Transilvania University of Braşov, Romania

Study program: Internet technologies (in English)

Faculty: Mathematics and Computer Science
Study period: 2 years (master)

1st Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Basic internet tehnologies	TIN11	8	2	-	2	-

Course description (Syllabus): Mapping on metric spaces; ϕ-contractions; Generalized ϕ-contractions; Common fixed points and coincidence points; Stability of fixed points; Multivalued mappings.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Web applications development	TIN12	8	2	-	2	-

Course description (Syllabus): Riemann manifolds: definitions, examples, gradient, volume form, divergence, Levi-Civita connection, isometries; Geodesics on Riemann manifolds: variational theory of the geodesics, Jacobi fields, exponential map; Sectional curvature of the Riemann manifold: Riemann tensor, Ricci curvature, Einstein spaces; Laplace Operator on a Riemann manifold: armonic forms, Hodge de Rham Theorem; Riemann submanifolds: classes of submanifolds (ombilical, minimal submanifolds); Compare Theorems: Bonnet, Myers.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Multimedia interaction technologies	TIN13	7	2	-	2	-

Course description (Syllabus): Special classes of univalent functions: functions with positive real part, starlike functions, convex functions, α-convex functions, close-to-convex functions; Integral and differential operators: integral operators, differential operators; Differential subordinations: Schwarz lemma, the method of differential subordinations, applications; Subordination chains: simple univalence criteria, the method of subordination chains, univalence criteria obtained with the method of subordination chains.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Management of projects in Web technologies	TIN14	7	2	-	2	-

Course description (Syllabus): Cantor's triadic set, Sierpinski's triangle, Koch's curve; Takagi-type functions; Topological dimensions; Hausdorff measure and dimension; Code space; Hausdorff-Pompeii metric; Iterative function systems (IFS), the attractor of an IFS; The connection between the set of attractors of IFSs on a complete metric space X and the set of compacts in X; The size of the attractor of an IFS, the parameter dependence of the attractor of an IFS; The attractor connectivity of an IFS; Hutchinson metric, IFSs with probabilities, Hutchinson measure; Fractal interpolation.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Java Advanced programming	TIN21	6	2	-	2	-

Course description (Syllabus): Principles of special relativity. Relativistic interval, Minkowski metric, cone structure. Lorentz transformations and their consequences. Lagrangian of a free particle in special relativity, energy and momentum. Vectors, covectors, tensors and differential forms on R^n. Maxwell equations. Differentiable manifolds,

pseudo-Riemannian metrics, geodesics, Levi-Civita connection. Principles of general relativity and consequences. Newtonian approximation of the gravitational field. Hilbert action, Einstein field equations. Linearized solutions of vacuum Einstein equations, gravitational waves. Schwarzschild solution, black holes. Elements of cosmology: Friedmann-Lemaitre-Robertson-Walker metric, Big Bang and the expansion of the Universe.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Science, mamagement and engineering of services	TIN22	6	2	-	1	-

Course description (Syllabus): Lie groups, Lie algebra associated to a Lie group. Local Lie groups. Applications of Lie groups to differential equations. Symplectic and almost symplectic manifolds. Hamiltonians on a symplectic manifold, Hamiltonian vector field, Poisson bracket and applications. Contact manifolds, Reeb vector field. Complex and almost complex manifolds. Hermitian and Kahler manifolds, holomorphic sectional curvature.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Data warehouse and Data mining	TIN23	6	2	-	1	-

Course description (Syllabus): Extrema of differentiable functional; Classical variational calculus (Indirect methods); First order variation; Euler's equation; Prime integrals; Second order variation; Legendre's necessary condition; Weierstrass sufficient conditions; Generalizations: Euler-Lagrange system, The Euler-Poisson equation, The Euler-Ostrogradski equation; Dirichlet's variational principle; Isoperimetric problems; Lagrange multiplier; Link to the Sturm-Liouville problem; Functional spaces (Lebesgue spaces: definition and properties (approximation by continuous functions, reflexivity, duality); Sobolev spaces: definition and properties (approximation by smooth functions, reflexivity, duality, Sobolev diving, trace operator)); Non-smooth variational calculus (Direct methods)(Functional energy; The Euler-Ortrogradski equation; The notion of a weak solution; Solution of variational non-smooth problem: Coercivity, Convexity, Weak lower semicontinuity, Existence and uniqueness theorems for minimizers; Non-smooth isoperimetric problems. Lagrange multiplier; Existence theorems for minimizers).

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Business projects management	TIN24	6	2	-	1	-

Course description (Syllabus): Probability space (sigma-algebra, probability measure, probability space, random variables. Examples and properties). Conditional expectation with respect to a sigma-algebra (filtration, conditional expectation. Examples and properties). Martingale (martingale/submartingale/supermartingale. Examples and properties). Stopping times (definitions, examples, properties). Doob's optional stopping theorem (the case of discrete/continuous martingales and bounded stopping time. Generalizations). Martingale transforms (definitions, examples, properties). Inequalities and convergence theorems (maximal inequalities, upcrossing/downcrossing inequalities theorem, application to the submartingale convergence). Brownian motion. Definition, construction, properties. Stochastic integral (construction, properties). Itô formula (1-dimensional case, extensions to the general case). Probabilistic solution of Dirichlet problem for Laplace's equation. Probabilistic solution of Dirichlet problem for Poisson's equation. Probabilistic solution of heat equation (with Dirichlet / Neumann boundary conditions). Feynman-Kac formula. Black-Merton-Scholes formula.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Cryptography and systems security	TIN25	6	2	1	-	-

Course description (Syllabus): Fundamental spaces of distributions; The derivative of distributions; the primitive of distributions; Product of distributions; Differential and partial differential equations in distributions; Elements of convex analysis; Banach reflexive spaces; Sobolev spaces; Inferior semi-continuous functions; properties; Subdifferential of a function; Yoshida approximation and resolvent of multivalued operators; Semi-groups of operators; Equations of evolutions.

2ˢᵗ Year

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Wireless network management	TIN31	8	2	2	-	-

Course description (Syllabus): Researchers should promote accuracy, honesty, and truthfulness in their work; Researchers should work in a fair manner taking into account issues of equality, impartiality, and proportionality; Researchers should show respect to the fundamental rights, dignity, and worth of all people.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Cloud computing and distributed computing	TIN32	8	2	-	1	-

Course description (Syllabus): Density theorems; The theory of best approximation; Jackson's type theorems; Markov's and Bernstein's inequalities; Approximation by positive linear operators; Korovkin type theorems, Approximation by sequences of projectors.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
WEB applications development II	TIN33	7	2	-	2	-

Course description (Syllabus): Lifetimes; Stochastic orderings; Structure function of coherent systems; Renewal processes; Markov models in reliability; Asymptotic results

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Remote control using Internet	TIN34	7	1	-	2	-

Course description (Syllabus): The general theory of convexity, Classical inequalities, Arithemetic inequalities, Inequaliries in Hilbert space, Geometric inequalities, Analitic inequalities
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Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Capstone	TIN41	7	2	-	1	-

Course description (Syllabus): Presentation of new and significant new results in a certain fields of mathematics: Algorithms and computability, Topological dimension and fractals, Special class of functions in real analysis, Special chapters in the theory of analytic function, Inequalities, Finsler spaces. Activity of documentation; Identification of problems of research and applications. Developing of an own scientific research; Training in writing of scientific papers; Elaboration and presentation of a work at the student scientific session.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Research Activity	TIN42	13	-	-	-	4

Course description (Syllabus): Presentation of new and significant new results in a certain fields of Computer science: Algorithms and computability. Activity of documentation; Identification of problems of research and applications. Developing of an own scientific research; Training in writing of scientific papers; Elaboration and presentation of a work at the student scientific session.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Final Project	TIN43	8	-	-	-	4

Course description (Syllabus): Making a synthesis of the knowledge obtained in a field of Computer Science; Completion of the own contributions to the study; Redaction of the thesis.

Course title	Code	No. of credits	Number of hours per week			
			course	seminar	laboratory	project
Ethics and academic integrty	TIN44	2	1	–	–	–

Course description (Syllabus): Researchers should promote accuracy, honesty, and truthfulness in their work; Researchers should work in a fair manner taking into account issues of equality, impartiality, and proportionality; Researchers should show respect to the fundamental rights, dignity, and worth of all people.