SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Automation and Computer Science
1.3	Department	Mathematics
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	9.

2. Data about the subject

2.1	Subject name					Mathematical analysis II (Integral calculus and differential equations)					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer					Prof. dr. Dumitru Mircea IVAN					
2.4	Teachers in charge of applications					Lect. Mircea RUS, Lect. Adela CAPATA					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	exam	2.8	Subject category	DF/OB

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Mathematical analysis II (Integral calculus and differential equations)**	**2**	**2**	**-**	**-**	**28**	**28**	**-**	**-**	**98**	**154**	**6**

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the teaching plan	56	3.5	of which, course	28	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	40
Supplementary study in the library, online and in the field	14
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	41
Tutoring	0
Exams and tests	3
Other activities	0

3.7	Total hours of individual study	98
3.8	Total hours per semester	154
3.9	Number of credit points	6

4. Pre-requisites (where appropriate)

4.1	Curriculum	Basic knowledge Integral Calculus
4.2	Competence	Competences in elementary Integral Calculus: primitives, definite integrals.

5. Requirements (where appropriate)

5.1	For the course	Videoprojector
5.2	For the applications	Videoprojector

6. Specific competences

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 **C1.3 –** Building models for various components of computing systems **C1.5 –** Providing a theoretical background for the characteristics of the designed systems

Cross competences	N/A

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

7.1	General objective	A presentation of the concepts, notions, methods and fundamental techniques used in integral calculus.
7.2	Specific objectives	Use of the integral calculus in order to solve problems in engineering.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Ordinary differential equations (ODE) of order one	Explanation Demonstration Collaboration Interactive activities	
2	Linear homogeneous ODE with constant coefficients		
3	Linear non-homogeneous ODE with constant coefficients		
4	Positive and linear functionals.		
5	Riemann-Stieltjes integral. Primitives.		
6	Improper integrals.		
7	Integrals depending on parameters.		
8	Special functions		
9	Paths. Vector fields. Line integrals with respect to the coordinates. Circulation.		
10	Differential Forms. Exact differential forms. Path-independence. Work.		
11	Line integrals with respect to the arc length. Total mass, center of mass.		
12	Double integral. Green-Riemann formula.		
13	Surface integral. Flux of vector field across a surface. Stokes' Theorem.		
14	Volume integral. Gauss-Ostrogradsky Theorem. MATHEMATICA capabilities.		

Bibliography

1. Mircea Ivan. Elemente de calcul integral. Mediamira, Cluj-Napoca, 2003. ISBN 973-9357-40-7.
2. Dumitru Mircea Ivan. Calculus. Editura Mediamira, Cluj-Napoca, 2002. ISBN 973-9358-88-8.

8.2. Applications (Seminars)		Teaching methods	Notes
1	Ordinary differential equations (ODE) of order one (Exercises)	Explanation Demonstration Collaboration Interactive activities	
2	Linear homogeneous ODE with constant coefficients (Exercises)		
3	Linear non-homogeneous ODE with constant coefficients (Exercises)		
4	Positive and linear functionals (Exercises)		
5	Riemann-Stieltjes integral. Primitives (Exercises)		
6	Improper integrals (Exercises)		
7	Integrals depending on parameters(Exercises)		
8	Special functions (Exercises)		
9	Line integrals with respect to the coordinates(Exercises)		
10	Differential Forms (Exercises)		
11	Line integrals with respect to the arc length. (Exercises)		
12	Double integral. Green-Riemann formula. (Exercises)		
13	Surface integral. (Exercises)		
14	Volume integral. MATHEMATICA related capabilities. (Exercises)		

Bibliography

1. Dumitru Mircea Ivan, et al. Analiză matematică - Culegere de probleme pentru seminarii, examene şi concursuri. Editura Mediamira, Cluj-Napoca, 2002. ISBN 973-9357-20-2.
2. Mircea Ivan et al. Culegere de Probleme Pentru Seminarii, Examene şi Concursuri. UT Press, Cluj-Napoca, 2000.

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	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		Abilities of understanding and using creatively the concepts and proofs		Written examination		30%
Applications		Abilities of solving problems and applying algorithms		Written examination		70%
10.4 Minimum standard of performance						
Ability to present coherently a theoretical subject and to solve problems with practical content.						

Course responsible
Prof.dr. Dumitru 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	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	10.

2. Data about the subject

2.1	Subject name					Special Mathematics in Engineering					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer					Prof.dr. Ioan RASA Ioan.Rasa@math.utcluj.ro					
2.4	Teachers in charge of applications					Conf. dr. Daniela Inoan - Daniela.Inoan@math.utcluj.ro					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	exam	2.8	Subject category	DF/OB

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Special Mathematics II**	**2**	**2**	**-**	**-**	**28**	**28**	**-**	**-**	**100**	**156**	**6**

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the teaching plan	56	3.5	of which, course	28	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	20
Supplementary study in the library, online and in the field	21
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	56
Tutoring	
Exams and tests	3
Other activities	

3.7	Total hours of individual study	100
3.8	Total hours per semester	156
3.9	Number of credit points	6

4. Pre-requisites (where appropriate)

4.1	Curriculum	Elementary knowledge of complex numbers. Elements of calculus.
4.2	Competence	Competences in using complex numbers (in algebraic and trigonometric form). Ability to calculate derivatives and real integrals.

5. Requirements (where appropriate)

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

6. Specific competences

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 **C1.3 –** Building models for various components of computing systems **C1.5 –** Providing a theoretical background for the characteristics of the designed systems

Cross competences	N/A

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

7.1	General objective	A presentation of the concepts, notions, methods and fundamental techniques used in complex functions theory and integral transforms theory.
7.2	Specific objectives	Use of the complex functions theory and integral transforms theory for solving problems in engineering.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Complex numbers. Operations, topology in C.	Explanation Demonstration Collaboration Interactive activities	
2	Continuity. Monogenic functions. The Cauchy-Riemann conditions. Holomorphic functions.		
3	The complex integral. Definition. Cauchy's integral theorem. Cauchy's integral formula.		
4	Taylor and Laurent series. Singular points, classification.		
5	Residues. The Residue Theorem.		
6	Applications of the Residue Theorem.		
7	Real integrals calculated with complex methods.		
8	The Fourier transform. Definition, properties.		
9	Applications of the Fourier transform.		
10	The Laplace transform. Definition and properties.		
11	The inverse Laplace transform.		
12	Applications of the Laplace transform.		
13	The z transform. Applications.		
14	Difference equations. The z transform applied to solving difference equations.		

Bibliography

1. A.I. Mitrea, Analiza matematica in complex (curs+culegere de probleme), Ed. Mediamira, Cluj-Napoca, 2005.
2. A.I. Mitrea, Transformari integrale si discrete (curs + culegere de probleme) Ed. Mediamira, Cluj-Napoca, 2004.
3. M.L. Krasnov, A.I. Kiselev, G.I. Makarenko, Functions of a Complex Variable, Operational Calculus and Stability Theory, Mir Publishers, Moscow, 1984.

8.2. Applications (Seminars)		Teaching methods	Notes
1	Operations in C. Geometric interpretations.	Explanation Demonstration Collaboration Interactive activities	
2	The Cauchy-Riemann conditions. Holomorphic functions.		
3	Elementary functions, equations in the complex domain.		
4	The complex integral.		
5	Series of functions.		
6	Residues. The Residue Theorem.		
7	Computing real integrals by using the Residue Theorem.		
8	The Fourier transform.		
9	Properties and apploications of the Fourier transform		
10	The Laplace transform.		
11	The inverse Laplace transform.		
12	Applications of the Laplace transform.		
13	The z transform.		
14	Difference equations solved with the z transform.		

Bibliography

1. A.I. Mitrea, Analiza matematica in complex (curs+culegere de probleme), Ed. Mediamira, Cluj-Napoca, 2005.
2. A.I. Mitrea, Transformari integrale si discrete (curs + culegere de probleme) Ed. Mediamira, Cluj-Napoca, 2004.
3. M.L. Krasnov, A.I. Kiselev, G.I. Makarenko, Functions of a Complex Variable, Operational Calculus and Stability Theory, Mir Publishers, Moscow, 1984.

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	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		Abilities of understanding and using creatively the concepts and proofs		Written examination		30%
Applications		Abilities of solving problems and applying algorithms		Written examination		70%
10.4 Minimum standard of performance						
Ability to present coherently a theoretical subject and to solve problems with practical content.						

Course responsible
Prof. dr. Ioan Raşa

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	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	11.

2. Data about the subject

2.1	Subject name					Electrotechnics					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer					Assoc. prof. dr. eng. Laura DARABANT – Laura.Darabant@et.utcluj.ro					
2.4	Teachers in charge of applications					As. drd. eng. Mihaela CRETU - Mihaela.Cretu@et.utcluj.ro; As. drd. eng. Denisa STET – Denisa.Stet@et.utcluj.ro					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	exam	2.8	Subject category	DID/OB

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Electrotechnics**	**3**	**-**	**1**	**-**	**42**	**-**	**14**	**-**	**74**	**130**	**5**

3.1	Number of hours per week	4	3.2	of which, course	3	3.3	applications	1
3.4	Total hours in the teaching plan	56	3.5	of which, course	42	3.6	applications	14

Individual study	Hours
Manual, lecture material and notes, bibliography	23
Supplementary study in the library, online and in the field	12
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	25
Tutoring	10
Exams and tests	4
Other activities	

3.7	Total hours of individual study	74
3.8	Total hours per semester	130
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Mathematics I, II; Physics

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	The presence of the lab is mandatory

6. Specific competences

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 **C1.3 –** 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

Cross competences	N/A

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

7.1	General objective	
7.2	Specific objectives	

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Electric and magnetic quantities. Static electric and magnetic fields (the electric field in free space and in material, electric current, the magnetic field in free space and in material)	Multimedia, PowerPoint Presentations, Demonstration board	
2	Laws and theorems of electromagnetic field		
3	Electrical capacitance, energy and forces		
4	Magnetic circuits. Self-inductance and mutual inductance. Magnetic energy and forces.		
5	Basic concepts, units and laws of circuit theory (characteristic values, power in sinusoidal regime, representation of sinusoidal functions by vectors and complex numbers)		
6	The characterisation of the linear circuits in complex plane, the complex form of some theorems		
7	Equivalent impedances (series and parallel connection, without mutual inductance, with mutual inductance, real condenser, real inductance, air core transformer)		
8	Resonance (in series, parallel, real, inductively coupled circuits, power factor improvement)		
9	Two-port networks (equations, equivalent circuits, open-circuit and short-circuit tests, characteristic impedance, propagation constant, filters)		
10	Network theorems (th superposition theorem, Thevenin-Norton theorem, mesh or loop analysis, node analysis, matrix methods)		
11	Transient regime of linear circuits (continuity conditions, transient behaviour of the R-L, R-C and R,L,C)		
12	Transient regime of linear circuits (the Laplace transform, Duhamel integral, state variable method)		
13	Study-state periodic non-sinusoidal regime (Fourier expansion, power, network analysis)		
14	Transmission lines (the primary line parameters, the equations of the transmission line, voltage and current waves on long lines, distortionless lines)		

Bibliography

1. The Theory of Electric Circuits, authors: RV Ciupa, V. Ţopa, Casa Cartii de Stiinta Publishing House, 2003, ISBN 973-9204-98-8
2. Simion, E., Maghiar, T., *Electrotehnica*, E.D.P., Bucureşti, 1982
3. Mocanu, C. I., *Teoria câmpului electromagnetic*, E.D.P., Bucureşti, 1981

8.2. Applications (Laboratory)		Teaching methods	Notes
1	Determination of the spectrum and equipotential surfaces of an electric field using a electrokinetic model	Practical exercises	
2	The study of a magnetic circuit. The measurement of the iron losses using an oscilloscope		
3	Representation of sinusoidal functions by vectors and complex numbers		
4	Analysis of the R,L,C series and parallel circuits, of the voltage and current resonances		
5	Power transfer in inductively coupled circuits		
6	The study of a circuit in non-sinusoidal regime		
7	The study of the transient regime, methods for solving circuits in transient regime		

Bibliography

1. Răduleţ, R., *Bazele electrotehnicii. Probleme.*, E.D.P., Bucureşti, 1981
2. Micu, D.D., Creţ, Laura, Duma, Denisa, *Teoria circuitelor electrice. Culegere de probleme.*, UTPress, Cluj-Napoca, 2005

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

10. Evaluation

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course				Three hours written examination, written test (WT)		0.8 WT
Applications				Laboratory works (LW)		0.2 LW
10.4 Minimum standard of performance						
N=0,8 WT + 0,2 LW Pass conditions: : N≥5; LW≥5						

Course responsible
Assoc.prof.dr.eng. Laura Darabant

Head of department
Prof.dr.ing. Rodica Potolea

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	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	12.

2. Data about the subject

2.1	Subject name					Digital Systems Design					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer					Prof. dr. eng. Creț Octavian Augustin – Octavian.Cret@cs.utcluj.ro					
2.4	Teachers in charge of applications					Dipl. eng. Lorena Dăian – lorenaiulia@yahoo.com Dipl. eng. Bogdan Popa – bogditupopa@gmail.com					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	exam	2.8	Subject category	DID/OB

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Digital Systems Design**	**2**	**-**	**2**	**-**	**28**	**-**	**28**	**-**	**74**	**130**	**5**

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the teaching plan	56	3.5	of which, course	28	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	25
Supplementary study in the library, online and in the field	17
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	17
Tutoring	6
Exams and tests	9
Other activities	0

3.7	Total hours of individual study	74
3.8	Total hours per semester	130
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Logic Design
4.2	Competence	At least one high level programming language (i.e. C or PASCAL)

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 competences

Professional competences	**C2 –** Designing hardware, software and communication components **C2.1 -** Describing the structure and functioning of computational, communication and software components and systems **C2.2 –** Explaining the role, interaction and functioning of hardware, software and communication components **C2.3 –** Building the hardware and software components of some computing systems using algorithms, design methods, protocols, languages, data structures, and technologies **C2.4 –** Evaluating the functional and non-functional characteristics of the computing systems using specific

	metrics **C2.5 –** Implementing hardware, software and communication systems
Cross competences	N/A

7. Discipline objectives (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 Digital Systems Design, in order to make them able to analyze, design and implement any complex digital system.
7.2	Specific objectives	To reach this goal, students will learn to: • Apply Digital System Design principles and descriptive techniques; • Understand various aspects of Automata Theory with applications in the field of Digital Systems Design; • Describe any digital system in VHDL; • Utilize programmable devices such as FPGAs and PLDs to implement digital systems.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	VHDL hardware description language – basic design units, signals	Blackboard presentation discussions	N/A
2	VHDL hardware description language – generics, constants, operators, data types, attributes		
3	VHDL hardware description language – sequential domain		
4	VHDL hardware description language – concurrent domain		
5	Creating testbenches for simulating and testing circuits in VHDL		
6	Automata (Finite State Machines) Theory – classification, definitions, formal models		
7	Microprogramming		
8	Microprogrammed Devices		
9	Designing Synchronous Automata		
10	Analysis and Design (Synthesis) of Asynchronous Automata (I)		
11	Analysis and Design (Synthesis) of Asynchronous Automata (II)		
12	Automata Identification		
13	Lossless Machines		
14	Linear Automata		

Bibliography

1. Digital Design Principles and Practices, John F. Wakerly, Prentice-Hall, 2000.
2. Automate programabile, Th. Borangiu, R. Dobrescu, Ed. Academiei, 1986.
3. Advanced Digital Logic Design Using VHDL, State Machines, and Synthesis for FPGA's, Sunggu Lee, Thomson-Engineering; 1 edition (April 25, 2005), ISBN 0534466028.
4. PowerPoint slides for VHDL and Automata Theory lectures + sets of problems for the individual study: http://users.utcluj.ro/~lucia/index.html

8.2. Applications (Laboratory)		Teaching methods	Notes
1	Introduction to VHDL	Practical work on test boards, FPGA boards, specialized software, blackboard	N/A
2	Basic design units in VHDL		
3	Signals, generics, constants, in VHDL		
4	Operators, data types in VHDL		
5	Attributes in VHDL		
6	Sequential domain. Processes in VHDL		

7	Sequential statements in VHDL	presentations, supplemental explanations and discussions	
8	Concurrent domain in VHDL		
9	Concurrent statements in VHDL		
10	Sub-programs in VHDL		
11	Testbenches in VHDL		
12	Standard and predefined packages in VHDL		
13	Mini-projects delivery		
14	Lab test		

Bibliography

1. Limbajul VHDL, Îndrumător de laborator, Ediţia a-3-a. O. Creţ, L. Văcariu, Ed. U.T. Press, Cluj-Napoca, 2007.
2. PowerPoint slides for VHDL and Automata Theory lectures + sets of problems for the individual study: http://users.utcluj.ro/~lucia/index.html

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	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		Problems solving abilities		Written Exam		60%
		Presence, (Inter)activity				
Homeworks		Problems solving abilities		Practical Evaluation		20%
Applications		Problems solving abilities		Practical Evaluation (hands-on)		20%
		Presence, (Inter)activity				
10.4 Minimum standard of performance						
• Modeling and solving typical Digital Systems Design problems using the domain-specific formal apparatus						

Course responsible
Prof. dr. eng. Creţ Octavian Augustin

Head of department
Prof.dr.ing. Rodica Potolea

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	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	13.

2. Data about the subject

2.1	Subject name					Data Structures and Algorithms					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer					As. dr. eng. Marius Joldoş – Marius.Joldos@cs.utcluj.ro					
2.4	Teachers in charge of applications					S.L.dr.mat. Iulia Costin – Iulia.Costin@cs.utcluj.ro As.dr. eng. Andrei Vătavu – Andrei.Vatavu@cs.utcluj.ro					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	exam	2.8	Subject category	DID/OB

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Data Structures and Algorithms**	**2**	**-**	**2**	**-**	**28**	**-**	**28**	**-**	**74**	**130**	**5**

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the teaching plan	56	3.5	of which, course	28	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	27
Supplementary study in the library, online and in the field	5
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	10
Tutoring	7
Exams and tests	5
Other activities	0

3.7	Total hours of individual study	74
3.8	Total hours per semester	130
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	Computer Programming course
4.2	Competence	Programming in C

5. Requirements (where appropriate)

5.1	For the course	
5.2	For the applications	

6. Specific competences

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 **C1.4 –** 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

Cross competences	N/A

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

7.1	General objective	To acquaint the students with a wide range of fundamental algorithms and data structures. To learn how to use general methods for development of algorithms, as well as mathematical tools for analyzing the correctness and efficiency of algorithms.
7.2	Specific objectives	• To choose the appropriate data structure for modelling a given problem. • To compare and contrast the cost and benefits of dynamic and static structure implementations. • To compare iterative and recursive solutions for elementary problems. • To determine when a recursive solution is appropriate for a problem. • To determine the time and space complexity of simple algorithms and recursively defined algorithms. • To design and implement algorithms using development techniques such as: greedy, divide-and-conquer, backtracking, dynamic programming, branch and bound. • To write C programs that use data structures such as: arrays, linked lists, stacks, queues, trees, hash tables, and graphs. • To implement in C the most common sorting algorithms. • To solve problems using the fundamental graph algorithms, including depth-first and breadth-first search, topological sort, minimum spanning tree algorithm, and single-source shortest path.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Introduction. Problem solving. Measuring time efficiency of algorithms – Big-Oh notation. Stack, Queue, List ADTs.	Lectures, demos and discussions	Uses a video-projector
2	Trees – definitions, traversals. ADT Tree. Implementations. Binary Search Trees. Optimal Trees		
3	Sets ADTs and Implementations. Dictionary ADT. Hash Tables. Mapping ADT. Priority Queue ADT.		
4	Advanced Set Representation Methods. AVL trees. 2-3 Trees. Union-Find Set ADT.		
5	Directed Graphs. Definitions. Representations. ADT's. Single Source Shortest Path Problem (Dijkstra, Bellman-Ford, Floyd-Warshall). Traversals for DGs. Parenthesis Lemma. DAGs. Strong Components. Topological Sort		
6	Undirected Graphs. Terminology. Free Trees. Graph Representations. Minimum Spanning Trees (algorithms: Prim, Kruskal). Graph Traversals (depth-first, breadth-first). Articulation points & Biconnected Components. Graph Matching.		
7	Algorithm Analysis. Correctness of Algorithms. Efficiency of Algorithms		
8	Algorithm Design techniques I. Divide-and-Conquer. Dynamic Programming		
9	Algorithm Design techniques II. Brute Force Algorithms. Greedy Algorithms. Backtracking		
10	Algorithm Design techniques III. Minimax. Alpha-Beta Prunning. Search Tree Strategies (backtracking revisited, branch and bound). Local Search.		
11	Sorting. Simple comparison sorting schemes (bubble, selection, insertion). HeapSort. QuickSort. Decision Tree model. Counting Sort, Radix Sort, Bucket Sort. Criteria for Sorting Algorithm Selection.		
12	Data Structures and Algorithms for External Storage I. External Sorting BTrees		
13	Data Structures and Algorithms for External Storage I. B+Trees		
14	Review		

Bibliography

1. Aho, Hopcroft, Ullman. Data Structures and Algorithms, Addison-Wesley, 427 pages, 1987.
2. Cormen, Leiserson, Rivest, Stein: Introduction to Algorithms, 2nd edition. MIT Press / McGraw Hill, 1028 pages,

2001.
3. Preiss, Bruno. Data Structures and Algorithms with object-Oriented Design Patterns in C++, John Wiley and Sons, 660 pages, 1999 (freely available on the Web)

8.2. Applications (Laboratory)		Teaching methods	Notes
1	Singly Linked Lists. Stacks. Queues	Tutoring, discussions, and assisted program development	PCs equipped with MinGW C and Code-blocks IDE
2	Circular Lists. Circular Queues		
3	Doubly Linked lists		
4	Arbitrary Trees		
5	Binary Search Trees		
6	Hash Tables		
7	Graph Representations and Traversals		
8	Graph Processing Algorithms		
9	Algorithm Design I. Greedy and Backtrack		
10	Algorithm Design II. Divide & Conquer and Branch and Bound		
11	Algorithm Design III. Dynamic Programming and Heuristics.		
12	Fundamental Sorting Algorithms		
13	Comparison of Algorithm Performance (estimated vs. practical) I		
14	Comparison of Algorithm Performance (estimated vs. practical) II		

Bibliography

1. Moodle course Web Site available at https://193.226.5.110

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

10. Evaluation

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		The understanding of the concepts taught and the ability to solve problems		Written exam		60%
Applications		Quality of the assigned applications		Analysis and evaluation of the solved assignments		40%

10.4 Minimum standard of performance

Correct solutions for min. 60% of the exam topics and applications

Course responsible
As. dr. eng. Marius Joldoş

Head of department
Prof.dr.ing. Rodica Potolea

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	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	14.

2. Data about the subject

2.1	Subject name					Foreign Language II (English, French, German)					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer										
2.4	Teachers in charge of applications					Asist. drd. Ema Adam, adam@lang.utcluj.ro Asist.drd. Monica Negoescu, Negoescu@mail.utcluj.ro Asist.dr. Sanda Păduręţu Sanda.Paduretu@lang.utcluj.ro Asist.dr. Maria Olt maria.olt@lang.utcluj.ro Asist.dr. Cecilia Policsek cecilia.policsek@lang.utcluj.ro Asist.dr. Florina Codreanucodreanu.florina@gmail.com Lect. dr. Mona Tripon Mona.Tripon@lang.utcluj.ro Asist. drd. Aurel BărbînţăAurel.Barbinta@lang.utcluj.ro Asist.dr. Adina Forna adina.forna@yahoo.com					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	Colloquium	2.8	Subject category	DC/OB

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Foreign Language II (English, French, German)**	**-**	**2**	**-**	**-**	**-**	**28**	**-**	**-**	**24**	**52**	**2**

3.1	Number of hours per week	2	3.2	of which, course	-	3.3	applications	2
3.4	Total hours in the teaching plan	28	3.5	of which, course	-	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	8
Supplementary study in the library, online and in the field	4
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	8
Tutoring	
Exams and tests	4
Other activities	

3.7	Total hours of individual study	24
3.8	Total hours per semester	52
3.9	Number of credit points	2

4. Pre-requisites (where appropriate)

4.1	Curriculum	A2/B1 according to the Common European Framework for Languages
4.2	Competence	Team work

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	Seminar attendance compulsory

6. Specific competences

Professional Competences	N/A
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 objectives (as results from the *key competences gained*)

7.1	General objective	Development of communicative competence in an engineering professional context
7.2	Specific objectives	- Mastering basic vocabulary and language structures typical of sciences studied - Development of the skill of writing short technical texts and of presenting them

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1			
Bibliography			
8.2. Applications (Seminars)		Teaching methods	Notes
1	Engineering and automation.	Conversation, improving the reading, writing, speaking, listening skills, working in pairs and groups	
2	Microelectronics and nanotechnology		
3	Computers in industry		
4	Design of products. Definition		
5	Procedures		
6	Systems of communication		
7	Monitoring		
8	Types of networks, The Internet		
9	Engineers and managers		
10	The responsibilities of the manager		
11	Companies		
12	Organisations and their culture		
13	Final test		
14	Final test		

Bibliography

1. Munteanu, S-C**.** (2004) *Reading skills For Engineering Students***,** UTPress, Cluj-Napoca.
2. Granescu, M. et. al. *Students' Grammar Of English*, UTPress, Cluj-Napoca, 2001.
3. Bonamy, D. *Technical English 1-2*, Longman, London
4. Tripon, Mona: *Faszination Technik. Sprachtrainer Deutsch für Studenten technischer Universitäten*. Editura Napoca Star, Cluj-Napoca, 2012. ISBN 978-973-647908-3
5. Odou M., Informatique.com, Clé international, 2010
6. Constantin Paun, Limba franceză pentru ştiinţă şi tehnică, EdituraNiculescu, Bucuresti, 1999
7. Vlaicu, R., *Grammaire du français scientifique et technique*, Cluj-Napoca, UTPRESS, ISBN 2007 973-662-2258-4.

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 help students in a more flexible integration in the labour market, and have improved personal development. The introduction in the language for specific purposes will facilitate reading more documents in the field of study.

10. Evaluation

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course						
Applications		Assignments and tests are corrected and marked if submitted in due time. The undergraduate will be allowed to sit in the final test if he/she attends seminars in a proportion of 80% of the time.		Written test, Oral test		100%.
10.4 Minimum standard of performance						
The undergraduate will be allowed to sit in the final test if he/she attends seminars in a proportion of 80% of the time. Final score: attendance= 1pct, written test =5 pct, oral test =4 pct. Pass score is received if 60 % of both tests is produced by the undergraduate.						

Head of department
Prof.dr.eng. Rodica Potolea

Course responsible
Conf.univ.dr. Marinela Grănescu

Teachers in charge of applications

Asist. drd. Ema Adam,
Asist.drd. Monica Negoescu,
Asist.dr. Sanda Pădureţu
Asist.dr. Maria Olt
Asist.dr. Cecilia Policsek
Lect. dr. Mona Tripon
Asist. drd. Aurel Bărbînţă
Asist. dr. Forina Codreanu
Asist. dr. Adina Forna

SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	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	15.

2. Data about the subject

2.1	Subject name					Sport II					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer					Assoc. prof. Marin Dumitrescu, PhD, marind@efs.utcluj.ro					
2.4	Teachers in charge of applications					Assoc. prof.Viorel Moisin, PhD, Lecturer Alina Rusu, PhD, Lecturer Mihai Olanescu, PhD student, As. Prof. Bogdan Tanase					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	verification	2.8	Subject category	DC/OB

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Sport II**	**-**	**2**	**-**	**-**	**-**	**28**	**-**	**-**	**-**	**28**	**1**

3.1	Number of hours per week	2	3.2	of which, course	-	3.3	applications	2
3.4	Total hours in the teaching plan	28	3.5	of which, course	-	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	
Supplementary study in the library, online and in the field	
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	
Tutoring	
Exams and tests	
Other activities	

3.7	Total hours of individual study	-
3.8	Total hours per semester	28
3.9	Number of credit points	1

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	physically fit, necessary skills, knowledge, skills and abilities gained in classes I-XII

5. Requirements (where appropriate)

5.1	For the course	Muncii Blvd, no.103-105, Cluj-Napoca, Politehnica Swimming Complex
5.2	For the applications	Sports Hall, Muncii Blvd, no.103-105, Cluj-Napoca Outdoor and Fitness - Complex Polytechnic

6. Specific competences

Professional competences	N/A

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 objectives (as results from the *key competences gained*)

7.1	General objective	• Harmonious physical development • Maintain health at a high standard
7.2	Specific objectives	• Capacity development effort • Learning and motor skills development • Education volitional qualities

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1			
Bibliography			
8.2. Applications (Seminars)		Teaching methods	Notes
1-2	Improvement and maintenance of health, athletic ability and fitness	interactive	
3-4	Improving tehnical exercises learned before using tactic tasks		
5-6	Automatization of technical and tactics in game conditions (competition).		
7-8	Learning regulations of different sports, to be able to practice and organize leisure-time sport activity.		
9-10	Necessary skills to practice independent physical activity		
11-12	Improving the drills, combinations, schemes in different sport games		
13-14	Close the school situation by passing physical test		

Bibliography

1. Curs de Educaţie fizică – Litografiat UTC-N
2. Dezvoltare fizică generală pentru studenţi – UTC-N
3. Cultură fizică pentru tineret - UTPRES

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

Sports activity there in the curriculum of universities and faculties in the country and abroad. Content is consistent with the expectations of professional associates and employers epistemic community representative of the afferent program.

10. Evaluation

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		-		-		
Applications		70% + 30% Frequency Active Participation, sports skills and advances		By passing control samples		
10.4 Minimum standard of performance						

Course responsible
Assoc. Prof. Marin Dumitrescu, PhD

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	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	100.

2. Data about the subject

2.1	Subject name					Fundamentals of Electronic Circuits					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer					Prof. Gabriel OLTEAN, PhD					
2.4	Teachers in charge of applications					Assist. prof. Emilia Şipoş, PhD					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	Colloquium	2.8	Subject category	DID/FAC

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Fundamentals of Electronic Circuits**	**2**	**1**	**1**	**-**	**28**	**14**	**14**	**-**	**74**	**130**	**5**

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the teaching plan	56	3.5	of which, course	28	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	28
Supplementary study in the library, online and in the field	12
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	28
Tutoring	3
Exams and tests	3
Other activities	-

3.7	Total hours of individual study	74
3.8	Total hours per semester	130
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	Basic knowledge about electrical signals, electric circuits, passive electronic components

5. Requirements (where appropriate)

5.1	For the course	Cluj-Napoca
5.2	For the applications	Cluj-Napoca

6. Specific competences

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 **C1.3 –** 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

Cross competences	N/A

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

7.1	General objective	Developing the competences regarding the use of electronic devices, regarding the use, analysis and (re)design of fundamental electronic circuits.
7.2	Specific objectives	1. Recognizing and understanding basic concepts that are specific to electronic devices, fundamental electronic circuits. 2. Developing skills and abilities necessary for the use of electronic devices in simple electronic circuits 3. Developing skills and abilities necessary for the use of electronic circuits 4. Developing skills and abilities for the analysis and (re)design of electronic circuits.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Introduction. Fundamentals: electrical signals, relations and theorems for electric circuits.	Presentation, euristic conversation, exemplification, problem presentation, teaching exercise, case study, formative evaluation	Use of .ppt presentation, projector, blackboard
2	Diodes. Models for switching diode. Switching DR circuits. Switching DC circuits. Single-phase rectifiers with capacitive filter. Zener Diode. LED		
3	Operational amplifier (op amp). Op-amp terminals. Op-amp operation. Ideal op amp. Modes of use.		
4	Simple op-amp comparators. Inverting and noninverting comparators. Voltage transfer characteristic. Waveforms		
5	Positive feedback op-amp comparators. Inverting and noninverting comparators. Voltage transfer characteristic. Waveforms		
6	Negative feedback op-amp amplifiers. Inverting, noninverting amplifiers: voltage transfer characteristic, waveforms, gain, input and output resistances.		
7	Op-amp applications: summing amplifiers, differential amplifiers, voltage domain conversion circuits, integrator and differentiator; precision rectifier.		
8	Transistor digital circuits. MOSFET Digital Circuits. Bipolar digital circuits. Noise margins.		
9	DC voltage regulators. Parametric regulators. Linear voltage regulators with op amp. Increasing the output current. Over - current and short - circuit protection.		
10	Integrated voltage regulators. The 723 voltage regulator. Three – terminal fixed regulator. Switching voltage regulators.		
11	Sinusoidal oscillators. Oscillation criterion. RC oscillators. Op – amp and Wien bridge oscillators. Automatic control of the amplitude. Op amp and RC ladder network oscillator.		
12	Nonsinusoidal oscillators. Astable multivibrators. Astable multivibrator with one op – amp. Astable multivibrator with an integrator and a comparator. Quartz – crystal clock generator. LM555 timer.		
13	Power amplifiers. Amplifier classes. Class B amplifiers. Operating principle, VTC, crossover distortions, waveforms, powers, efficiency.		
14	Class AB amplifiers. Biasing using diodes. Biasing using V_{BE} multiplier. Overcurrent protection. Use of compound transistors with higher current gain.		

Bibliography

1. Oltean, G.,Electronic Devices, Editura U.T. Pres, Cluj-Napoca, ISBN 973-662-220-7, 2006; 317 pag.
2. Oltean, G., Circuite electronice, UT Pres, Cluj-Napoca, 2007, ISBN 978-973-662-300-4, 203 pag.
3. Sedra, A. S., Smith, K. C., Microelectronic Circuits, Fifth Edition, Oxford University Press, ISBN: 0-19-514252-7, 2004.

8.2. Applications		Teaching methods	Notes
Seminars		Didactic and	Use of laboratory
1	Fundamentals		
2	Diodes		

3	Op-amp comparators	experimental proof, didactic exercise, team work	instruments, experimental boards, computers, magnetic board, blackboard
4	Op-amp amplifiers. Logic Circuits with Transistors		
5	Voltage Regulators. Integrated Voltage Regulators		
6	Sinusoidal Oscillators. Nonsinusoidal oscillators		
7	Power Amplifiers. Review		
Laboratory			
1	Lab instrumentation		
2	Applications of DR circuits		
3	Op-Amp voltage comparator		
4	Op-Amp basic amplifier		
5	LM 7805 voltage regulator		
6	Class B amplifier		
7	Laboratory test		

Bibliography

1. Oltean, G., Sipos, Emilia, Miron, C., Ivanciu, Laura, Laboratory Manual for Electronic Devices, Editura UTPRESS, Cluj Napoca, 2010, ISBN 978-973-662-542-8, 90 pag.
2. Şipoş, Emilia, Oltean, G., Miron, C., Ivanciu, Laura, Gordan, Mihaela, Fundamental Electronic Circuits. Laboratory Manual, UT Pres, Cluj-Napoca, 2009, ISBN 978-973-662-503-9; 91 pag

On – line references

1. Oltean, G., Fundamentals of Electronic Circuits, PowerPoint slides,
http://www.bel.utcluj.ro/dce/didactic/fec_aai/fec_aai.htm
2. Oltean, G, et al., Fundamentals of Electronic Circuits. Seminars and laboratories,
http://www.bel.utcluj.ro/dce/didactic/fec_aai/fec_aai.htm

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

The discipline content and the acquired skills are in agreement with the expectations of the professional organizations and the employers in the field, where the students carry out the internship stages and/or occupy a job, and the expectations of the Romanian Agency for Quality Assurance (ARACIS).

10. Evaluation

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		The level of theoretical knowledge and practical skills acquired for the analysis and (re)design of electronic circuits		- 3 formative evaluation tests (problem solving) - Summative evaluation written exam (theory and problems)		- T, max 10 pts. 10% - E, max 10 pts. 60%
Applications		The level of the abilities acquired for problem solving and experimental analysis of electronic circuits		- Continuous formative evaluation		- L, max. 10 pts. 20% - S, max. 10 pts. 10%
10.4 Minimum standard of performance						
$L \geq 5, E \geq 4$				$0,6E+0,1T+0,2L+0,1S \geq 4.5$		

Course responsible
Prof. Gabriel OLTEAN, PhD

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	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	101.

2. Data about the subject

2.1	Subject name					Chemistry					
2.2	Subject area					Computer Science and Information Technology					
2.3	Course responsible/lecturer					Assoc. prof. chem. Mihaela-Ligia Unguresan; Mihaela.Unguresan@chem.utcluj.ro					
2.4	Teachers in charge of applications					Assoc. prof. chem. Mihaela-Ligia Unguresan; Mihaela.Unguresan@chem.utcluj.ro					
2.5	Year of study	I	2.6	Semester	2	2.7	Assessment	exam	2.8	Subject category	DF/FAC

3. Estimated total time

Sem.	Subject name	Lecture	Applications			Lecture	Applications			Individual study	TOTAL	Credit
		[hours / week.]				[hours / semester]						
			S	L	P		S	L	P			
2	**Chemistry**	**2**	**-**	**2**	**-**	**28**	**-**	**28**	**-**	**48**	**104**	**4**

3.1	Number of hours per week	4	3.2	of which, course	2	3.3	applications	2
3.4	Total hours in the teaching plan	56	3.5	of which, course	28	3.6	applications	28

Individual study	Hours
Manual, lecture material and notes, bibliography	14
Supplementary study in the library, online and in the field	10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	10
Tutoring	8
Exams and tests	6
Other activities	0

3.7	Total hours of individual study	48
3.8	Total hours per semester	104
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	General knowledge of chemistry in high school
4.2	Competence	Arithmetics, Algebra, Mathematical analysis; Physics.

5. Requirements (where appropriate)

5.1	For the course	-
5.2	For the applications	-

6. Specific competences

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 **C1.3 –** Building models for various components of computing systems **C1.5 –** Providing a theoretical background for the characteristics of the designed systems

Cross competences	N/A

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

7.1	General objective	Throughout the semester, this course will touch on many different aspects in the field of chemistry. Each one of you should gain knowledge in the field and better appreciate the connection between chemistry and everyday life and more specifically how chemistry is relevant to biological processes and the health industry. Upon successful completion of this course, students will be able: - to classify basic forms of matter; - to perform mathematical unit conversions; - to describe atomic structure and how it affects the structure of the Periodic Table of Elements, apply basic concepts of chemical bonding and predict simple molecular formulas, and write and analyze chemical formulas; - to know the interest materials in the electro techniques, electronics, communications, automation and computers: metals and alloys, plastics and semiconductors; - to monitor the automated methods for the implementation of fixing the coefficients of chemical reactions; - to predict, depict and describe: gas behavior, basic properties of chemical bonding, molecular geometry and theory of bonding, liquids and intermolecular forces; - to deepen the phenomena of electrolysis, electroplating, cathodic deposition, the phenomena of corrosion and corrosion protection.
7.2	Specific objectives	- To know how to use the apparatus and glassware from the chemistry laboratory, how to measure temperature, pressure, concentration, titer or the purity of some substances or solutions; how to analyze the experimental chemical data obtained. - To follow the application of the methods for the establishment of the coefficients of chemical reactions. Understand and apply concepts to solve problems using: matter and measurement, atoms, molecules and ions, stoichiometry & calculations/chemical formulas equations - To know how to measure the electrode potential, the pH of a solution of metal. After reading discipline students will be able to: - analyze the chemical substances in a qualitatively and quantitatively mode; - know how to interpret graphical results obtained as a result of the kinetic study of chemical reactions, of the thermodynamics of a chemical process.

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Fundamental concepts in chemistry.(general presentation; chemistry classification; the distribution of elements in nature, chemical compound, substance quantity)	Lecture by teacher; Class discussion conducted by teacher; Ppt. Presentation; Tutorials; Coaching: special assistance provided for students having difficulty in the course.	
2	The periodical system of elements (atom components; radioactivity; periodic system structure; physical and chemical properties)		
3	Chemical bonds (ionic bond, covalent polar and unpolar bond; metallic bond; Van der Waals, dipole-dipole, ion-dipole, hydrogen bonds)		
4	The gas state (law gases; real gases; virial coefficients; Van der Waals equation)		
5	Liquid state. Solid state. (viscosity coefficient; vapor pressure; surface tension; crystalline substances, amorphous solid; crystalline systems; state transformations)		
6	Metals (nonferrous, fusible; precious metals; superconductivity)		
7	Ceramic materials (history; ferromagnetic, ferroelectrics, piezoelectric materials; refractors; radio ceramics)		
8	Semiconductors (quantum mechanics, orbital functions; Schrödinger equation; bands formation; semiconductor combinations; impurification; Schottky and Frenkel defects; integrate circuits)		
9	Thermodynamics concepts (thermodynamic system state; state variables;		

	thermodynamic equilibrium; first and second laws of thermodynamics and their consequences)		
10	Thermochemistry (calorimetry; Lavoisier-Laplace's law, Hess's law; applications)		
11	Chemical equilibrium (masses action law; chemical equilibrium in homogeneous systems; relations between K_p, K_c and K_x; heterogeneous chemical equilibrium; dimensions characteristic to chemical equilibrium; applications)		
12	The kinetics of chemical reactions (reaction rate; order rate (0, 1, 2, 3, fractional); reaction mechanism; kinetic simple reaction and complex (successive, parallel, opposite, with preequilibrium); reaction in chain; explosions)		
13	Electrochemistry (electrolytic dissociation; electrodes; potentials of electrodes; electrolysis; Butler-Volmer equation; galvanic cells; accumulators)		
14	Metal corrosion. Anticorrosion protection General terms: influencing factors in the process of corrosion; monitoring methods based on thermodynamic stability of the metal; corrosion protection methods.		

Bibliography

1. M.-L. Ungureşan, Delia Maria Gligor, *General Chemistry*, Ed. UTPRESS, Cluj-Napoca, ISBN: 978-973-662-707-1, 2012, pg. 490.
2. M.-L. Ungureşan, L. Jantschi, *Thermodinamics and chemical kinetics*, Ed. Mediamira, Cluj-Napoca, 2005.
3. L. Jantschi, M.-L. Ungureşan, *Special Chapters of Chemistry for automatics*, Ed. U.T. Pres, Cluj-Napoca, 2002.
4. T. Coloşi, M. Abrudean, M.-L. Ungureşan, V. Mureşan, *Numerical Simulation Method for Distributed Parameters Processes using the Matrix with Partial Derivatives of the State Vector*, Ed. Springer, ISBN 978-3-319-00013-8(Print); 978-3-319-00014-5 (Online), 2013, pg. 343.

8.2. Applications (Laboratory)		Teaching methods	Notes
1	Presentation of work. Safety norms. Analytical balance. Chemical laboratory utensils, glassware and laboratory equipment	Using and organising techniques, apparatus and materials; Observing, measuring and recording; Handling experimental observations and data; Planning and evaluating investigations.	Mathematical modeling and numerical simulations, experimental apparatus.
2	Acid-base titration. Determination by titration of acetic acid content of vinegar		
3	Determination of molar mass of carbon dioxide		
4	Hydrated Ionic Compound		
5	Caffeine isolation		
6	Hydrolyze		
7	Determination of enthalpy, entropy and free enthalpy at different temperatures		
8	The heat of hydration of copper sulfate		
9	Thermal analysis		
10	Acidity of solutions. Conductivity measurement		
11	Reaction rate. The kinetic of simple and complex reactions		
12	Activity series of metals		
13	Cu spontaneous deposition. Protection of metals against corrosion		
14	Metal corrosion		

Bibliography

1. M.-L. Ungureşan, L. Jantschi, D. Gligor, *Educational* A*pplications of Chemistry on the Computer*, Ed. Mediamira, Cluj-Napoca, 2004.
2. A. Mesaroş, L. Bolunduţ, M.-L. Ungureşan, *General Chemistry Experiments*, Ed. Galaxia Gutenberg, Colecţia Tehne 5, ISBN: 978-973-141-228-3, 2010, pg. 197.
3. L. Bolunduţ, A. Mesaroş, M.-L. Ungureşan, *Electrochemistry Experiments*, Ed. Galaxia Gutenberg, Colecţia Tehne 1, 2009, pg. 110.
4. M.-L. Ungureşan, E. M. Pică, H. Naşcu, L. Marta, *Chemistry exercises*, Ed. Mediamira, Cluj-Napoca, 1999.

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

Collaborations with: INCDTIM Cluj, Faculty of Chemistry and Chemical Engineering, UBB Cluj, Faculty of Environmental Science and Engineering UBB.

10. Evaluation

Activity type	10.1	Assessment criteria	10.2	Assessment methods	10.3	Weight in the final grade
Course		Written Examination		Multiple choice evaluation - 2 hr.		80%

Applications		Laboratory test		The written test -1h		20%
10.4 Minimum standard of performance						
• Exam grade ≥ 5 • Laboratory grade ≥ 5						

Course responsible
Assoc. prof. chem. Mihaela Unguresan

Head of department
Prof.dr.eng. Rodica Potolea