UNIVERSITY OF DEBRECEN
Doctoral School of Informatics

Doctoral Program	Theoretical foundation and applications of information technology and stochastic systems
Director of Doctoral Program	István Fazekas
Objectives of Doctoral Program	The students get acquainted with the theoretical foundation of information technology and stochastic systems, get insight to the applications of the theory, and they achieve competency to develop the theory. Those topics are preferred which improve the quality of info-communication technology, therefore meet the requirements of the information society.
Academic and Research Fields	Modelling complex systems: stochastic and computer models. Modelling evolution of networks by random graphs and computer experiments. Scientific calculations: applying supercomputer and parallel programming to solve problems in statistics, numeric analysis and operational research, their applications in natural and social sciences (physics, meteorology, economics,…). Study of methods of operational research and their applications in science and industry. Description of temporal and spatial processes by stochastic models. Studying statistical models by mathematical methods and computer simulations. Stochastic financial, insurance and other econometric models and their statistical aspects. Theoretical problems and applications of autoregressive and branching processes. Statistical, mathematical and software tools of business intelligence (neural networks, program packages). Library informatics, applications of multimedia and Web. History of information, cognitive science. Libraries and digital archives. Didactics of informatics and electronic (e-learning) teaching frameworks.
Participant Supervisors	Sándor Baran, Mátyás Barczy, Anett Rácz Bekéné, Miklós Bényei, István Boda, Erzsébet Dani Bujdosóné, Pál Burai, Mária Borbély Eszenyiné, István Fazekas, József Gáll, Erzsébet Tóth, Tamás Vertse, MártaVirágos
Participant Tutors	Ágnes Baran, Sándor Baran, Mátyás Barczy, Anett Rácz Bekéné, Miklós Bényei, István Boda, Erzsébet Dani Bujdosóné, Pál Burai, Mária Borbély Eszenyiné, István Fazekas, Erika Fülöp, József Gáll, Gyula Pap, Kinga Sikolya, Erzsébet Tóth, Tamás Vertse, MártaVirágos

Courses

UNIVERSITY OF DEBRECEN
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Codes	Courses	Credits	Type of Exam.	Lecture	Practice	Lab	Tutor	Scient. Grad.
	Compulsory courses							
	Neural Networks		O	+	-	+	István Fazekas	DsC, habil
	Library Management		O	+	-	-	Márta Virágos	PhD
	Compulsorily eligible courses							
	Scientific computing		W	+	-	+	Ágnes Baran	PhD
	Topics in the theory of stochastic processes		O	+	-	-	Sándor Baran	PhD, habil
	Selected topics in probability		O	+	-	-	Mátyás Barczy	PhD
	Random graphs and networks		O	+	-	-	István Fazekas	DsC, habil
	History of information		O	+	-	-	Miklós Bényei	DsC, habil
	The narratives of digital reading, electronic literature		O	+	-	-	Erzsébet Dani Bujdosóné	PhD
	Optional courses							
	Finite element methods		W	+	-	+	Ágnes Baran	PhD
	System theory		O	+	-	-	Sándor Baran	PhD, habil
	Stochastic algorithms		O	+	+	-	Sándor Baran	PhD, habil
	Stochastic calculus		O	+	-	-	Mátyás Barczy	PhD
	SAP administration		W	+	-	+	Anett Rácz, Bekéné	PhD
	Implementation issues of dual simplex method		W	+	-	+	Anett Rácz, Bekéné	PhD
	Integer programming		W	+	+	-	Anett Rácz, Bekéné	PhD
	Nonlinear Optimization		W	+	+	-	Pál Burai	PhD, habil
	Convex analysis and optimization		W	+	+	-	Pál Burai	PhD, habil
	Convergence of Probability Measures		O	+	-	-	István Fazekas	DsC, habil
	Statistical analysis with SAS		W	+	-	+	Erika Fülöp	PhD
	Financial mathematics		O	+	-	-	József Gáll	PhD
	Insurance mathematics		O	+	-	-	József Gáll	PhD
	R programming language		W	+	-	+	Sikolya Kinga	PhD
	Numerical analysis for engineers		W	+	-	+	Vertse Tamás	DsC, habil
	Cognitive Science		O	+	-	-	István Boda	PhD, habil
	Software quality		O	+	-	-	Mária Borbély,Eszenyiné	PhD
	Web information retrieval		O	+	+	-	Erzsébet Tóth	PhD
	Electronic library, digital archives		O	+	+	-	Márta Virágos	PhD
	Basic Questions of the Copyright in the Digital Age		O	+	-	-	Márta Virágos	PhD
	Questions of knowledge transfer		O	+	-	-	Márta Virágos	PhD

Students of the doctoral program have to get 2 credits by taking compulsory courses. After this they have to collect 10 credits by taking 2 compulsorily eligible and 3 optional courses. The last 4 credits can be get by taking further courses of the doctoral school or other doctoral schools. Before taking subjects students have to consult with their supervisor about the order and time of taking them.

UNIVERSITY OF DEBRECEN
Doctoral School of Informatics

Doctoral Program	Industrial and scientific applications of informatics
Director of Doctoral Program	Dr. János Sztrik
Objectives of Doctoral Program	Studying the possibilities of interconnections between computers and devices that can be connected to them, their application for system engineering design, operation, and high-performance computing application possibilities, particularly in imaging and measurement data processing. Examining the possibilities of the industrial and scientific application of the theory of control and regulation of processes, particularly with regard to the technical aspects of measurement.
Academic and Research Fields	Logic Design with FPGA circuits, computer hardware modeling. Reconfigurable and high performance computing, hardware acceleration algorithm with FPGA. Programming and testing properties of microcontrollers and embedded systems. Examination of the applicability of FPGA in cryptographics, image processing, data compression, and other compute-intensive areas. Examination of high-speed computer networks with FPGA. Application of high performance computing, especially in image processing. Industrial and scientific application of mathematical modeling methods. Data transmission between computers and measuring devices, communication procedures. Operating systems of computers and their connection to other autonomous systems. Process control and control technology, various aspects of measuring systems for computer technology.

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Participant Supervisors

Dr.János Sztrik (program leader)
Dr Gábor Halász
Dr Attila Buchman (IK)
Dr István Budai (MK)
Dr Miklós Emri (ÁOK)
Dr Géza Husi (MK)
Dr Imre Kocsis (MK)
Dr Ferenc Kun (TTK)
Dr István Oniga (IK)
Dr László Pokorádi (MK)
Dr Istvánné Ráthy (MK)
Dr János Tóth (MK)
Dr László Tóth (IK)
Dr. Angéla Váradiné Szarka (TTK)
Dr János Végh (ME)

Participant Tutors

Dr Gábor Halász
Dr István Budai (MK)
Dr Miklós Emri (ÁOK)
Dr Géza Husi (MK)
Dr Imre Kocsis (MK)
Dr Ferenc Kun (TTK)
Dr László Pokorádi (MK)
Dr Istvánné Ráthy (MK)
Dr János Tóth (MK)
Dr László Tóth (IK)
Dr János Végh (ME)

UNIVERSITY OF DEBRECEN
Doctoral School of Informatics

Courses

Codes	Courses	Credits	Type of Exam.	Lecture	Practice	Lab	Tutor	Scient. Grad.
	Compulsory courses							
	Compulsorily eligible courses							
IPPV701	Simmulation and process modelling techniques in the field of medical imaging	2	V	2	0	0	Dr. Balkay László	PhD
IPPV723	IT applications in the development of business processes	2	V	2	0	0	Dr. Budai István	PhD
IPPV715	Introduction to statistical and data analysis using R	2	V	2	0	0	Dr. Emri Miklós	PhD
	Basics of fMRI postprocessing and brain network analysis	2	V	2	0	0	Dr. Emri Miklós	PhD
IPPV703	Production informatics	2	V	2	0	0	Dr. Husi Géza	PhD
IPPV704	Process control	2	V	2	0	0	Dr. Husi Géza	PhD
IPPV705	Computer-aided Engineering	2	V	2	0	0	Dr. Kocsis Imre	PhD
IPPV721	Application of data processing methods in technical diagnostics	2	V	2	0	0	Dr. Kocsis Imre	PhD
IPPV706	Modelling physical systems	2	V	2	0	0	Dr. Kun Ferenc	D.Sc
IPPV707	Informatics in physical measuring systems	2	V	2	0	0	Dr. Molnár József	C.Sc
IPPV708	Safety Engineering	2	V	2	0	0	Dr. Pokorádi László	C.Sc
IPPV109	Modeling of Technical Systems	2	V	2	0	0	Dr. Pokorádi László	C.Sc
IPPV7013	Engineering Application of Fuzzy Logic and Set Theory	2	V	2	0	0	Dr. Pokorádi László	C.Sc
IPPV722	Computerised Maintenance Management Systems	3	V	2	0	0	Ráthy Istvánné Dr.	PhD
IPPV712	Automated engineering systems	4	V	2	0	0	Dr. Tóth János	PhD
IPPV710	Logical modelling with FPGA circuits	2	V	2	0	0	Dr. Végh János	D.Sc
IPPV108	Communication of comptuer devices	2	V	2	0	0	Dr. Végh János	D.Sc
	Optional courses							

Students of the doctoral program have to get at least 6 credits by taking compulsory eligible courses and 6 credits by taking further courses of the doctoral school in accordance with the suggestions of the supervisor. Additional 4 credits should be obtained based on the guideline

UNIVERSITY OF DEBRECEN
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Doctoral Program

Discrete mathematics, data processing and visualization

Director of Doctoral Program

Prof. András Kruppa

Objectives of Doctoral Program

The aim of the program is to make interested PhD students to get familiar with the basic analytical, geometrical, algebraic, combinatorial concepts of image data processing, geometrical modeling, computer graphics and information visualization, and to acquire the corresponding general methods and algorithms, the programming environments for effective data processing.

Academic and Research Fields

Computer-aided geometrical modeling and visualization.

Spline curves and surfaces, subdivision methods. Modeling unordered data, application of artificial neural networks.

Constructive, projective and descriptive geometrical methods and mappings, their application in computer graphics. Models and related analytical methods for scientific and information visualization. 3D modeling and finite element analysis.

Image processing and pattern recognition.

Medical and biological imaging. Pattern matching , object simplification, hierarchical template databases, temporal analysis.

Multimodal human-machine interaction. Biometrical identification (face detection and recognition, fingerprint recognition), character recognition.

Image databases, indexing and retrieval, semantic image and video content description. Surface and volume reconstruction from projections. Machine learning, representation learning.

Big data processing.

Data mining methods for large-scale data. Distributed storage and programming environments, grid technologies, structured and non-structured data storage and processing. Discrete stochastic methods for optimization of geometrical modeling and data processing systems.

Powerful computing solutions, graphics accelerators. Sensor-based data acquisition technologies. Processing of genetic data, automated clinical screening systems based on heterogeneous data. Data fusion methods for geometric problems.

Digital geometry.

Adaptation of image processing methods for heterogeneous grids. Compressing binary shapes. Theory and applications of neighborhood sequences, their analytical, algebraic and topological properties on the square and other grids. Approximation of the Euclidean metric by distance transformations. Grid approximations in image classification.

Theory of the discrete tomography.

Unambiguous reconstruction in the classical and absorptional discrete tomography. Investigation of the structure of tomographically equivalent sets. Convex and HV-convex sets. Algorithmical and complexity problems.

The application of the non-associative algebraic methods to combinatorial and geometrical problems.

Quasigroups and loops in geometrical algebra and in finite geometry.

Coordinatization of finite geometry and block systems. Steiner systems.

Commutative Moufang loops and related combinatorial structures,

Bol and Moufang networks, collineation groups.

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Participant Supervisors
Dr. Bálint Antal
Dr. Sándor Bácsó
Dr. Attila Fazekas
Dr. András Hajdu
Dr. Lajos Hajdu
Dr. Miklós Hoffmann
Dr. Tamás Mankovits
Dr. Róbert Tornai
Dr. Marianna Zichar

Participant Tutors
Dr. Bálint Antal
Dr. Sándor Bácsó
Dr. Attila Fazekas
Dr. Ágota Figula
Dr. András Hajdu
Dr. Lajos Hajdu
Dr. Miklós Hoffmann
Dr. Roland Kunkli
Dr. Tamás Mankovits
Dr. Péter Tibor Nagy
Dr. Ildikó Papp
Dr. Henrietta Tomán
Dr. Róbert Tornai
Dr. Marianna Zichar

Courses

Courses	Credits	Type of Exam.	Lecture	Practice	Lab	Tutor	Scient. Grad.
Compulsory courses							
Compulsorily eligible courses							
Big Data Processing	2	V				Antal Bálint	PhD
Topics in geometry	2	V				Bácsó Sándor	CSc habil
Low-level image processing	2	V				Fazekas Attila	PhD habil
Discrete stohastic optimization	2	V				Hajdu András	PhD habil
Image processing algorithms	2	V				Hajdu András	PhD habil
Discrete mathematics	2	V				Nagy Péter Tibor	DSc
Information and Scientific Visualization	2	V				Zichar Marianna	PhD habil
Computer aided design and simulation	2	V				Papp Ildikó	PhD
Optional courses							
Pattern analysis	2	V				Antal Bálint	PhD

Image processing in medicine and biology	2	V				Antal Bálint	PhD
Applied descriptive and projective geometry	2	V				Bácsó Sándor	CSc habil
Digital geometry and mathematical morphology	2	V				Fazekas Attila	PhD habil
Multimodal human computer interaction	2	V				Fazekas Attila	PhD habil
Loops and nets	2	V				Figula Ágota	PhD
Bioinformatics	2	V				Hajdu András	PhD habil
Discrete tomography	2	V				Hajdu Lajos	DSc
Geometry of numbers	2	V				Hajdu Lajos	DSc
Neighborhood structures and sequences	2	V				Hajdu Lajos	DSc
Computer aided modelling of curves and surfaces	2	V				Hoffmann Miklós	PhD habil
Finite Element Method and its Engineering Applications	2	V				Mankovits Tamás	PhD
Finite geometries	2	V				Nagy Péter Tibor	DSc
Quasigroups	2	V				Nagy Péter Tibor	DSc
Topics in Computer Graphics	2	V				Papp Ildikó	PhD
Finite Element Analysis	2	V				Tomán Henrietta	PhD
Data Fusion Models	2	V				Tomán Henrietta	PhD
Sensor-based data collection and processing	2	V				Tomán Henrietta	PhD
Graphics Accelerators	2	V				Tornai Róbert	PhD
Geoinformatics	2	V				Zichar Marianna	PhD habil
Visual analytics methods	2	V				Zichar Marianna	PhD habil

Students of the doctoral program have to get 8 credits by taking compulsory eligible courses. The last 8 credits can be get by taking further courses of the doctoral school or other doctoral schools. Before taking subjects students have to consult with their supervisor about the order and time of taking them.

UNIVERSITY OF DEBRECEN
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Doctoral Program	Theoretical computer science, data security and cryptography
Director of Doctoral Program	Dr. Attila Pethő
Objectives of Doctoral Program	The aim of this programm is that the PhD students make acquainted the basic methods of theoretical computer science, data security and cryptography. After finishing the courses they should be able to apply the methods to solve problems int he above topics. The students have to learn the methodology of the collection and ordering scientific materials and the publication of their results. They have to learn the most important algorithms, the analysis of their correctness and complexity as well as their implementations. Important aspect is the knowledge of relevant software tools and standards.
Academic and Research Fields	The topics of the programme are: development and analysis of cryptographic algorithms and protocols. We are especially interested for hash functions, pseudorandom number generators and protocols for identification, secret sharing, voting and secure exams. Cryptographic method, which are resistent against quantum computers. New computer paradigms, classical and non-standard logics, computability and complexity, formal languages, computer algebra, automata theory, automata networks, artificial intelligence, automatic theorem proving, logical programming, standard and non-standard logical languages.

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Courses

Codes	Courses	Credits	Type of Exam.		Tutor	Scient. Grad.
	Compulsorily eligible courses					
1	Cryptopgrahic Protocols	2	V	Dr.	László Csirmaz	CSc habil
2	Finite fields and applications	2	V	Dr.	Tamás Herendi	PhD
3	Network Security	2	V	Dr.	János Folláth	PhD
4	Information theory and coding	2	V	Dr.	Attila Pethő	DSc
5	Cryptographic algorithms	2	V	Dr.	Attila Pethő	DSc
6	Design and Analysis of Cryptographic Protocols	2	V	Dr.	Andrea Huszti	PhD habil
7	Moddal Logic	2	V	Dr.	Tamás Mihálydeák	CSc habil
8	Dynamic logic	2	V	Dr.	László Aszalós	PhD habil
9	Theory of computability and its logical applications	2	V	Dr.	Tamás Mihálydeák	CSc habil
10	Automata networks	2	V	Dr.	Pál Dömösi	DSc
11	Automata and languages	2	V	Dr.	Pál Dömösi	DSc
12	DNA computing	2	V	Dr.	Benedek Nagy	PhD habil
13	Introduction to Membrane Computing	2	V	Dr.	György Vaszil	DSc
14	Automated Theorem Proving	2	V	Dr.	Magda Várterész	PhD habil
	Optional courses					
1	Computer Algebra Systems	2	V	Dr.	Attila Bérczes	PhD habil
2	The organizational and legal aspects of data protection	2	V	Dr.	József Ködmön	PhD
3	Symbolical and numerical calculations with Mathematica	2	V	Dr.	András Tibor Kruppa	DSc
4	E-business	2	V	Dr.	Attila Pethő	DSc
5	Parallel models of computing	2	V	Dr.	Benedek Nagy	PhD habil
6	Artificial Intelligence	2	V	Dr.	Benedek Nagy	PhD habil
7	Algorithmic Algebra and Number Theory	2	V	Dr.	Attila Pethő	DSc
8	Algorithmic and combinatorial properties of formal languages	2	V	Dr.	Pál Dömösi	DSc
9	Classical first order logic	2	V	Dr.	Tamás Mihálydeák	CSc
10	Theorem proving in modal logic	2	V	Dr.	László Aszalós	PhD habil
11	Correlation clustering	2	V	Dr.	László Aszalós	PhD habil
12	Automated Theorem Proving	2	V	Dr.	Magda Várterész	PhD habil
13	Boolean Functions in Computer Science	2	V	Dr.	Magda Várterész	PhD habil
14	Context-free Languages	2	V	Dr.	Géza Horváth	PhD
15	Context-Sensitive Languages	2	V	Dr.	Géza Horváth	PhD
16	Pushdown Automata	2	V	Dr.	Géza Horváth	PhD

Students of the doctoral program have to get 8 credits by taking compulsorily eligible courses and further obtain 8 credits based on the guideline of Chapter 3.2., preferably taking optional courses of this doctoral program.

UNIVERSITY OF DEBRECEN
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Doctoral Program	Information Technology Systems and Networks
Director of Doctoral Program	Dr. Sztrik, János
Objectives of Doctoral Program	One of the main purposes of the program is to give firm and practical knowledge of advanced techniques of modeling, analysis, performance evaluating, maintaining, designing and creating complex information technology systems and networks to students intending to conduct research in this field. The modeling tools are based on the elements of the queueing theory. After completion of the courses students will be capable of applying the most important theoretical or experimental techniques in their chosen specific field and can start the research and practical part of their training. We study connection possibilities of information technology systems and their applications in architectural planning and maintenance. We examine transmission between information technology system with special attention on sound and video, including security questions as well. We also investigate reconfigurable embedded systems and sensor networks with emphasis on data acquisition and signal processing applications. We follow global trends of research and participate in international cooperations with the aim on applying theoretical result in practice.
Academic and Research Fields	Queueing systems and their applications for performance evaluation of complex infocommunication systems: infocommunication networks, tool supported analysis of stochastic systems, modeling and analysis of information technology systems. Next generation networks, future Internet: application-centric design of wireless sensor platforms, QoS analysis of sensor networks, experimental measurement and analysis of network traffic, future Internet. Development of FPGA–based calculations: artificial neural networks hardware implementation using programmable logic devices, networked systems for calculations and measurements.
Participant Supervisors	Dr. Sztrik, János Dr. Gál, Zoltán Dr. Oniga, István Dr. Orosz, Péter Dr. Tóth, László

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Participant Tutors
Dr. Bérczes, Tamás
Dr. Buchman, Attila
Dr. Gál, Zoltán
Dr. Kocsis, Gergely
Dr. Krausz, Tamás
Dr. Kuki, Attila
Dr. Oniga, István
Dr. Orosz, Péter
Dr. Sztrik, János
Dr. Tóth, László
Dr. Varga, Imre

Courses

Codes	Courses	Credits	Type of Exam.	Lecture	Practice	Lab	Tutor	Scient. Grad.
	Compulsory courses							
1	Routing and Switching	2	V	2			Dr. Gál, Zoltán	PhD
2	Reconfigurable Embedded Systems based Cyber-Physical systems	2	V	2			Dr. Oniga, István	PhD
3	Queueing Theory	2	V	2			Dr. Sztrik, János	DSc
4	Stochastic Modeling of Informatics Systems	2	V	2			Dr. Sztrik, János	DSc
	Compulsorily eligible courses							
1	Analytic methods in stochastic modeling	2	V	2			Dr. Bérczes, Tamás	PhD
2	Embedded systems and wireless sensors networks	2	V	2			Dr. Buchman, Attila	PhD
3	Agent-based models and simulation methods	2	V	2			Dr. Kocsis, Gergely	PhD
4	Wireless network security	2	V	2			Dr. Krausz, Tamás	PhD
5	Tools for Network Modeling	2	V	2			Dr. Kuki, Attila	PhD
6	Quality of Service Guarantees in Telecommunications Networks	2	V	2			Dr. Orosz, Péter	PhD
7	Imaging by informatics systems	2	V	2			Dr. Tóth, László	PhD
8	Modeling complex systems and networks	2	V	2			Dr. Varga, Imre	PhD

Students of the doctoral program have to get 8 credits by taking compulsory courses. After this they have to collect 4 credits by taking 2 compulsorily eligible courses. The last 4 credits can be get by taking further courses of the doctoral school or other doctoral schools. Before taking subjects students have to consult with their supervisor about the order and time of taking them.

UNIVERSITY OF DEBRECEN
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Doctoral Program	Applied Information Technology and its Theoretical Background
Director of Doctoral Program	Dr. Terdik György
Objectives of Doctoral Program	The goal of this program is to acquaint PhD students with high-level applications in information technology, get to know the theoretical backgrounds, and involve students in researches that lay the foundation of further applications. The fundamental objective of the program is to give scientific answers to problems that are raised by practical needs.
Academic and Research Fields	Modelling and technological implementation of an intelligent city and similar, social-based applications. Intelligent objects' machine-to-machine (M2M) communication, traffic modelling and quality measures. Statistical data mining. Statistical models in psychology, pedagogy and computer science. Modelling high speed networks and HPC, multiprocessor technologies. Identification and statistical analysis of linear and non-linear dynamic systems. Modelling of information systems and the WEB. Fine tuning of information systems and databases. Large scale databases and data warehouses, quality management, data cleaning. IT didactics. Models of quality assurance of electronic teaching environments.

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Doctoral Topics

• IoT (Internet of Things), analysis of communication technology and dataflow (supervisor: Terdik György/ Gál Zoltán)
• Spatio-temporal / nonlinear time series analysis (supervisor: Terdik György)
• Development and application of data mining models on large scale data (supervisor: Ispány Márton, Szathmáry László)
• Modelling, developing and applying social applications for Smart City projects (supervisor: Ispány Márton)
• Tools of developing computational thinking (supervisor: Csernoch Mária)
• Developing software tools for automated logging of interactive computer activities (supervisor: Csernoch Mária/ Máth János)
• Quality assurance models of electronic teaching systems (supervisor: Fazekas Gábor)
• Designing, Developing, Analyzing, Implementing and Examining Effectiveness of E-learning systems (supervisor: Bujdosó Gyöngyi)
• Model-based development methods and XML technologies (supervisor: Adamkó Attila)
• Processing of data streams and complex events in distributed ICT systems (supervisor: Gál Zoltán)
• Three-dimensional virtual systems (supervisor: Gilányi Attila)

Participant Tutors

Abari Kálmán
Adamkó Attila
Benczur András
Bíró Piroska
Bujdosó Gyöngyi
Csernoch Mária
Fazekas Gábor
Fehér Gábor
Gál Zoltán
Gilányi Attila
Godó Zoltán
Ispány Márton
Kósa Márk
Máth János
Pánovics János
Szathmáry László

UNIVERSITY OF DEBRECEN
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Courses

Courses	Credits	Type of Exam.	Lecture	Practice	Lab	Tutor	Scient. Grad.
Compulsory courses							
Compulsorily eligible courses							
Novel approaches for Internet-based applications	2	V	E			Adamkó Attila	PhD
Statistical Analysis of the Distributed Systems	2	V	E			Gál Zoltán	PhD
Advanced data mining methods and applications	2	V	E			Ispány Márton	PhD habil
Statistical data mining	2	V	E			Ispány Márton	PhD habil
Symbolic Data Mining	2	V	E			Szathmáry László	PhD (habil)
Statistics for high speed network data	2	V	E			Terdik György	DSc
Spatial-time modelling with application to IoT	2	V	E			Terdik György	DSc
Optional courses							
Knowledge space theory in practice	2	V	E			Abari Kálmán	PhD
Informatics education in ICT rich environment	2	V	E			Bíró Piroska	PhD
Development and usage of Content Management Systems	2	V	E			Bíró Piroska	PhD
Online and virtual environments in knowledge transfer	2	V	E			Bujdosó Gyöngyi	PhD
Developing computational thinking	2	V	E			Csernoch Mária	PhD habil
Sprego Programming	2	V	E			Csernoch Mária	PhD habil
Information technology	2	V	E			Fazekas Gábor	PhD
Three-dimensional developments in the VirCA system	2	V	E			Gilányi Attila	PhD habil
Informatics in life sciences	2	V	E			Godó Zoltán	PhD
Functional Programming Languages and its Applications	2	V	E			Kósa Márk	PhD
Examining qualitative variables	2	V		Gy		Máth János	PhD habil
Multiparadigm Programming in F#	2	V	E			Pánovics János	PhD
Nonlinear time series and applications	2	V	E			Terdik György	DSc

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With the approval of the program's leader:

1) Four courses must be selected from the following compulsorily eligible courses of the program:

- Novel approaches for Internet-based applications (Adamkó Attila)
- Statistical Analysis of the Distributed Systems (Gál Zoltán)
- Advanced data mining methods and applications (Ispány Márton)
- Statistical data mining (Ispány Márton)
- Symbolic Data Mining (Szathmáry László)
- Statistics for high speed network data (Terdik György)
- Spatial-time modelling with application to IoT (Terdik György)

2) Three courses must be selected from the other programs of the Doctoral School of Informatics.

3) One course must be selected from the programs of the Hungarian Doctoral Schools.

or

With the approval of the program's leader:

1) Four compulsory courses in the field of Didactics of Informatics:

- Knowledge space theory in practice (Abari Kálmán)
- Online and virtual environments in knowledge transfer (Bujdosó Gyöngyi)
- Developing computational thinking (Csernoch Mária)
- Statistics of measuring knowledge (Máth János)

2) Three courses must be selected from the other programs of the Doctoral School of Informatics.

3) One course must be selected from the programs of the Hungarian Doctoral Schools.