescu, Grafe. Teorie si algoritmi, Ed. Mediamira, 2005.
3. D. Rosca, Discrete Mathematics, Ed. Mediamira, 2007.
4. A. Mitrea, Fundamente de teoria probabilitatilor, Ed. UTPress, 2003.

5. K. Bogart, S. Drysdale, C. Stein, Discrete Math for Computer Science Students, available online at *http://www.cs.dartmouth.edu/~ac/Teach/cs21-Winter04/*
6. N. L. Biggs, Discrete Mathematics, Oxford University Press, 2005.
7. R. Durret, The Essentials of Probability, Duxbury Press, 1994.

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Counting. The pigeonhole principle, counting set of pairs. Functions, words. Selections with and without repetition.	2	Windows Journal software for graphic tablet , videoprojection Explanation Demonstration Collaboration	
Partitions, classifications, distributions.	2		
Walks, trails, cycles in graphs. Graphs and digraphs representations.	2		
Problems related to graphs.	2		
Properties and applications of incidence matrices and adjacency matrices.	2		
Applications of trees: decision problems, sorting algorithms.	2		
Spanning trees: depth-first search, breadth-first search trees, properties. Algorithms for minimum spanning trees.	2		
Algorithms for shortest path. Greedy algorithms for vertex coloring. General notions about planar graphs.	2		
Bipartite graphs and matchings. Construction of alternating paths.	2		
Eulerian and Hamiltonian graphs. Algorithms for Eulerian and Hamiltonian tours.	2		
Calculation of probabilities.	2		
The theorem on total probability and Bayes' formula with applications.	2		
Construction of random variables and calculation expected value and variance.	2		
Applications of the weak law for large numbers.	2		

Bibliography

1. J. A. Bondy, U.S.R. Murty, Graph theory with applications, available online at http://www.ecp6.jussieu.fr/pageperso/bondy/books/gtwa/gtwa.htm
2. J. Gross, J. Yellen, Graph Theory and its Applications, CRC Press, 1999
3. Hannelore Lisei, Sanda Micula, Anna Soos, *Probability Theory through Problems and applications*, Cluj University Press, 2006.
4. Arthur Enghel - *Probleme de matematică: strategii de rezolvare*, Ed. Gil, 2006.

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

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

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Abilities of understanding and reproducing the concepts and proofs	Written examination	30.00%
Seminar	Abilities of solving problems and applying algorithms	Written examination	70.00%
Laboratory			
Project			

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

Course responsible
Prof.dr. Daniela Rosca

Head of department
Prof.dr.eng. Rodica Potolea

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	4.

2. Data about the subject

2.1 Subject name				***Logic Design***	
2.2 Course responsible/lecturer				Prof. dr. eng. Octavian Creţ – Octavian.Cret@cs.utcluj.ro	
2.3 Teachers in charge of seminars/ laboratory/ project				As.Drd.Ing. Diana Irena Pop – Diana.Pop@cs.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*				DD
	DI – Impusă, DOp – opțională, DFac – facultativă				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminars		Laboratory	2	Project	
3.2 Number of hours per semester	56	of which:	Course	28	Seminars		Laboratory	28	Project	
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										25
(b) Supplementary study in the library, online and in the field										17
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										17
(d) Tutoring										6
(e) Exams and tests										9
(f) Other activities:										0
3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))										69
3.5 Total hours per semester (3.2+3.4)										125
3.6 Number of credit points										5

4. Pre-requisites (where appropriate)

4.1 Curriculum	• N/A
4.5 Competence	• Mathematics (Algebra), Physics (electricity)

5. Requirements (where appropriate)

5.1. For the course	A minimum of 75% course attendance rate is mandatory for being admitted to the final exam.
5.2. For the applications	Preliminary preparation of summaries from the indicated bibliography (laboratory textbook)

6. Specific competence

6.1 Professional competences	**C1 –** Operating with basic Mathematical, Engineering and Computer Science concepts **C1.1 –** Recognizing and describing concepts that are specific to the fields of calculability, complexity, programming paradigms, and modeling computational 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 a 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	• The main objective of this discipline is to give to the students the bases of Logic Design, in order to make them able to analyze, design and implement any digital system.
7.2 Specific objectives	To reach this goal, students will learn to: • Analyze and synthesize combinational logic systems; • Analyze and synthesize synchronous and asynchronous sequential machines; • Apply digital system design principles and descriptive techniques; • Utilize programmable devices such as FPGAs and PLDs to implement digital systems; • Understand timing issues in digital systems and study these via digital circuit simulation.

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Introduction. Number systems and codes, errors	2	Blackboard presentation discussions	
Number representation systems. Binary arithmetic	2		
Boolean Algebra. Boolean functions. Logic gates. Digital systems and functions representation	2		
Methods for minimizing Boolean functions and systems of functions	2		
Combinational logic circuits (CLCs) analysis and design (synthesis). SSI and MSI CLCs.	2		
Methods for designing digital systems with SSI, MSI, LSI and VLSI circuits. Combinational Hazard.	2		
Sequential logic circuits. Latches and Flip-Flops.	2		
Flip-Flops applications: frequency dividers, counters	2		
Flip-Flops applications: data registers, converters, memories	2		
Methods for designing digital systems using Flip-Flops	2		
Methods for designing digital systems using memories, multiplexers, decoders, counters	2		
Methods for designing sequential synchronous systems	2		
Methods for designing digital systems using programmable devices (I)	2		
Methods for designing digital systems using programmable devices (II)	2		

Bibliography

1. Contemporary Logic Design, Randy H. Katz, Benjamin Cunnings / Addison Wesley Publishing Co., 1993.
2. Digital Design Principles and Practices, John F. Wakerly, Prentice-Hall, 2000.
3. FPGA-based System Design, Wayne Wolf, PRENTICE HALL Professional Technical Reference Upper Saddle River, NJ 07458 www.phptr.com ISBN: 0-13-142461-0.

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Basic Logic Circuits	2	Practical work on test boards, FPGA boards, specialized software, blackboard presentations, supplemental	
ActiveHDL Schematic Editor and Simulator (I)	2		
ActiveHDL Schematic Editor and Simulator (II)	2		
Combinational Logic Circuits (I)	2		
Combinational Logic Circuits (II) – MSI circuits	2		
Combinational Logic Circuits (III) – Complex circuits	2		
Synthesis of Combinatorial Logic Circuits using Programmable Logic Devices	2		

Flip-flops	2	explanations and discussions	
Counters (I)	2		
Counters (II)	2		
Registers and Shift Registers	2		
The XILINX FPGA Family	2		
Synthesis of Sequential Logic Circuits using FPGA Devices	2		
Laboratory test	2		
Bibliography 1. Analiza şi sinteza dispozitivelor numerice, Îndrumător de laborator, Ediţia a-3-a, L. Văcariu, O. Creţ, A. Neţin, Ed. U.T. Press, Cluj-Napoca, 2009.			

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

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

• Since this discipline is a basic one in Computer Science, its content is "classic" but also modern because it familiarizes students with the modern principles of Logic Design (utilization of modern simulation and synthesis tools, FPGA and CPLD-based design etc.). Its contents have been discussed with major academia and industry actors from Romania, Europe and U.S.A. and it has been evaluated several times by Romanian Governmental Agencies like CNEAA and ARACIS.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Problems solving abilities Presence, (Inter)activity	Written Exam	70%
Seminar			
Laboratory	Problems solving abilities Presence, (Inter)activity	Written Exam	30%
Project			
Minimum standard of performance: Modeling and solving typical Logic Design problems using the domain-specific formal apparatus. Grade calculus: 30% lab + 70% final exam Conditions for participating in the final exam: Lab ≥ 5 Conditions for promotion: final exam ≥ 5 For participating in the final written exam minimum of 80% course attendance rate is necessary.			

Course responsible
Prof.dr. Octavian Cret

Head of department
Prof.dr.eng. Rodica Potolea

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	5.

2. Data about the subject

2.1 Subject name				***Computer Programming***	
2.2 Course responsible/lecturer				Lect. dr. eng. Marius Joldoş – Marius.Joldos@cs.utcluj.ro	
2.3 Teachers in charge of seminars/ laboratory/ project				Asist. dr. eng.Ciprian Pocol – Ciprian.Pocol@cs.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	5	of which:	Course	2	Seminars	1	Laboratory	2	Project	
3.2 Number of hours per semester	70	of which:	Course	28	Seminars	14	Laboratory	28	Project	

3.3 Individual study:	
(a) Manual, lecture material and notes, bibliography	30
(b) Supplementary study in the library, online and in the field	25
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays	13
(d) Tutoring	7
(e) Exams and tests	5
(f) Other activities:	0
3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	80
3.5 Total hours per semester (3.2+3.4)	150
3.6 Number of credit points	6

4. Pre-requisites (where appropriate)

4.1 Curriculum	N/A
4.6 Competence	N/A

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	N/A

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 - U**sing 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	To learn how to use a general purpose high level programming language for writing programs
7.2 Specific objectives	• To understand a small-sized problem stated in a natural language, and develop a solution as a computer program. • To understand code written by other programmers and reason critically about them. • To design and implement computer programs in C using the structured/modular approach. • To learn a good programming style. • To determine the causes of programming errors and correct them

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Programming Languages. Stages of Problem solving Using Computers. Algorithm – Definition, Properties. C features. Simple Data Types. Simple I/O	2	Lectures, demos and discussions	Uses a video-projector
Programming Style. Digital Representations. Variables and Expressions	2		
C Statements. C Preprocessing	2		
Functions (Structure, Invocation, Parameter passing, Functions as parameters, Variable scope). Functions for character processing	2		
Modular Programming. Debugging	2		
Pointers. Memory Management.	2		
Pointers and Arrays. Function Pointers	2		
C Character Strings. C library	2		
Structures, unions, enumerations. User-defined Types	2		
File Handling. High Level I/O.	2		
Recursion. Mechanism and Examples	2		
Working with time. I/O redirection. Variable length argument lists. Command line arguments. Self referential structures	2		
Sample Programs Explained. (Combinatorial generation. Simple Sorting Algorithms)	2		
Review	2		

Bibliography

1. Paul and Harvey Deitel, C: How to program, Pearson Education, 6ed, 2010
2. K.N. King, C Programming: A modern Approach, W.W. Norton, 2008
3. Stephen Prata, C Primer Plus, Sams, 5ed, 2004
4. Brain W. Kernighan, Dennis M. Ritchie – The C Programming Language, Prentice Hall, Inc., 1988.
5. William H. Press – Numerical Recipes in C - The Art of Scientific Computing – freely available on the Web (same address)

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
S1. Algorithm Representations (Flowcharts, Pseudocode)	1	Tutoring, discussions, and in class problem solving	
S2. Operators, Expressions, Functions	1		
S3. Functions and Modular Programming	1		
S4. Pointers and Memory Management	1		
S5. String Manipulation. Command Line Arguments	1		
S6. Structures, Unions, Enumerations	1		
S7. Recursion. Working with Files	1		

L1.Pseudo code. Interactive Development Environments for C. Setting up and Using Codeblocks IDE	2	Tutoring, discussions, and assisted program development	PCs equipped with MinGW C and Code-blocks IDE
L2. Simple IO in C	2		
L3. Expressions in C	2		
L4. Statements in C	2		
L5. Functions. Debugging C programs	2		
L6. Modular Programming	2		
L7. Pointers. Pointers and Arrays	2		
L8. Memory allocation. Pointers to functions	2		
L9. String manipulation	2		
L10. Structures, Unions, Enumerations	2		
L11. High level I/O in C.	2		
L12. Recursion	2		
L13. Review	2		
L14. Laboratory test	2		
Bibliography 1. Moodle site for course available at: https://labacal.utcluj.ro (laboratory session description are available on the site)			

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

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

The contents of the course is in accordance with the ACM Computer Science Curricula recommendations.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Written exam	Written exams: In-class tests Final	 10% 60%
Seminar	Seminar activity may bring bonuses		
Laboratory	Laboratory test	Evaluation of program implementation In class activity evaluation	30%
Project			
Minimum standard of performance: Grade calculus: 10% midterm + 30% laboratory + 60% final exam Conditions for participating in the final exam: Laboratory ≥ 5 Conditions for promotion: grade ≥ 5			

Course responsible
S.l.dr. Marius Joldos

Head of department
Prof.dr.eng. Rodica Potolea

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	6.

2. Data about the subject

2.1 Subject name				***Physics***	
2.2 Course responsible/lecturer				Prof.dr.fiz. Radu Fechete	
2.3 Teachers in charge of seminars/ laboratory/ project				Lect. Dr. Codruta Badea; Assist. Dr. Dumitrita Corpodean	
2.4 Year of study	I	2.5 Semester	1	2.6 Type of assessment (E - exam, C - colloquium, V - verification)	C
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	3	of which:	Course	2	Seminars		Laboratory	1	Project	
3.2 Number of hours per semester	42	of which:	Course	28	Seminars		Laboratory	14	Project	
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										16
(b) Supplementary study in the library, online and in the field										10
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										14
(d) Tutoring										10
(e) Exams and tests										3
(f) Other activities:										5

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	58
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	Good knowledge in high school physics Good knowledge in high school mathematics
4.7 Competence	Some knowledge in operating computers (Word, Power Point, Excel, www).

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	N/A

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	• Introduction of the most important physical quantities that are encountered in automation engineering. • Introduction of the main laws of physics that play a central role in automation engineering applications.
7.2 Specific objectives	• Understanding of the most important laws of classical mechanics • Knowledge of the oscillatory and wave phenomena • Knowledge of the sound characteristics and transfer phenomena • Knowledge of the electrical, magnetically and electromagnetic phenomena. • Knowledge of the quantum mechanical phenomena. • The ability to document alone in a given scientific problem using the books library and the Internet. • The ability to elaborate and to present a report on a given scientific problem • The ability to represent graphically the physical quantities. • The ability to use commercial computer programs for interpretation of the experimental data. • The ability to solve a given physical problem and to express it in a mathematical form. • The ability to work in a team for solving real physical problems

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Introductions. Physical quantities (fundamental physical quantities, derivate physical quantities). Space – time motion. Elements of motion.	2	Didactic discourse, exposure and explanation of curricular subjects, narrative-story related to the physics history and association with real life facts. Didactic conversation (heuristics and catechetic) in which the students are involved. Demonstration of physical laws in mathematical form and using objects to represents the physical phenomena at reduced scale. Demonstration with actions performed by students which are asked to: extract from problem the significant data, to observe,identify and classifyphysical laws and types of motions.	
Basics of kinematics: velocity, acceleration, linear motions, curvilinear motions, circular motion.	2		
Dynamics: Principle of dynamics. Specific physical quantities (mass, force, linear momentum, mechanic work, energy, power.)	2		
Conservations laws of dynamics: linear momentum, kinetically momentum, energy, orbital momentum.	2		
Oscillatory motion: linearly harmonically oscillator, dumped oscillations, forced oscillations, resonance, Superposition of parallel and perpendicular oscillations.	2		
Waves. Wave function. Differential equation, Characteristic phenomena: reflection, refraction, interference, diffraction, dispersion, absorption.	2		
Elastic mechanic waves. Longitudinal waves in solids, liquids and gases. Wave intensity.	2		
Acoustics: sounds quality (sources, properties, parameters), closed chambers acoustics, sound reverberation, Doppler effect, ultrasounds.	2		
Electromagnetic waves: velocity, transversally, intensity, and range. Photometrical quantities. Polarization.	2		
Quantum Mechanics: thermal radiation (specific physical quantities; spectral density of energy function and Rayleigh-Jeans, Wien, Planck's laws, Stefan-Boltzmann law, Wien's displacement law), photoelectric effect, Compton effect, Generation of pairs (particle antiparticle), de Broglie hypothesis.	2		
Waves attached to particles. Davisson-Germer experiment. Wave group. Schrödinger equation. Wave function properties. Potential gap. Potential barrier.	2		

Hydrogen atom. Quantum numbers. Spin quantic number (magnetic loop, magnetic moment, orbital magnetic moment). Experimental proves of energy quantifications. Quantum transitions theory. Laser. Holography.	2		
Electrons in solid body. Energy bands. Metals. Electrically conductibility. Hall effect. Contact potential difference. Thermoelectrically effect. Peltier effect.	2		
Intrinsic semiconductors. Extrinsic semiconductors. p-n Junction. Transistor. Magnetic properties of solid body: magnetic moment, orbital magnetic moment, diamagnetism, paramagnetism, ferromagnetism. Superconductibility.	2		

Bibliography

In UTC-N library

1. R. Fechete, Fundamental physics for engineers, course notes.
2. E. Culea, S. Nicoara, Fundamentals of Physics, RISOPRINT, Cluj-Napoca 2004
3. R. Fechete, Elemente de Fizica pentru Ingineri, Ed. UTPress, 2008.
4. I.Ardelean, Fizica pentru ingineri, Ed. UTPres, 2005.
5. I. Coroiu, E. Culea, Fizica I, Ed. UT. Press, 1999.
6. Microsoft Encarta Encyclopedia.
7. Encyclopedia Britannica.
8. www.wikipedia.org
9. http://users.pandora.be/educypedia/education/physicsbytopic.htm

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Work Protection. The study of thermoelectrically effect.	1	Heuristic discovery In laboratory of some physical phenomena. Problematization (problematize) presentations of laws and principles of general physics with situations from real life, and situations from the future work of students.	
Longitudinal and transverse standing waves.	1		
Polarizations of light.	1		
Optical spectroscopy.	1		
The study of photoelectric effect.	1		
The determination of the energy gap of a semiconductor.	1		
The study of Hall Effect.	1		

Bibliography

1. R. Fechete, R. Chelcea, D. Moldovan, S. Nicoara, I. Coroiu, C. Badea, E. Culea, I. Cosma, N. Serban, Fizica: Indrumator de laborator, UT. PRESS, Cluj-Napoca, ISBN 978-973-662-952-5, (2014).
2. http://www.phys.utcluj.ro/resurse/Facultati/Calculatoare/2016-2017/AnICalculatoareEng_2016-2017.html

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

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Theoretical Knowledges accumulated at class, individual study	Written test	70%
Laboratory	Practical knowledges (abilities) accumulated in TUCN Laboratory + Individual study (essays on a general Physics subject or practical)	Essay, Practical Presentation, PPT presentation, written problems	30%
Minimum standard of performance: 2.75/10 points (2.75 mark + (2.75 student – 1 default = 1.5) total 4.5 rounded to 5) + all laboratories			

Course responsible
Prof.dr. Radu Fechete

Head of department
Prof.dr.eng. Rodica Potolea

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	7.1

2. Data about the subject

2.1 Subject name				***English I***	
2.2 Course responsible/lecturer				-	
2.3 Teachers in charge of seminars/ laboratory/ project				Lector dr. Monica Negoescu Emma Adam	
2.4 Year of study	I	2.5 Semester	1	2.6 Type of assessment (E - exam, C - colloquium, V - verification)	C
2.7 Subject category	*DF – fundamentală, DD – în domeniu, DS – de specialitate, DC – complementară*				DC
	DI – Impusă, DOp – opțională, DFac – facultativă				DI

3. Estimated total time

3.1 Number of hours per week	2	of which:	Course		Seminars	2	Laboratory		Project	
3.2 Number of hours per semester	28	of which:	Course		Seminars	28	Laboratory		Project	
3.3 Individual study:										
(a) Manual, lecture material and notes, bibliography										
(b) Supplementary study in the library, online and in the field										
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										22
(d) Tutoring										
(e) Exams and tests										
(f) Other activities:										

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	22
3.5 Total hours per semester (3.2+3.4)	50
3.6 Number of credit points	2

4. Pre-requisites (where appropriate)

4.1 Curriculum	none
4.8 Competence	Minimum B1, B2 level (CEFR)

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	Class attendance, individual study and homework completion

6. Specific competence

6.1 Professional competences	N/A
6.2 Cross competences	**CT2 –** Identifying, describing and conducting processes in the projects management field, assuming different roles inside the team and clearly and concisely describing, verbally or in writing, in Romanian and in an international language, the own results from the activity field.

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

7.1 General objective	Students should acquire knowledge and integrated skills to communicate in English in professional (technical and engineering) contexts and on job related topics.
7.2 Specific objectives	At the end of this seminar, the students will be able to: - Participate and express their opinion, evaluation and recommendation in work-related meetings/events/activities; - Take notes on specialized topics within their field of specialization; - Read and extract specific and general information from a variety of technical texts; - Write and talk about their own work/professional skills and abilities, professional needs and development.

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
-			
Bibliography -			
8.2 Applications – Seminars/Laboratory/Project	**Hours**	**Teaching methods**	**Notes**
Asking and answering questions in a professional meeting. Note-taking and summarizing information of oral input.	2	Presentation of contents, elicitation, small-project based learning tasks, problem solving tasks, group and pair work, peer evaluation, formative assessment.	
Extracting and delivering information extracted from written specialized text (technical article, product specification, technical brochure, work memo, product review, report, and proposal) in written and spoken form to knowledgeable audience and non-specialists.	2		
Comparing and contrasting features of product, process, events, activities.	2		
Expressing opinion, in writing or speaking, on topics of general professional or job related topics. Complaining about product quality or service.	2		
Expressing various degrees of certainty, assessing situations, events and objects. Expressing outcomes and conditions. Supplying information to support/refute an argument.	2		
Describing events, their time frames, sequence and duration.	2		
Preparing a job application file and interview: introducing self and describing experience, skills and abilities in writing and speaking, asking and answering questions about job preferences, professional needs and development.	2		
Making proposals, in writing or speaking, reacting appropriately to others' proposals, agreeing and disagreeing.	2		
Participating and managing participation in work related meetings on familiar topics within their field of specialization.	2		
Using hedges, polite and appropriate language for various work-related situations, repairing communication breakdowns or misunderstandings.	2		
Predicting development of events, highlighting main trends and secondary tracks or less important details.	2		
Supplying spoken and written feedback on technical/work related topics.	2		
Expressing modality: necessity, obligation, recommendation on work related topics.	2		
End-term test	2		
Bibliography 1. Esteras, S. R & al. (2010) *Professional English in Use For Computers and the Internet*, CUP.			

2. Biber, D & al. (2009) *Longman grammar of spoken and written English*, Longman.
3. Glendinning, *Technology*, vol I-II, Oxford University Press, 2008.
4. Ibbottson, M. (2010) *Cambridge English for Engineering*, CUP.

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

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

Mastering a foreign language will support students in a more flexible integration in the labour market, and have improved personal development. The introduction in the language for specific purposes and academic discourse will facilitate reading and writing more documents in the field of study, making informed decisions on various types of information, and keeping up-to-date with state of the art knowledge in students' professional field.

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course			
Seminar	Completion of mid-term and end-term evaluation, homework or individual study solving, attendance to seminar	On-going class-work evaluation; One mid-term test and one end-term test (integrated skills)	Class-work evaluation – 30% Mid-term test – 30% End-term test – 40%
Laboratory			
Project			
Minimum standard of performance: at least 50% of all components of tasks solved correctly			

Teachers in charge of applications
Lector dr. Monica Negoescu

Head of department
Conf.univ.dr. Ruxanda Literat