

Transilvania University of Braşov, Romania

Study program: Computer Science – Distance learning

Faculty: Mathematics and Computer Science

Study period: 3 years (bachelor)

1st Year

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Mathematical Analysis	AP01_ID	6	42	8	20	

Course description (Syllabus): The real number system; topological notions. Sequences and series of real numbers. Sequences and series of functions; power series. Structure of the space R^n ; euclidian norm and distance. Limits and continuity of functions of several variables; linear functions. Differential calculus. Relative extrema of differentiable functions. Integral calculus: improper integrals, line integrals, multiple integrals

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Algebraic Background of Informatics	AG13_ID	5	28	8	20	

Course description (Syllabus): Functions and relations, Binary operations, Free semigroups, Groups, Permutations, Rings and fields, Tropical geometry, Matrices, Vector spaces, Linear codes.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Basic Algorithms	IT11_ID	6	28	4	10	28

Course description (Syllabus): Introductory elements. Components of an algorithm. Pseudocode and conventions. Variables; Constants. Instructions. Visibility of variables in an algorithm, global / local variables. Subprograms. Recursion; Analysis of Algorithm Efficiency. Computing complexity on various issues; Algorithms of Elementary Data Structures (List, Stack, Queue - Implementations and Complexity); Search and sort algorithms; Divide et Impera algorithms; Greedy algorithms; Dynamic programming algorithms; Text Processing algorithms; Comparative analysis of implementations and programming methods; Intelligent Algorithms with discussion of the basic notions of Artificial Intelligence - research / case study on several chosen issues. In the seminar: solving different types of problems. In the laboratory: implementation of the discussed algorithms

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Basic Programming	IT12_ID	6	28			28

Course description (Syllabus): Getting familiar with the C language. Generic programming using macros. Understanding procedural programming. Pointers. Memory allocation and management. Developing C applications oriented on functions.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Mathematical Computational Logic	IT13_ID	5	28	4	10	

Course description (Syllabus): Binary, decimal, octal, hexadecimal number systems; Conversions among bases; Addition, subtraction, multiplication and division of base b numbers, Representation of integer numbers (Sign and magnitude, One's complement, Two's complement); Addition, subtraction and multiplication of two's complement numbers; Fixed point numbers; Floating Point Numbers. The IEEE 754 Floating Point Standard (Formats and Rounding), Properties of Boolean Algebra; Truth Table; Boolean Functions. The disjunctive normal form and conjunctive normal form; Minimization of Boolean functions: Veitch-Karnaugh Maps, Quine McCluskey's method; Combinatorial circuits; The Algebra of GF(2). The operational and function domains; Reed-Müller expansions; Generalized Reed-Müller expansions.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
English Language (1)	MIE1_ID	2	14	4	10	

Course description (Syllabus): The main objective of English language seminars from the second semester is that of consolidating and improving the English language knowledge acquired by students up to that point. This time the focus is no longer grammar but students' ability to express themselves as fluently and as accurately as possible by means of using a wide range of vocabulary items especially from the field of computer science. To this end special material providing them with texts and exercises covering various issues of interest from their future professional activity will be used. Topics such as operating systems, computer programming, viruses, modern gadgets, etc will be approached.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Linear Algebra, Analytical and Differential Geometry	AG03_ID	5	28	8	20	

Course description (Syllabus): Basic notions of linear algebra (vectors, calculus with vectors, dependence and independence linearity, bases, dimensions, linear applications, bilinear forms, and quadratic forms, scalar products and other products). Matrix representation from linear algebra (of vectors, linear applications, bilinear forms and quadratic forms, of vectors products). Basic notions of analytical geometry (point, line, conic, plane, quadric and its equations, frame, relative positions, angles, distances). To apply techniques from linear algebra in analytical geometry, the knowledge of basic elements from differential geometry of curves and surfaces. Explain the necessity for use specific techniques of linear algebra and analytical geometry in mathematics, physics, technique and informatics. Explain the use of specific techniques of linear algebra and analytical geometry (in particular and in details). Matrix interpreting the abstract definitions from linear algebra. Mathematics significations interpreting of some calculated elements. Use theoretical knowledge for problem solving. Interpreting algebraic and geometric some notions related to informatics.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Computer Systems Architecture	IT21_ID	5	28	4	10	14

Course description (Syllabus): The Computer Architecture content attempts at using theoretical computer science fundamentals for describing the modern computers' structure and organization, in order to efficient value the hardware characteristics in the software programming solutions; introducing the main concepts in computer architecture; understanding the basic concepts in modern computer architecture; identifying and distinguishing between the hardware and software components of a given computer system; understanding the inner-workings of modern computer systems, their evolution and the present aspects about the hardware-software interface; enabling students to design and recognize the structure of a basic computer system, including the design of the I/O subsystem, the memory system and the processor data path and control; presenting how a personal computer system operates. Appropriate working with the specific concepts of the computer architecture are focused and specific set of basic assembly language programs for the specific model of processor in use are developed.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Object Oriented Programming 1	IT22_ID	6	28			28

Course description (Syllabus): Getting familiar with the C++ language. Understanding OOP concepts. Developing OOP applications in C++

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Data Structures	IT23_ID	6	28			28

Course description (Syllabus): Understanding and learning data structures, used in efficiently manipulating and keeping dynamic sets. Getting familiar with linear data structures like linked lists, stacks, queues, hash-tables and using them for real problems. Understanding the concepts of rooted trees, binary trees search trees and self-balancing trees, learning to implement and use these structures. Learning to discuss the efficiency of different data structures. Augmenting data structures to increase efficiency of operations. Understanding persistence in data structures. Learning more complex data structures, like quad-trees, used in advanced programming. Getting familiar with the STL library of C++, which implements some of the main data structures discussed in the theoretical part.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Operating Systems	IA21_ID	6	28			28

Course description (Syllabus): Assimilating the basic concepts of operating systems. Knowledge of theoretical concepts of operating systems Windows and Linux. Knowledge of interface elements of operating systems. Developing the skills to use resources provided by operating systems in applications development. To use MSDOS, Windows and Linux Interfaces. To write command files / scripts under MSDOS / Linux. To develop applications in C that use the resources offered by operating systems. To use specific algorithms of operating system.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
English Language (2)	MIE2_ID	2		8	20	

Course description (Syllabus): The English language course attempts at revising, consolidating and improving grammar points at advanced level. It also provides opportunities for students to practice grammar structures and express themselves during the seminars. To this end, each lecture presents a theoretical issue which synthesizes essential information from outstanding books in English morphology, followed by a wide range of exercises which will be approached during the following seminar. The exercises are designed in such a way so that students can solve them both individually and in pairs, during the seminars. The aim of this course is to provide students with comprehensive grammar structures linked to the following issues: subjunctives and conditional, reported speech, adjectives and adverbs, nouns and articles, non-finite moods, linking clauses and emphasis.

2nd Year

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Scientific and professional communication	AG14_ID	5	28	8	20	

Course description (Syllabus): Principles of academic writing, Approaches for academic and scientific writing, Types of scientific papers: essay, review, bachelor, dissertation, thesis, Citation rules, Write a scientific article - practical approach, Presentation of scientific papers, Publication of scientific papers.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Graph algorithms	IT31_ID	6	28	4	10	14

Course description (Syllabus): The students must learn how to use the basic knowledge about graph algorithms that are necessary for studying other discipline and practical applying after graduation. Modelling practical problems using graph algorithms.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Formal Languages and Compilers	IT32_ID	6	28	4	10	14

Course description (Syllabus): Main concepts in formal languages: grammars, Chomsky hierarchy, deterministic finite automata, nondeterministic finite automata, pumping lemma, Myhill-Nerode theorem, regular languages, regular expressions, finite automata with lambda-transitions, context-free grammars and languages, push-down automata. Main concepts in compiler theory: stages of a compiler, lexical analysis, syntactic analysis, semantic analysis, LEX and YACC. In the seminary: solving problems. In the laboratory: implementing automata, grammars and using LEX and YACC for compiler construction.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Programming tools environments	IA31_ID	6	28			28

Course description (Syllabus): Introductory concepts; Fundamental laws. Parallel computing; Introduction to cloud computing, typologies; Amazon Web Services. Google Compute Engine. HP Cloud Compute; IBM Smart Cloud Enterprise. Amazon S3. Google Cloud Storage. Host Europe Cloud Storage; Google App Engine. AWS Elastic Beanstalk; Private Cloud Infrastructure Services. Private platform services; Cluster computing; Grid computing; Peer to peer and Cloud Computing; MapReduce/Hadoop; Service Oriented Architectures. Web services.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Databases	IT33_ID	5	28			28

Course description (Syllabus): Differences between logical and physical views of data, Data Modelling, Logical Database Design, ANSI / X3 / SPARC model, Entity Relationship Model, Design Rules for Data Modelling, Main steps in the logical program design, Modes of operation and their symbolic presentation, Case Study: Manage Owners Association, SQL commands, Database implementation Examples: Library management, restaurant management, employee management, management of a medical cabinet, management of a CD collection, resource management of a computer network, etc.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
English Language (3)	MIE3ITR_ID	2	14	4	10	

Course description (Syllabus): The main objective of English language seminars from the second semester is that of consolidating and improving the English language knowledge acquired by students up to that point. This time the focus is no longer grammar but students' ability to express themselves as fluently and as accurately as possible by

means of using a wide range of vocabulary items. To this end special material providing them with texts and exercises covering various artistic, cultural, political and social issues will be used. Apart from the emphasis placed on developing students speaking skills, the seminars will also focus on students' ability to communicate in writing. They will be taught to develop and organize their ideas logically and coherently, while at the same time using the language correctly.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Automaton, calculability, complexity	IT41_ID	6	28	4	10	14

Course description (Syllabus): Types of automata and formal languages (4 Hours): Deterministic / non deterministic finite automata and regular expressions / languages, Pushdown Automata and context free languages. Theory of computability (12 Hours): Turing machines and variants, Algorithms and some Hilbert's problems, Decidability problems in formal languages, The Halting problem, Non-decidability problems in formal languages Theory of Complexity (12 Hours): Measures of complexity using the big-O and small-o notations, P and NP problems, Theoretical elements for the NP complexity class

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Distributed databases	IT42_ID	6	28			28

Course description (Syllabus): Introduction to distributed databases, DDBMS architectures, Designing Distributed Databases, Vertical and horizontal fragmentation of relations and fairness requirements, Tree representation of the fragmentation of relations, Transparent Distributed Databases, Two-phase commit protocol, Deadlock, Replicated data synchronization, Production and use phases of the data warehouse (Data Warehouse), Events and processing rules based on data

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Visual programming environments	IA43_ID	6	28			28

Course description (Syllabus): NET framework architecture. Object oriented programming in C#. Collections and generic data types. Developing applications with database systems. Using LINQ to objects. Working with threads and streams

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Computer networks	IA44_ID	5	28			28

Course description (Syllabus): Assimilating the basic concepts on which the computer networks. Learning some basic notions on current network technologies. Acquisition of necessary knowledge for distributed programming. Formation of required skills for computers network administration. Using Windows commands to manage computer networks. IP and MAC addresses. Using and programming various algorithms for computer networks. To establish a local network and an inter-network.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
English Language (4)	MIE4ITR_ID	2		8	20	

Course description (Syllabus): The English language course attempts at revising, consolidating and improving grammar points at advanced level. It also provides opportunities for students to practice grammar structures and

express themselves during the seminars. To this end, each lecture presents a theoretical issue which synthesizes essential information from outstanding books in English morphology, followed by a wide range of exercises which will be approached during the following seminar. The exercises are designed in such a way so that students can solve them both individually and in pairs, during the seminars. The aim of this course is to provide students with comprehensive grammar structures linked to the following issues: problem verbs, modal verbs, passive voice, determiners and pronouns and relative clauses.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Linux Programming	IAO1_ID	5	28			28

Course description (Syllabus): Assimilating the basic concepts of Linux operating systems. Acquiring skills needed for making scripts under Linux. Knowledge of system calls provided by the language C. Acquisition of software packages for writing scripts under Linux. Using Linux command in Bash. To develop applications in C that uses Linux features.

3rd Year

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Operational research	IT51_ID	5	28	4	10	14

Course description (Syllabus): Understanding the concept of mathematical model for handling the basic economic problems in terms of an adequate math modelling language in order to solve the problems, analyze their solutions and decide over the optimal solution. Knowing and understanding the domain specific concepts, theories and basic method. Recognizing the appropriate classes and types of problems to be solved with Operations Research method. Identifying the opportunities for (a) solving and (b) studying the solutions of real decisional problems using specific software tools. Mathematical modelling the quantity and quality characteristics of a given situation. Using the appropriate mathematical models for specific real problems solving. Developing the software modules for specific Operations Research algorithms and providing the corresponding documentation.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Distributed programming	IT52_ID	5	28			28

Course description (Syllabus): Acquiring specific theoretical aspects of programming in a distributed environment. Developing skills of using specific instruments of distributed programming.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Software Engineering	IA51_ID	5	28			28

Course description (Syllabus): Elements regarding the general theory of the system. Information systems. Information flows. Information systems with automated component. The notion of methodologies. The UML modeling language. Tools that assist the UML development of a problem's solution. The presentation of the tool Visual Paradigm for UML.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Web Technologies	IA57_ID	5	28			28

Course description (Syllabus): Basic principles in design. HTML. CSS rules. JavaScript. PHP. VRML. Workframe GREENFOOT.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Practice	IT53_ID	5	20	3	7	10

Course description (Syllabus): Improvement of the didactic activities and the students' vocational training by placing students in real situations of software development and by practicing the basic competences regarding human relations within working conditions. Placing students in real situations of software development. Qualified company personal attendance to student's practical training. Practicing the competences regarding human relations within working conditions. Increasing students' motivation regarding their theoretical and practical preparation by offering them a better knowledge about their future profession. Preparing young graduates for the work market, by acquiring practical experience during the period of university studies. Supervising and validation of the students activity both by the university mentor and the person appointed by the company. Providing detailed and reliable information regarding the future students profession.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Probability and Statistics	AP07_ID	5	20			20

Course description (Syllabus): Events; probability space; properties of probability. Counting methods (probability schemes). Conditional probability; independent events. Random variables; distribution functions. Discrete and continuous distributions; mean and variance; Chebyshev's inequality. The weak law of large numbers; the central limit theorem. Descriptive statistics. Estimators; properties

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Artificial intelligence	IA56_ID	5	20			20

Course description (Syllabus): Introduction, topics, foundations, candidate definitions for AI. Solving problems by searching: uninformed and informed search. Heuristic methods for searching. Constraint satisfaction problems. Logical agents, propositional logic. First order logic

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
IT project management	IA62_ID	5	20			20

Course description (Syllabus): Elements regarding the general theory of the management. The management of the IT projects. Planning the IT projects. The management of the IT projects. Resource management. The management of the IT projects. Quality management. The management of the IT projects. Risk management. The management of the IT projects. The management of changes. The usage of the supporting tools for the projects management. Case study: Microsoft Project 2010.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Practice	IT61_ID	5				40

Course description (Syllabus): Improvement of the didactic activities and the students' vocational training by placing students in real situations of software development and by practicing the basic competences regarding human relations within working conditions. Placing students in real situations of software development. Qualified company

personal attendance to student's practical training. Practicing the competences regarding human relations within working conditions. Increasing students' motivation regarding their theoretical and practical preparation by offering them a better knowledge about their future profession. Preparing young graduates for the work market, by acquiring practical experience during the period of university studies. Supervising and validation of the students activity both by the university mentor and the person appointed by the company. Providing detailed and reliable information regarding the future students profession.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Computational simulation models	IAO3_ID	5	28			28

Course description (Syllabus): Implementation random phenomenon in computer science. Modeling and simulation of queuing system. Modeling and simulation of stock - supply problems Formal construction of simulation models for discrete event systems Parallel and distributed simulation.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Data security in computer networks	IAO5_ID	5	28			28

Course description (Syllabus): Training skills needed to define security policies and security audit for IT systems. Develop of the ability to secure, manage and maintain software systems and computer networks.

Course title	Code	No. of credits	Number of hours per semester			
			Individual study	Activities tutorials	Control issues	Assisted activities
Web Application Development with PHP and Smarty	IAO7_ID	5	28			28

Course description (Syllabus): Acquiring skills and learning some basic notions of this topic. Learning how to connect PHP and Smarty. Improving developing of web applications using PHP and Smarty. Optimizing skills for web applications.