EÖTVÖS LORÁND UNIVERSITY BUDAPEST, HUNGARY 2005

EÖTVÖS LORÁND UNIVERSITY
BUDAPEST, HUNGARY

# FACULTY OF INFORMATICS

2005

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## Contents

# FOREWORD

The Faculty of Informatics is one of the newest faculties in the Eötvös Loránd University which was founded in 1635 by Cardinal Péter Pázmány. The university is now divided into 8 faculties after the government of the Hungarian Republic established 3 new faculties on 1st of September 2003.

The Faculty of Informatics – in harmony with the commission declaration of the Eötvös Loránd University – considers its main task the training of informatics experts and teachers as well cartographers and geoinformatical specialists. The extraordinary quickness in the development of informatics, as an applied science since the XXth century presents a great challenge in the field of teaching for our faculty. Recently, in the XXIst century the requirements from the labour market became fairly high towards information experts. The Eötvös Loránd University has been opened to the progressive changes such as the foundation of the Faculty of Informatics. Most people believe that this century is going to be the century of the information society. The government set up the goals – the development of information infrastructure, the generalization of electronic information supply, the teaching of the citizens of information society, the stabilization of a competitive economy, efficient, service public administration and a human-centred society – several years ago. All of these goals themselves require the development and modernization of all levels in the education of the future information experts.

As Hungary joined to the European Union and the Bologna Process our faculty worked out a new type of education offering the possibility for the students to choose the subjects freely from not only the Hungarian universities but also the European universities. By the connection of the Department of Cartography and Geoinformatics to the Faculty of Informatics new possibilities came to life. The informatical character of cartography is stronger day-by-day with the new techniques of geographic information systems and geoinformatics. The high level of the training of informatics experts and teachers is strongly expected from the society because the teachers play a significant role in forming the society's information culture. That is why the aspirants have to possess the most up to date pedagogical knowledge and the confident use of IT tools. They also should know the fast integrated media, the digital education tools and the computer assisted teaching methods. The new faculty's leadership has the responsibility to ensure the appropriate human and infrastructural background.

To the teaching staff belong more than a hundred teachers who are divided into 8 departments and a methodology group. Professors from our faculty work in different committees of the Hungarian Academy of Science and in several Hungarian and foreign reviews' editorial boards. In the last 5 years almost 40 conferences were held, in which ELTE was represented by our colleges and over 20 projects were won by them. Research activities support our PhD students' work so the faculty is on the way to start more and more projects to strengthen the teamwork inside the faculty together with the PhD students.

This is the first time that the staff of the Faculty of Informatics introduces itself. We do hope to present useful knowledge for the readers.

Budapest, 15 April 2005

Dr. László Kozma
dean

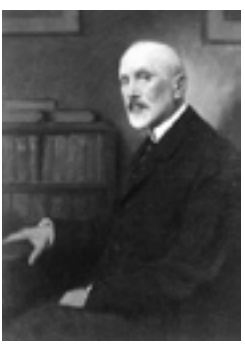
# HISTORY OF THE UNIVERSITY

The Hungarian tertiary education is about the same age as the other institutions of the Central-European region. Eötvös Loránd University which is the biggest and oldest one in Hungary was founded on the 12th of May 1635 by Cardinal Péter Pázmány (1570–1637) as a catholic institution. Its original location was in Nagyszombat, North-West Hungary (now Trnava in Slovakia), since large areas of Hungary were at that time the subject of continual dispute with the Ottoman Empire.

The original faculties were Theology and Philosophy, and the university had the right to give scientific degrees. Though the university had a strong catholic character, the curriculum from the very beginning included mathematics and natural sciences, like physics and cartography. In 1667 was the foundation of the Faculty of Law and the Faculty of Medicine was the following more than a century later, in 1769. Thus the classical European university structure of four faculties was established, and state control was introduced in the same year by Empress Maria Theresia, who gave it the new name of the Royal Hungarian University (Magyar Királyi Tudományegyetem).

The Turks were expelled from Hungary at the turn of the XVII-XVIIIth centuries and Buda (the western part of Budapest) slowly regained its role as capital of the country. The university was moved to Buda in 1777. In the next decades its faculties were distributed among several buildings in Buda and Pest. The prosperity of the second half of the XIXth century made it possible to build the campus on Museum Ring (Múzeum körút), which is now the location of several departments of the Faculty of Humanities. In addition, the ever-growing university acquired new buildings – more than 100 by now – spread out all over Budapest.

The original language of teaching was Latin, and it was only about two hundred years ago that the Department of Hungarian Language was created. Hungarian became the official language of undergraduate teaching in 1861.



The structure of the university remained unaltered for almost two hundred years, up to 1950, when significant changes were brought about by the communist takeover. The Faculty of Theology was expelled from the university on ideological grounds, and the Faculty of Medicine became the independent Semmelweis Medical University. The Faculty of Philosophy and Arts was divided into the Faculties of Science and Arts. A recent change was the opening of the new campus in South Buda (Lágymányos). In 1950 the university was re-named after Baron Loránd Eötvös (1848–1919), a Professor of Physics of considerable reputation (experimental evidence for the equivalence of gravitational and inertial mass) and an eminent statesman.

After the change of the political system (about 1989) the number of students grew rapidly. The university got back the right of PhD issuance in 1993. In 2000 two high schools were integrated into the university.

Since 2003 there are 8 faculties: Faculty of Arts, Faculty of Informatics, Faculty of Law, Faculty of Elementary and Nursery School Teachers' Training, Faculty of Education and Psychology, Faculty of Science, Faculty of Social Sciences and "Bárczi Gusztáv" Faculty of Special Education.

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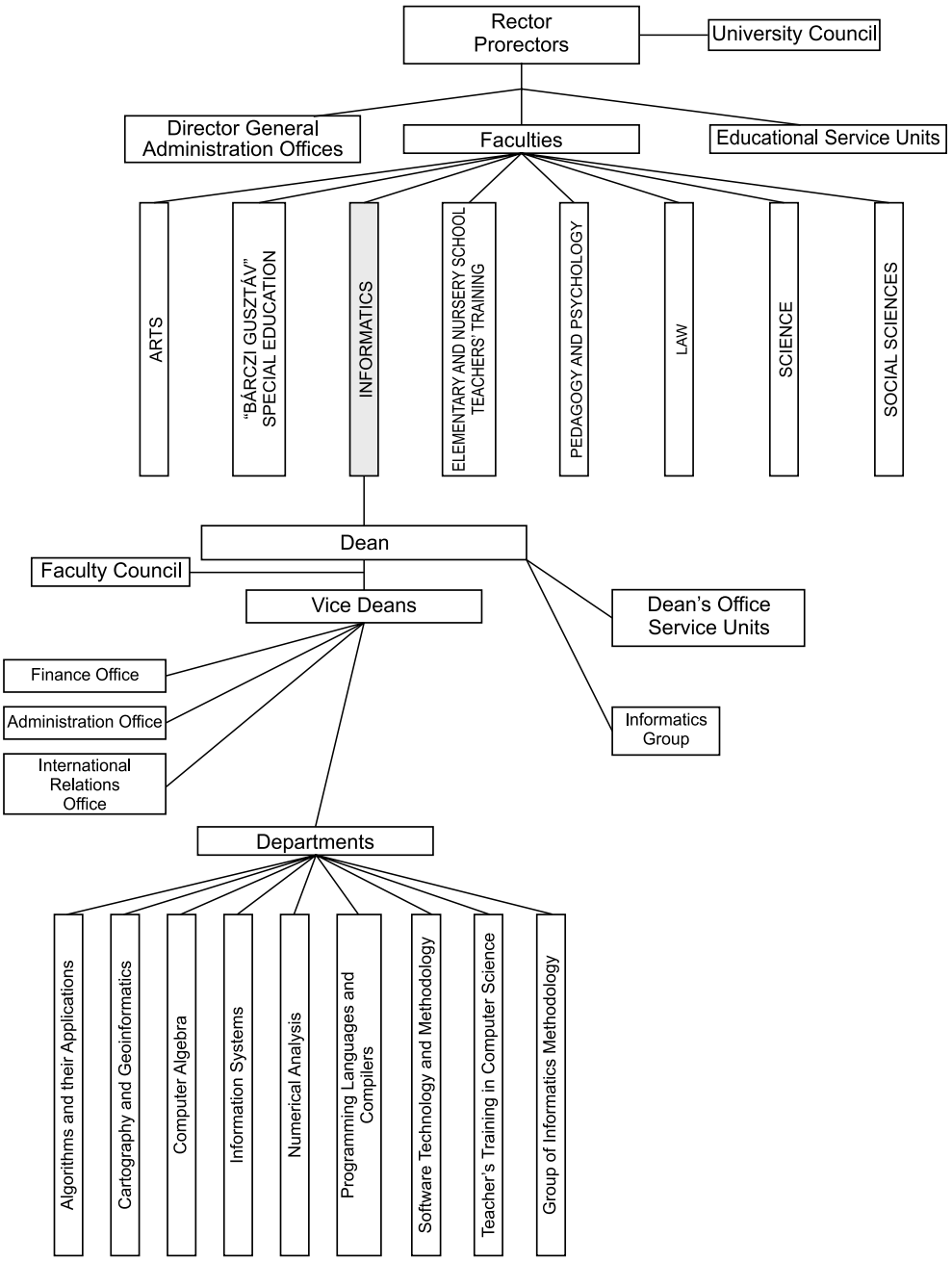
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SPECIAL EDUCATION
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ELEMENTARY AND NURSERY SCHOOL
TEACHERS' TRAINING
PEDAGOGY AND PSYCHOLOGY
LAW
SCIENCE
SOCIAL SCIENCES
Dean
Faculty Council
Vice Deans
Dean's Office
Service Units
Finance Office
Administration Office
International
Relations
Office
Informatics
Group
Departments
Algorithms and their Applications
Cartography and Geoinformatics
Computer Algebra
Information Systems
Numerical Analysis
Programming Languages and
Compilers
Software Technology and Methodology
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Group of Informatics Methodology

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### History of the department

At the Eötvös Loránd University the education of informatics was initiated in 1969. At the very beginning the courses were called *computing techniques* and offered to students in mathematics. In the frame of these courses they have studied mainly machine code programming.

Professor Imre Kátai – at that time he was the dean of the Faculty of Science – recognized the growing significance of informatics, and in 1972 he initiated a new curriculum called *programmer mathematician*. To organize the introduction of the new courses he established a new department, the Department of Numerical and Computer Mathematics.

The number of students learning informatics was increasing very rapidly, from 60 in 1972 to 400 in the middle of the eighties, and nowadays it has reached 2000.

Because of the very fast development and restructuring of the area and the quickly growing number of students it was necessary to divide this huge department into specialized ones such as departments of General Computer Science, Numerical Analysis, Teaching Informatics and Information Systems.

In 2003 these departments with the Department of Cartography and Geoinformatics established a new faculty, the Faculty of Informatics. The structure of the departments was a little bit modified: the Department of General Computer Science – the biggest one – was divided into three parts. One of them is the Department of Algorithms and their Applications.

**Research activities**

- design methodology of algorithms and data structures
- models and methods in computer graphics and image processing
- artificial intelligence algorithms
- implementation of programming languages
- fuzzy grammars and automata
- DNS computing
- animation of computer algorithms.

**Educational activities**

- data structures and algorithms
- complexity of algorithms
- formal language theory
- theory of automata
- computer graphics
- operating systems.

# DEPARTMENT OF CARTOGRAPHY AND GEOINFORMATICS


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| Dr. János GYÖRFFY, assoc. prof. | terkep1@ludens.elte.hu<br>http://lazarus.elte.hu/hun/dolgozo/terkep1.htm | Map Projections |
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## History of the department

Although cartography education started only in 1955 in the Faculty of Science, there have been several great geodetic surveyors and geographers at the Eötvös Loránd University since its foundation.

In 1953 the Department of Cartography was built up, two years after the first third-year students with the major of geography or geology could start their cartography studies here.

As the years went by the number of students had been growing significantly with the distance learners who already had working experience on the fields of civil or military mapping. In accordance with the general universal education reform in the beginning of the 70-s the teaching had changed. Cartographer education remained a three-year program in the syllabus but the previously existed geography basic training had changed into a four-semester earth sciences basic education together with the geologist and geophysicist students.

The Hungarian education law in 1986 made it possible for cartographer training to start as a ten-semester program in the academic year of 1988–1989.

Until recently 376 students received cartography degrees at Eötvös Loránd University. The PhD program started in 1994 and up to the present 14 people have been awarded this degree.

**Research activities**

- thematic cartography (electronic atlases)
- mathematics in cartography (projections, optimal distortions)
- internet and mapping (webcartography, hypermedia)
- theoretical cartography (history of cartography, toponymy)
- working in the commissions of the International Cartographic Association (ICA).

**Educational activities**

- general cartography, thematic cartography
- computer cartography GIS
- geodesy, GPS, Projections.

## DEPARTMENT OF COMPUTER ALGEBRA


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## History of the department

At the Eötvös Loránd University informatics education started about 30 years ago in the Department of Numerical and Computational Mathematics (1970–1985) under the supervision of Imre Kátai, then it continued partly in newly created departments and partly in the University Computing Centre (1980–1992). The Department of Computer Algebra was founded in 1992 from the staff members of Computing Centre, and Imre Kátai became its first head. Due to his scientific connections the staff members at the very beginning had the possibility to join the leading research projects in this field. Firstly, we have to mention the research group of Karl-Heinz Indlekofer at the University of Paderborn (Germany). This cooperation led to over 10 world records in computational number theory, and the results of mutual work were exhibited on CeBIT 1993, in Hanover. There is also a good connection with the MuPAD group in Paderborn and the Department of Computer Algebra of Catholic University of Nijmegen (Netherlands). Some people from the department visited the University of Waterloo (Canada), where the widely used Maple system was developed.

Due to the participation in the TEMPUS project since the very beginning the department has possessed high-quality computer infrastructure including SUN workstations with SPARC processors. Currently we use IBM made personal computers in our laboratory. The projects, requiring large capacity, are implemented in the Computation and Automatization Institute of the Academy of Sciences.

The students have the possibility to join research work in the department, and currently eight PhD students are working on their dissertations.

In 2003 Imre Kátai retired, since then Antal Járai is the head of department.

## Research activities

- computer algebra
- number theory
- fractal geometry
- simulation
- functional equations
- some aspects of probability theory.

## Educational activities

- introduction to mathematics
- computer algebra
- simulation
- dynamical systems
- fractal geometry
- cryptology
- algebraic coding theory
- algebraic geometry
- computer number theory
- parallel systems
- high-performance computing.

## DEPARTMENT OF INFORMATION SYSTEMS


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### History of the department

The origin of this department dates back to 1983, when the research activity in databases started at the Computing Centre of the University. The research group then, headed by András Benczúr, introduced database and networking courses into the education and performed intensive research in relational database technology. In 1991 when the Computing Centre ceased, 8 people from the former staff got into the Department of General Computer Science, formed an independent group within that department, and continued teaching database and computer network courses

for programmer students. The present department was established in 1996 when the former group seceded from the General Computing Department, and formed a new department headed by András Benczúr. The main educational activities of the department are teaching basic courses in Informatics for teachers of informatics students, teaching introductory courses in Database Systems and Computer Networks for programmer students, and teaching advanced courses in Information Systems and Distributed Systems for program-designer students. Since 1998, when András Lőrincz joined the department, the palette of courses is widened with Intelligent Systems, Neural Networks and other AI areas.

The department takes on an important role in the Informatics PhD School of the university. Most people from the department take part in this program both as tutor as well as supervisor.

**Research activities**

- database systems, database theory
- transactional systems
- information systems
- semi-structured data models
- computer networks, IT-security
- distributed systems, distributed objects
- data mining
- intelligent systems, human-computer interaction.

**Educational activities**

- fundamentals of informatics
- introduction to databases
- database theory, transactions, optimization
- computer networks
- distributed systems, component-based systems
- information systems
- application of AI, neural nets, intelligent agents
- image processing, speech recognition.

# DEPARTMENT OF NUMERICAL ANALYSIS


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## History of the department

The department was established in 1984. The founding members came from the Numerical Group of the Department of Numerical and Computer Mathematics Department which was split into two departments at that time. Since 2003 Department of Numerical Analysis belongs to the newly formed Faculty of Informatics.

The main teaching task of the department is to teach analysis and numerical methods to both undergraduate and graduate students with major in computer science. In addition to that the mathematics training of chemistry students, training of numerical methods, and partly analysis of physics, and mathematics students belong to their teaching responsibilities. The members of the department have been very active in the PhD programs in mathematics. About 40 dissertations have been written under the guidance by them.

Harmonic analysis, especially dyadic harmonic analysis, and numerical analysis are in the focus of the research interests of the department. Via the scientific programs and results the department has active connections with researchers and research centers throughout the world.

## Research activities

- approximation, interpolation theory
- differential equations
- fourier series
- functional analysis
- martingales
- numerical analysis
- system and control theory
- theory of Hardy spaces.

## Educational activities

- analysis
- linear algebra
- numerical analysis.

## DEPARTMENT OF PROGRAMMING LANGUAGES AND COMPILERS


| | |
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| Viktória Zsók, assistant | zsv@inf.elte.hu | Parallel Functional Programming, Programming Languages |

### History of the department

The department was established on the 1st of September 2003 as one of the three successors of the Department of General Computer Science. The mission of the department is to teach and conduct research in the field of programming languages including both theoretical and practical aspects. We examine programming language paradigms. This covers the design, syntax and semantics, formal

definitions, type systems and implementation of programming languages and also compilers, assemblers, debuggers and code generators.

We examine the concepts of programming languages which support the implementation of parallel and distributed systems.

We also investigate the applications of mathematical logics which support the synthesis of verified programs, verification tools and program transformations. We teach mathematical logics and examine theorem proving methods.

We emphasise the teaching of concrete programming languages which are widely used in practice or appropriate for demonstrating theoretical issues.

**Educational activities**

- programming languages
- compilers
- parallel programming
- functional programming
- logic programming
- generative programming.

**Running projects**

- correctness of distributed functional programs (OTKA)
- an integrated graphical application development and grid execution environment based on Jini (IKTA)
- user oriented unifying of the Hungarian SuperGrid and ClusterGrid Systems (IKTA)
- CEEPUS H-81: international cooperation in computer science.

# DEPARTMENT OF SOFTWARE TECHNOLOGY AND METHODOLOGY


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| Dr. László Vígh, assist. prof. | | Economics |

### History of the department

The department was established on the 1st of September 2003 as one of the three successors of the Department of General Computer Science.

The main research and educational fields of the department are the theoretical and practical aspects of programming and software engineering. In addition certain subjects in artificial intelligence are also taught and researched. In the area of programming methodology, program and data type correctness is investigated using relational and algebraic approach. The properties of concurrent object-oriented systems are also researched. Object-oriented design and the UML as a description tool is another field of interest in addition to the conventional software system development methods and tools.

### Research activities

- programming methodology: data types, synthesis of sequential and concurrent programs
- software engineering: object-oriented systems, formal methods (e.g.B)
- artificial intelligence: multi-agent systems, robotics, expert systems.

### Educational activities

- introduction to programming
- software engineering
- programming environments
- computer hardware
- artificial intelligence
- development of applications in C++
- programming methodology
- robotics.

# DEPARTMENT OF TEACHER'S TRAINING IN COMPUTER SCIENCE


| | |
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| Norbert Béli, lecturer, operator | norbi@sztech.inf.elte.hu belinor@freemail.hu | Hardware, Networks, Programming |

## History of the department

Our group separeted from the Mathematical Department of the Teacher Training College in 1989. The department is interested in the education of teachers for pupils between 11–14 years of age. Students can study both in day (with pairs of professions) and evening (supplementary) courses.

Currently, we have three kinds of pairs:

computer science - languages (English or German),
computer science - mathematics,
computer science - science (physics, chemistry, biology, geography).
Initial classes usually start with 30–70 people and 10–25 students typically finish the eight-semester program.

Proportion of the courses is the following:

programming – 30%, pedagogy of computer science – 25%, application, nets – 25%, problem solving and others – 20%.

## GROUP OF INFORMATICS METHODOLOGY


| | |
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**History of the department**

The first personal computers, the Swedish ABC80 appeared at the Numeric and Computational Mathematics Department of Eötvös Loránd University in 1979. The predecessor of the group worked as an independent group within the department and was responsible for several educational and research activities.

With the appearance of ABC80, informatics education changed dramatically. From 1981 we had the opportunity to offer informatics courses in computer laboratories for students with mathematics and physics majors as well.

The informatics teacher training program was born in 1983 (first in Hungary) from these two programs. In 1984 we started evening classes and in 1985 the correspondence courses began. In 1991 we started informatics teacher training as independent program.

From the 1980s, in cooperation with the specialized group dealing with disabled people in MTA KFKI, we created a special laboratory, where speaking software, character recognition applications and Braille printers helped blind students to learn.

After some organizational changes in the university, in 1996 an independent Informatics Methodology Group was formed.

The (Teaching with Multimedia) TEAM lab was established in 1997 within the Informatics Methodology Group. Research includes the ergonomics and content of developing educational applications, authoring tools, Internet and telematic environments, their cross-curricular and cultural integrated, creative implementation and evaluation of their effects on the learning process.

In 1998 the new system administrator program was introduced.

In 2000 the post-graduate program to prepare for pedagogy master's exam was launched.

In 2001 distance learning courses for students with informatics major became available.

In 2002 specialized courses on multimedia for Program Designer students were launched and quickly became one of the most popular electives among students.

In the past 20 years, more than 1800 informatics teachers graduated, and in the recent years the first PhD students appeared researching in the field of informatics methodology.

**Educational activities**

The role of Informatics Methodology Group is the education and methodological training of future teachers of informatics, and the organizing and controlling of practical teacher training and post-graduate courses. The group provides thesis topics and organizes the tasks in connection with the final exams.

We introduced new specialized courses (multimedia, system-informatics) both in the program of Informatics Teacher Training and the Program Designer field.

Our other important educational goal is to provide courses for non-informatics major students.

Our further tasks contain courses within the post-graduate training for informatics teachers. A specialized field of this is the pedagogy master's exam.

**Research activities**

- methodology of teaching informatics
- methodology of applying informatics in public education and special applications as well as issues of multimedia and e-learning
- methodology of programming, data-structures, algorithms in practice, educational fields
- programming languages for education
- applications for education
- basic knowledge of informatics.

# MAJORS OFFERED BY THE FACULTY

## University majors

The goal of the *MSc degree in Computer Science* is to train experts with deep mathematical and computing skills in order to solve complex informatical tasks even in foreign milieu.

The *applied mathematician* major's goal (jointly with the Faculty of Science) is to produce experts who have solid knowledge in mathematics and who can apply it in both Hungarian and European industry in interdisciplinary workgroups to solve economic, technical and scientific problems.

The *cartographer* major's task is to produce professionals who have thorough knowledge in constructuring, measuring, designing, producing and reproducing maps. Cartographers should be well informed about the other areas within geoinformatics and also they should provide assistance to the institutes dealing with map production, use and archiving. This is the only faculty in Hungary that offers cartographer education at the university level.

The *informatics teacher* major's aim is to the educate teachers who can teach the disciplines of informatics at all types of schools. They also should be able to use professionally the computer tools, to give advice to other teachers in the subject of informatics, to be active in the professional and social life and to never stop learning.

## College majors

The goal of the *BSc degree in Computer Science* is to educate experts who can handle program development, informatical system development and system operation problems.

The *computer science* teacher major's task is the same as that of the informatics teacher major.

## Special education

The system administrator training's aim is to pass knowledge to the students so they will be able to install and operate informatical tools (software and hardware) and to keep pace with their rapid development.

The special education's (for the pedagogy master's exam) aim is to provide help for various professions, such as informatics specialists, chairmen of examination board, school leadership and special consultancy.

# BSC IN COMPUTER SCIENCE

**First Semester**

| Subject | Lecture/week in hours | Practice/week in hours |
|---|---|---|
| Introduction to Mathematics I. | **3** | **3** |
| Introduction to Programming | **2** | **2** |
| Computer Logic | **2** | **0** |
| Computer Architecture | **2** | **0** |
| Calculus I. | **2** | **2** |
| Linear Algebra I. | **2** | **2** |

**Second Semester**

| Subject | Lecture/week in hours | Practice/week in hours |
|---|---|---|
| Introduction to Mathematics II. | **3** | **3** |
| Programming Methodology | **2** | **2** |
| Programming Environment | **0** | **2** |
| Calculus II. | **2** | **2** |
| Linear Algebra II. | **0** | **2** |
| Numerical Analysis I. | **2** | **0** |

**Third Semester**

| Subject | Lecture/week in hours | Practice/week in hours |
|---|---|---|
| Data Structures | **2** | **2** |
| Introduction to Mathematics III. | **2** | **2** |
| Software Engineering I. | **2** | **2** |
| Calculus III. | **2** | **2** |
| Numerical Analysis II. | **2** | **2** |

**Fourth Semester**

| Subject | Lecture/week in hours | Practice/week in hours |
|---|---|---|
| Formal Languages | **2** | **2** |
| Software Engineering II. | **2** | **2** |
| Programming Languages I. | **2** | **2** |
| Calculus IV. | **2** | **2** |
| Numerical Analysis III. | **2** | **2** |
| Probability Theory I. | **2** | **2** |

**Fifth Semester**

| Subject | Lecture/week in hours | Practice/week in hours |
|---|---|---|
| Data Bases | **2** | **0** |
| Software Technology | **2** | **2** |
| Assemblers | **1** | **2** |
| Programming Languages II. | **2** | **2** |
| Operational Research I. | **2** | **2** |
| Probability Theory II. | **2** | **2** |
| Parallel Programming | **2** | **2** |

**Sixth Semester**

| Subject | Lecture/week in hours | Practice/week in hours |
|---|---|---|
| Compilers | **2** | **2** |
| Artificial Intelligence | **2** | **2** |
| Operational Research II. | **2** | **2** |
| Operating Systems | **2** | **2** |

## MSC IN COMPUTER SCIENCE

The education lasts for 4 semesters. Within this period the students study all the core subjects and 4 related modules. The core subjects and the most popular modules are listed below.

| | |
|---|---|
| Core Subjects: | Theory of Software Methodology I–II.<br>Mathematical analysis I–II. |
| Module 1: | Computer Networks<br>Computer Systems<br>Parallel Processes |
| Module 2: | Principles of Artificial Intelligence II.<br>Artificial Intelligence Languages<br>Logic Programming |
| Module 3: | Theory and Practice of Handling Information I–IV. |
| Module 4: | Overview of Programming Languages<br>The C++ Programming Language<br>Java<br>Semantics of Programming Languages |
| Module 5: | Fundamentals of Computer Graphics<br>Fundamentals of Digital Image Processing<br>Fundamentals of Geometric Modelling<br>Modern Methods of Digital Image Processing |

## ABOUT THE MOST POPULAR SUBJECTS

### Introduction to Mathematics I.

Sets, power of a set. Relations and functions. Numbers: natural, rational, complex. Combinatorics. Number theory: divisibility, primes, congruences, Chinese remainder theorem, numbertheoretical functions, number systems.

### Introduction to Programming

Basic Concepts, Relations, Functions, Series. Problems, Programs, Program Functions, Solutions, Extensions. Type Specifications, Type, Conformity. Weakest Precondition, Theory of Specification. Program Constructions, Deduction, Backtracking, Transformations. Different Forms of Programs, Coding.

**Computer Logic**
The semantical and the syntactical treatment of the propositional calculus and the predicate calculus (zero-order and first-order logic). Concept of consequence, decision problem, automatic theorem proving and resolution principle. Soundness and completeness problems.

**Computer Architecture**
Historical survey of computer generations, structure of processors (classification according to commands, CISC & RISC processors); types of memory (physical classification: RAM, ROM, EPROM.); memory handling (bus system, data, address and control bus, DMA); logical classification of memory (associative, cache, disk cache, virtual storage); interrupt and their characteristics; realisation of I/O systems; structure of disk drives (magnetic and optical storage); printers, screen handling (video cards and monitors), special periphery and their handling (keyboard, mouse, scanner); structure of IBM PC; structure of the operating system, configuration, network and transport concepts, concepts of parallel machines.

**Calculus I.**
Limit of Functions. Theorems on Limits. Continuous Functions. The Derivative of a Function. Rules for finding derivatives. The chain rule. Increments and differentials. Implicit differentiation. Newton's method. Local extrema of functions. Rolle's theorem and the mean value theorem. The first derivative test. Concavity and the second derivative test. Related rates.

**Linear Algebra I.**
Introduction to Systems of Linear Equations, Gaussian Elimination, Homogeneous Systems, Matrices and Matrix Operations, Rules of Matrix Arithmetic, Different Methods of Finding the Inverse, Determinant, Properties of Determinant Function, Cofactor Expansion, Cramer's Rule,Vectors in 2D and 3D Spaces, Norm, Dot Product, Projection, Cross Product, Lines and Planes, Vector Spaces, Subspaces, Linear Independence.

**Introduction to Mathematics II.**
Algebraic structures. Semigroup, group. Isomorphism, homomorphism. Rings. Euclidean rings. Fields, the ring of polynomials. The basic theorem of algebra and its consequences. The field of rational functions. Graphs.

**Programming Methodology**
Complex problems are solved (elementwise processing, backtracking, updating and listing). The basic types in programming are introduced, the most frequently used programming methods are discussed (specification, creating correct programs by using the concept of weakest precondition, solving programs by using predefined programming theorems). Strategies for program creation are also described such as function and data abstraction, program and type transformation and state space transformation.

**Calculus II.**
Antiderivatives. Definite integral. The mean value theorem. The Newton-Leibniz theorem. Methods of integrations, i.e. by parts, by substitution etc. Integration of special types of functions. Indefinite integral. Area. Solids of revolution. Arc length. Other applications. Exponential and logarithm functions. Trigonometric functions and their inverses. Hyperbolic functions. Differentiation and integration of these functions.

**Linear Algebra II.**
Basis, Dimension, Orthonormal Basis, Gram-Schmidt Process, Change of Basis,
Linear Transformations, Kernel, Range, Matrices of Linear Transformations, Similarity, Eigenvalues, Eigenvectors, Diagonalisation of Matrices, Symmetric Matrices.

**Numerical Analysis I.**
Floating Point Representation of Numbers, Absolute Error, Relative Error, Rounding Error, Instability, Gaussian Elimination, Pivoting, LU Decomposition, MapleV --first part.

**Data Structures**
Solvability and unsolvability of problems, practical solvability of problems, the P and NP classes and their relation. Abstract data types, their representation by abstract data structures. Realization methods of abstract data structures. Realization of linear data structures, list-structures, dynamical storage management. Implementation of arrays, stacks, queues. Typical applications of stacks, processing of expressions. Trees, classification of trees, most interesting properties and operations on trees, application of trees. Sorting algorithms (bubble sort, insertion sort, tournament, heap, merge sort, radix, external sorting, sorting networks). Medians and order statistics. Advanced design and analysis techniques (divide and conquer, dynamical programming, randomization).

**Introduction to Mathematics III.**
Ideals. Division of polynomials. Greatest common divisor and its applications. Rational roots of polynomials with rational coefficients. Decomposition of polynomials. Construction of finite fields. Multiplicative group of a finite field. Huffmann-, Shannon-, Gilbert-Moore codes. Parity checking. Hamming codes.

**Calculus III.**
Infinite Sequences. Absolute convergence. Power series Taylor and MacLaurin series. The binomial series. Conic sections. Plain curves. Polar equations of curves. Areas in polar coordinates. Length of curves. Surfaces of revolution. Vector valued functions. Limits, derivatives, integrals. Motion. Curvatures.

**Numerical Analysis II.**
Iterative Methods for Solving Systems of Linear Equations: Jacobi Iteration, Gauss-Seidel Iteration, Nonlinear Equations: Bracketing Methods, Fixed Point Iteration, Newton Method, Eigenvalues, Eigenvectors: The Power Method, Deflation, Jacobi's Method. MapleV...--second part.

**Formal Languages**
Elementary concepts of formal language theory( alphabet, word, language, operations on languages). Methods of language description using finite amount of information. Production systems, formal grammars, languages generated by them. Classification of grammars and languages, Chomsky hierarchy theorem. Extension theorems, normal forms. Versions of finite automata and their equivalence. Characterization of regular languages by finite deterministic automaton. Small Bar-Hillel lemma, Myhill-Nerode theorem, Kleene theorem. Characterization of context-free languages by push-down automaton, deterministic context-free languages. Derivation trees, Bar-Hillel lemma. Strategies of parsing, LL(k) and LR(k) grammars. Some decidable problems of formal language theory.

**Software Engineering**
Objectives and aim of software technology. Different approaches to solving the problem are discussed. The object oriented approach is discussed in detail. Definition of module and class, levels of abstractions within them, information hiding. Relationships among classes and objects: inheritance, association and aggregation. Object class diagram. The static model of software. States of classes. Definition of states and events. State diagram, dynamic model. Functional modelling. Design methodology. Programming style, RVP, XP, UML, Design Patterns.

**Programming Languages I.**
Study of the general concepts underlying various programming languages and the most important language tools using the ADA language. Topics: concept of data types (type constructions, subtypes, types with parameters, aggregates, private types, packages). Subprograms (procedures and functions), parameters, overloading. Program structure, compilation unit, subunit. Elaboration of a declaration (static, dynamic). Scope and visibility, block structure, global and local variables. Exception handling. Concept and use of generic. Support of parallel programming (task object, task type). Object oriented features (Ada95). Predefinit library units.

**Calculus IV.**
Multiple integrals, applications, vector calculus, line integrals, surface integrals, Green's Theorem, Stokes' Theorem.

**Numerical Analysis III.**
Approximation: Polynomial Interpolation: Lagrange Form, Divided Difference Form, Error of the Interpolation, Hermite Interpolation, Cubic Spline Interpolation, Least Squares Approximation to Discrete Data, Numerical Integration: Newton Cotes Formulas, Composite Forms, Ordinary Differential Equations, Initial Value Problems: Euler Method, Trapesoidal Formula, Convergence, Stability. MapleV.

**Probability Theory and Mathematical Statistics I.**
The notion of probability, elementary properties. Kolmogorov probability field Combinatorial calculation of probabilities. Conditional probability, properties, calculation. Bayes theorem. Independency. Random (vector) variable and its distribution, joint distributions. Independent random variables. Random walk and ruin probabilities. Particular discrete distributions. Mean and variance, properties, calculation, inequalities. Median, moments. Covariance and the coefficient of correlation. Distribution and density functions. The distribution of sums of independent random variables (convolution). Particular absolute continuous distributions and their properties. Weak law of large numbers. Central limit theorem. Normal and multivariate normal distribution.

**Data Bases**
The concept of data bases. Physical and logical data independence. The data base administrator. Basic characteristics of data base handling languages. Classical data processing modes and the comparison of data base handling systems. The levels of data modelling. Tendencies in data modelling. The hierarchical, the netted, the relational data models.

Relational data models. Concept of the domain, the attribute, the record. Relation as a concept of Descartes series, as mapping, as a table. The key and is characteristics. The functional dependence and its properties, families. Decomposition and it's properties. The four normal forms. Normalisation. The operations of relational algebra. Application of the dBase III language in data base handling.

**Assemblers**
This course has two major themes: the use of a concrete assembly language; the study of algorithms of assemblers, linkers and loaders. The structure of a machine code is examined and the common properties of assembly languages are determined. We study the structure and algorithms of two- and one-pass macroassemblers, linkers and the loader program. There is a practice as a part of this course. A simple assembly language is designed and an assembler for this language is created.

**Programming Languages II.**
Overview of the classical imperative programming languages. The evaluation of the programming languages. Historical background. Common elements of imperative languages: lexical units, constants, expressions, evaluation strategy of expressions, statements, scope and life. Modules, subprograms, parameter passing. Types and type checking. FORTRAN, COBOL, Algol 60, PL/1, Simula 67, Algol 68. Detailed discussion of the C language.

**Probability Theory and Mathematical Statistics II.**
Statistical space, samples, statistics. Ordered statistics, empirical distribution functions. Unbiased, efficient and consistent estimators. Complete and sufficient statistics. Neyman factorization theorem. Fisher information, Cramer-Rao inequality. Rao-Blackwell-Kolmogorov theorem. Confidence intervals. Maximum likelihood estimators, properties. The method of moments. Hypothesis testing. Comparison of tests. Randomized and sequential tests. The Neyman-Pearson lemma. U-, Student t-, and F-tests. c2 -test, and its applications. Linear regression, and the method of least squares. The simplest cases of variance analysis.

**Introduction to Parallel Programming**
The basic concepts of a relational model of programming are introduced which model supports the synthesis of parallel programs. We define the concepts of a problem, an abstract program, behaviour relation of a parallel program and a solution. Programming theorems are developed and verified (computing the values of an associative function, theorem of pipelines, etc.) which theorems are widely applicable for different concrete problems. The abstract program is implemented in C/PVM on a PowerXplorer computer containing 16 processors. The effectiveness of an implemented program is investigated.

**Compilers**
The major theme of this course is the theory of compilers. The next main topics are examined: lexical analysis, syntactic analysis, the parsing of LL(1) and LALR(1) languages is examined in detail, semantic analysis using attribute translational grammars, run-time storage organization and management, code generation and code optimization. There is a practice as a part of this course, the theme of the practice: problems of compiler design and implementation. The strategy is to have students design a simple programming language and implement a compiler for this language.

**Artificial Intelligence**
Production systems. State space representation. Irrevocable searching. Backtracking. Graph searching. Heuristic graph searching algorithms. Algorithm A, A*, and the monotone restriction. Problem reduction, problem decomposition. Searching in AND/OR graphs. Plan generation by decomposition. Two-person games.

**Operating Systems**
History, functions, structure and types of operating systems. Memory management (monoprogramming, multiprogramming with fixed partitions, virtual memory with paging or segmentation, optimal page size, optimal memory size). Parallel processes in operating systems (mathematical model, determinancy, maximally parallel task systems, deadlock, mutual exclusion, synchronisation). Processor scheduling. Distributed operating systems. Performance and efficiency of computer systems.

**Theory of Software Methodology I–II.**
Algebra and abstract data types. Signatures, sigma-algebras, categories, specification, signature-morphism, specification-morphism. Specification methods for abstract data types, class specification. A specification methodology for abstract data types: analysis of specification, analysis of representation and implementation. Proof methods for program correctness. Correctness of concurrent programs. A methodology for deriving correct concurrent programs. Data types in concurrent environment, synchronisation interface. Specification methods for synchronisation interface. Analysis of specification, proof of consistence problems.

**Mathematical Analysis I–II.**
Orthonormal systems, Fourier series, coefficients, Parseval formula, Bessel inequality, Dirichlet kernel. Introduction to differential equations, existence and uniqueness of the solution, exact, separable and linear equations. Complex functions, line integrals, Cauchy's theorem, Cauchy's formula, Laurent series, singularities, residue.

**Semantics of Programming Languages**
Semantic description methods. Denotational semantics. Semantic domains and semantic functions. Fixed point theory. The meaning of different language constructs. Operational semantics. Transition systems.

**Computer Networks**
Layered architectures and the architectures of computer networks. The ISO Open System Interconnection Reference Model and the TCP/IP architecture. Formal methods for the definition of communication protocols. Application of the numerical Petri nets to the definition of layer protocols and interface (service) protocols. Verification and validation of protocols. Local networks and its architectures. Medium access control protocols for the local networks. The transport level interface service protocol and its applications. Connectionless (datagram) and connection oriented communication. Models of the client server communication. The protocols and distributed data bases of the internet layer of the TCP/IP architecture. Standard network applications and its protocols.

**Computer Systems**
Main topics: memory management, processor scheduling, performance evaluation. Memory management: modelling of paged and interleaved memory. Processor scheduling: resources, task systems, scheduling constraints performance measures, representation of schedulings, anomalies. Optimisation problems (minimal-length schedules, minimal mean weighted flow-time schedules performance bounds). Performance and efficiency of computer systems: empirical and analytical evaluation, simulation.

**Parallel Processes**
Some models defined for studying the behaviour of parallel processes on the base of automata theory. Theory of Petri nets and an algebraic model of J. Winkowski are detailed.

**Principles of Artificial Intelligence II.**
Representation using predicate calculus. Resolution. Resolution strategies. Answer extraction systems. Application in robot plan generation. Forward and backward rule-based deduction. Non-monotonic reasoning. Uncertainty. Procedural knowledge representation. Semantic nets, frames. AI and the cognitive psychology.

**Artificial Intelligence Languages**
The basic concepts of artificial intelligence languages. The language families PROLOG and LISP. Its comparison to other languages with respect to the basic ideas, data structures, control strategies, pattern matching and programming environment.

**Logic Programming**
The basic problems of the logic programming. Relationship of the PROLOG-like languages and the resolution calculus. The minimal model of a logic program. The fixpoint problem. The treatment of the negative information. Special strategies.

**Theory and Practice of Handling Information I–IV.**
Introduction to the basic theories of database handling. Theory of dependence, rule-based logical data models, theory of Datalog programs, comparison of query languages. Basic of Unix, the SQL language of a concrete database handling language, use of SQL interpreter to solve problems. Introduction to the effectiveness of information handling and communication. Mastering the use of a Forms type 4GL, embedding data base handling into a programming language. Introduction to design methodology of information systems, tendencies in modern information handling. Use of application generators, analyses, design, and code generation of a simple system with Case-tool, introduction to client-server systems.

**Overview of Programming Languages**
A survey of programming language tools supporting object oriented programming: data abstraction - class - module; constructors and destructors; levels of visibility (public, protected, private); single, multiple and repeated inheritance; polymorphism, virtual methods. The languages referred to are: Simula-67, Smalltalk-80, CLU, object oriented extensions of Turbo Pascal and Modula-2, C++. Current trends in development of high level programming languages. In the first part of the semester the topic is the Eiffel object oriented programming language. In the second part the students form independent small groups and deliver lectures on various programming languages - e.g. Oberon, Objective-C, Perl, Modula-3, ADA95, Trellis, Beta, Miranda. The choice of the languages depends on the actual papers.

**The C++ Programming Language**
Overview on C++. C++ as better C. Constant values, constant types. Declaration statement. Reference types. Functions, function overloading. Template functions. Class, members, encapsulation. Constructor, destructor, operators. template classes. Specialisation of templates. Class derivation and inheritance. virtual functions. Multiply inheritance and virtual base classes. Exception handling.

**Fundamentals of Computer Graphics**
Picture coding and graphical equipment. Co-ordinate systems and transformations. The process of picture creation and basic operations. Process of realistic pictures and their basic operations. Methods of creation of realistic pictures.

**Fundamentals of Digital Image Processing**
Introduction: digital picture processing, picture analysis, computer view. Picture correction, scaling, enlightening, correction, filtering, masking. Picture representation: coding binary pictures. Segmenting: thresholding, spot detection, line detection. Resegmentation. Morphological picture processing. Contour and shape description. Statistical shape recognition.

**Fundamentals of Geometric Modelling**
Introduction to computing with geometry. Curve and surface representation in design, manufacture and animation. Free-form Bézier, B-spline and subdivision curves and surfaces. Overwiew of wireframe, surface and solid models.

**Modern Methods of Digital Image Processing**
Adaptive balancing of histograms. Picture analysing algorithms of varied resolution and scale-space. Detection of well-known graphs. Texture analysis. Picture models. Movement analyses. Flexible control of concentration. Stereo view.

## THE PHD SCHOOL OF INFORMATICS

Since 1993 the Faculty of Science runs programs for PhD degree in all branches of natural sciences, including informatics. Doctorate programs are organized into Doctorate Schools approved by the National Accreditation Board. The PhD programs run parallel to those taught at the undergraduate level. The duration of studies is 3 years. During this period organized courses are given and the term ends with a final examination and submission of a thesis, written on the special topics of the student.

When the Faculty of Informatics became independent in 2003 we have formed a separate PhD School for Informatics (which was a doctorate program in the Faculty of Science).

This past year 88 postgraduate students took part in our PhD training, 28 of them as full-time fellowship holders. The high scientific standard of the PhD training is guaranteed by members of the Hungarian Academy of Sciences, Doctors of Hungarian Academy of Sciences as well as many other PhD holders taking part in the program as lecturers, supervisors or school/program leaders. Many internationally acknowledged scientists and experts participate in the work of the PhD Schools as lecturers of short courses and seminars.

The PhD training is open to foreign students who have an M.Sc. or equivalent degree or diploma. Most programs provide courses and supervision in English. Applications should be submitted to the Office of PhD Training Relations Office with documents on previous studies, plan of research, etc. Previous consultation with the program leader is recommended. The tuition fee is US$ 3000 per semester. Additional information can be obtained from the International Relations.Office.

We have one doctoral school with three programs, and the head of the school is prof. János Demetrovics.

**Programmes:**

- Information Systems – head: Prof. András Benczúr
- Numeric and Symbolic Calculus – head: Prof. Antal Járai
- Basics and Methodology of Informatics – head: Prof. János Demetrovics

The Cartography Programme is the part of Earth Sciences Doctorate School (Faculty of Science) – head: Prof. István Klinghammer

* - English language PhD processes

| Name | Title of the PhD dissertation | Year of defence |
|---|---|---|
| György Antal | Global illumination methods for architectural scenes* | 2004 |
| Tibor Ásványi | User's functions in the standard Prolog | 2001 |
| Gábor Bacsó | Perfect graphs and dominating sets* | 1998 |
| Pál Benkő | Reconstructing conventional engineering objects from measured data* | 2002 |
| Zsolt Bíró | Numerical interface curves for some nonlinear diffusion equations | 2000 |
| Judit Csima | Investigations on simple eco-grammar systems* | 2003 |
| Ferenc Csonka | Combination of Random Walk and Stochastic Iteration Based Global Illumination Methods | 2005 |
| Gábor Dózsa | Issues of graphical support for developing message passing parallel applications | 2003 |
| Anikó Judith Ekárt | Genetic programming: New performance improving methods and applications* | 2001 |
| Mohamed Elhadi | Hybrid IR & CBR approach to legal research & reasoning in bankruptcy law* | 2000 |
| Gábor Farkas | The investigation of generalized number systems in algebraic extension fields | 2001 |
| Szabina Fodor | Symmetric and non-symmetric ABS methods for solving diophantine systems of equations | 2002 |
| Ákos Fóthi | A Relational Model of Programming | 2002 |
| Zoltán Horváth | A Relational Model of Parallel Programs | 1996 |
| Zoltán Illés | Creating real-time applications for high energy ion irradiation | 2002 |
| Gábor Kallós | Univoque sets | 2001 |
| Géza Kós | Computer aided geometric – algorithms for reverse engineering* | 2002 |
| Attila Kovács | Radix expansion in lattices* | 2001 |
| Adrien Leitold | Analysis of dynamic process models with computer science methods | 2002 |
| András Micsik | Internet technologies for digital libraries and virtual communities* | 2001 |
| Zoltán Porkoláb | On the Structured Complexity of Object-Oriented Programs | 2003 |
| Anna Sali-Czinkóczy | Uncertainity in databases and relational connections | 2003 |

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|---|---|---|
| Ágnes Stark-Werner | Decision support expert systems | 1999 |
| Botond Szatmáry | Neural learning with reconstruction networks | 2005 |
| Gábor Szirtes | Functional modelling of the hippocampal formation | 2004 |
| Márta Turcsányi-Szabó | Integration of computers into the creative learning process* | 1999 |
| Attila Ulbert | Pluggable semantic elements and semantic extensions in distributed objects systems* | 2004 |
| György Vaszil | Investigations on parallel communicating grammar systems* | 2000 |
| Judit Verestóy | Smoothness based feature tracking* | 2001 |
| Gábor Wiener | Approximate search* | 2003 |
| Abdulmagid Zawia | Deductive object oriented databases programming and query evaluation* | 2001 |

| | | |
|---|---|---|
| Károly Brezsnyánszky | Geological mapping: fieldwok – summary on maps | 2001 |
| Éva Csató | Application of Satellite Data for Topographic Mapping | 2001 |
| András Dutkó | Gazetteer and Electronic Atlas of the World Ocean | 2004 |
| István Elek | An application of geographical information system in oil industry | 2001 |
| Zsuzsanna Harkányi- Székely | Examination of the questions of climatical water supply with GIS | 2000 |
| Annamária Jankó | Topographic map systems of Hungary between 1890–1950 | 1997 |
| Pál Kaszai | The content and form of the special military thematic maps of the Hungarian Defence Forces | 1996 |
| Elizabeth Lipcsey | Cartographic aspects of the use of digital land information in geographic information systems for planning purposes* | 2000 |
| Kristóf Pétery | Application of multimedia possibilities and the cadastre of Hungarian caves | 1998 |
| Katalin Plihál | Sources of maps introducing Hungary and Transylvania (1528–1709) | 1998 |
| Andrea Pödör | Thematic mapping of the Hungarian angler water | 2002 |
| Jesús Reyes | Presentation of cartographic concepts on the web | 2002 |
| Gábor Turczi | Map based informatics in the earth sciences | 2001 |
| Zoltán Vekerdy | Geographical information system based hydrogeological modelling of alluvial regions* | 1996 |
| Zoltán Verrasztó | Cartographic decision making in the environment protection | 2000 |

# INTERNATIONAL RELATIONS

In an era of increasing mobility and improving communications it is widely recognized that the development of international links has become vital to the continuing well-being of the University. Our newly founded faculty has made great efforts to broaden and develop its international contacts with universities abroad.

Staff members have many informal contacts with colleagues in other countries. There are also official agreements for cooperation and exchange with a number of foreign institutions. Cooperation takes place in both teaching and research, in the exchange of students and lecturers.
There are formal agreements for cooperation and exchange with the following universities:

Friedrich Schiller University, Jena, Germany
Norges Landbrukshøgskole, Ås, Norway
Universite D'Orleans, France
Universidade do Porto, Portugal
Universität Wien, Austria
Technische Universiteit Eindhoven, The Netherlands
Katholike Universiteit Nijmegen, The Netherlands
University of Helsinki, Finland
Tampere University of Technology, Finland
Universite de Nantes, France
Johannes Kepler Universität, Linz, Austria
University of Klagenfurt, Austria

Our University has become the member of the UNICA (Universities from Capitals of Europe), the IAU (International Association of Universities), the EAIE (European Association for International Education), the EUROBIO (European Association of University Departments and Faculties of Biology), the Coimbra Group, the Utrecht Network and the International Center of Tübingen. There are also formal contacts at faculty and at departmental levels.

The TEMPUS scheme for cooperation and mobility in higher education between Central/Eastern Europe and the European Community has offered new possibilities to establish links with universities in the EC and to arrange student exchange. The faculty has been keen to develop such links and a number of departments now have well-established joint European projects. Already a number of our undergraduates have taken the opportunity to spend months studying at a university in the EC.

The university is the member of the Erasmus programme to obtain further chances to develop and modernise the structure of education. The implementation of Erasmus activities naturally motivate the university management at all levels to improve its strategy in accordance with the extension of European programmes.

The university has decentralised its activity so that the international offices at the faculties have special responsibility for the local administration of programmes.

# ERASMUS PROGRAMME

SOCRATES/ERASMUS aims at improving the quality and the "European dimension" of higher education (university and non-university sectors) through a broad range of activities: from students and teachers exchanges to joint development of curricula; from language courses to thematic network projects between departments/faculties across Europe; from preparatory visits to systems of recognition of study periods undertaken abroad (ECTS).

ERASMUS is the name given to the Higher Education section of the European Community action programme in the field of education "SOCRATES". Adopted on the 24th of January 2000 and spanning the period until the end of 2006, SOCRATES is now open to the participation of 28 European countries.

ERASMUS contains a wide range of measures designed to support the European activities of higher education institutions and to promote the mobility and exchange of their teaching staff, students and administrators.

A small team of experienced university staff will be available in each participating state to give advice to colleagues and organise local information seminars. The Erasmus National Agencies can be contacted for the programme details.

**Tempus Public Foundation/Socrates National Agency of Hungary**
Street address : Váci út 37, 7th Floor (Duna Office Center), H-1134 Budapest
Postal address: H-1438 Budapest 70., POB 508
Telefon: +36-1-2371300
Fax: +36-1-2391329
E-mail : socrates@tpf.hu
Internet : http://www.tka.hu

ERASMUS contains a wide range of measures designed to support the European activities of higher education institutions and to promote the mobility and exchange of their teaching staff, students and administrators.

As in the past, ERASMUS is open to all types of higher education institutions (for which the term "universities" is generally used), all academic disciplines and all levels of higher education study up to and including the doctorate.

While the promotion of 'physical mobility', mainly of students, constituted the main thrust of ERASMUS Phase I and II, the higher education Chapter of SOCRATES seeks to integrate such mobility into a wider framework of cooperation activities which aim at developing a "European Dimension" within the entire range of a university's academic programmes. "Bringing students to Europe, bringing Europe to all students" is the new spirit of ERASMUS: while student mobility retains a position of central importance within the programme, stronger incentives will now be available to encourage universities to add a European perspective to the courses followed by students who do not participate directly in mobility.

More emphasis is consequently placed on teaching staff exchanges and transnational curriculum development. Wider dissemination of and participation in the results of this work are sought through supporting open and distance learning. ERASMUS also encourages universities to associate other public and private bodies from their surrounding regions with their transnational cooperation activities, thereby enhancing opportunities for inter-regional cooperation between the participating countries.

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Viktória Zsók (zsv@inf.elte.hu)
Ildikó Draskovits (ik-tnkcs@map.elte.hu)

The Faculty of Informatics has 9 bilateral ERASMUS Agreements in the field of Computer Science and 4 in Cartography.

Department of Computer Science, University of Helsinki
Department of Information Technology, Tampere University of Technology
Institute for Systemsoftware, Johannes Kepler University, Linz
Department of Computer Science and Business Informatics, University of Vienna
Department of Information Technology, Klagenfurt University
Department of Computer Science, Catholic University of Nijmegen
Department of Mathematics and Computer Science, Technical University of Eindhoven
Department of Mathematics and Computer Science, Friedrich Schiller University, Jena
Department of Informatics, University of Nantes
Norges Landbrukshøgskole, Ås
University of Architecture, Civil Engineering and Geodesy, Sofia
Universidade do Porto
Universidad del País Vasco

## CEEPUS

The CEEPUS programme was founded in 1993. Currently there are 10 member countries: Austria, Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Serbia and Montenegro, the Slovak Republic and Slovenia. The main goal of the programme is to promote academic mobility within networks formed by higher education institutions from the member countries.

The CEEPUS H-81 network (International Cooperation in the Education of Computer Science) started in 1998 with 4 participants: Eötvös Loránd University, University of Szeged, Johannes Kepler University (Linz) and Babes-Bolyai University Cluj-Napoca. Paisii Hilendarski University of Plovdiv joined in 2001, University of Klagenfurt and Constantine the Philosopher University in Nitra joined in 2003.

The objective of the CEEPUS H-81 network is to increase the level of educational cooperation among the participating institutions, to develop curricula jointly, and to publish the common achievements. The exchange programme allows the best undergraduate, graduate and PhD students to join the educational programmes of foreign universities and participate in international research projects. Teachers are also encouraged to participate in the mobility and give lectures at partner institutions.

The number of scholarship holders per year has been increasing significantly since the beginning. While in the first year (1998/99) 26 students and 11 teachers received the grant within the network, in academic year 2003/04 142 students and 25 teachers participated in the mobility.

The network won the CEEPUS Minister's Prize of Excellence in 2004.

Network co-ordinator: Assoc. Prof. Zoltán Horváth, Department of Programming Languages and Compilers

Further information can be found on the following pages:
http://english.tpf.hu
http://aszt.inf.elte.hu/~ceepush81/index.html.en
http://rdesc.pu.acad.bg/ceepus

# HONORARY PROFESSORS

Professor Karl-Heinz INDLEKOFER (Paderborn Universität) was the first professor who was given the title of Honorary Professor of the Faculty of Informatics. Here you can find the speech he made on this occasion.

**Address to the Senate of the Eötvös Loránd University on the 14th May, 2004**

Tisztelt Rektor Úr, tisztelt Egyetemi Tanács!
Hölgyeim és Uraim!

Nagy örömmel vettem át ezt a magas kitüntetést. Köszönöm Önöknek és az Informatikai Karnak a nagy megtiszteltetést, amelyben részesítettek.

Meine sehr verehrten Damen und Herren, in den vielen Jahre der gemeinsamen Kooperationen haben mich zahlreiche Personen begleitet. Ihnen allen gebührt mein Dank für ihre Unterstützung, ihre Anregungen und ihren Ansporn. Dies trifft insbesondere zu auf meinen Freund und Kollegen, den Akademiker und Széchenyi – Preisträger Professor Dr. Imre KÁTAI, dem ich für das jahrzehntelange Zusammenwirken sehr herzlich danke.

Lassen Sie mich, lieber Herr Rektor, am Schluß meiner kurzen Rede auf Ihre lateinische Einführung erwidern.

Primum quidem gratias ago, quia rector et senatus universitatis scientiarum Budapestinensis de Rolando Eötvös nominatae hoc die „doctorem et professorem honoris causa“ mihi praebuerint. Semper et ubique communa opera institutionum nostrarum cum amicitiae animo coniungens scientiam appello magistram et grave fundamentum  nationum Europae. Fructus conductionis in unam communitatem afferant omnibus ad bene vivendum.

# JOURNAL

Under the auspices of the faculty appears the journal

ANNALES UNIVERSITATIS SCIENTIARUM
BUDAPESTINENSIS
DE ROLANDO EÖTVÖS NOMINATAE
SECTIO COMPUTATORICA

founded in 1978. On an annual or semi-annual basis it publishes original research and, in special cases, survey papers from a broad field of applied mathematics and informatics in English, German or French written with mathematical precision, giving priorities to articles connected with the activities and interests within the departments of the faculty. The main topics are: classical numerical analysis, modern theories of algorithms of approximation both in deterministic and stochastic cases, summation of series, modelling and simulation, mathematical system theory, estimations of computational complexity, theory of automata, languages and system programming, computer algebra.

Since its foundation 23 volumes appeared, among which special issues were devoted to the anniversaries of Imre Kátai, Karl-Heinz Indlekofer and János Balázs, to the memory of Imre Környei and Béla Kovács.

The papers published in the journal are referred by the Mathematical Reviews, Zentralblatt für Mathematik and Referativni Zhurnal Matematika.

Via the Central Library of Eötvös Loránd University and faculty library the journal reaches the main universities and research institutions of the world, and separate volumes are obtainable at the publishers.



Address of editorial office:
ELTE Department of Computer Algebra
H-1518 Budapest, PO.Box 32

Website of the journal:
http://compalg.inf.elte.hu/annales/computatorica

# STUDENT UNION

In every Hungarian institute for higher education there is one official body to represent the rights and interests of the students, and that is the Student Union.

Every student at the Faculty of Informatics, EÖTVÖS Loránd University is also member of the Student Union. Every year the students elect their representatives for the general assembly, which is the main ruling body for the Student Union. After that, the general assembly elects the office holders: the chairman, the vice-chairman, and the principals for the different boards responsible for the different fields of activities. The general assembly usually meets once or twice per semester. The governing body responsible for the operational tasks meets every week, and its members are the office holders. Our operations are regulated by the Organizational and Functioning Regulations, and also by general procedures. Our Student Union is one of the most active members of the national organization, the National Conference of Student Unions.

We are active in three fields, and so we have three boards corresponding to these. The Social Welfare Board is responsible for the distribution of the state allotments among the students in the form of scholarships and social support, and they also look for other kinds of fellowships to inform the students about. The Academic Board informs the students about their duties and defends their rights under the different regulations and laws. The Organizing Board makes the various sport and cultural programs, most notably the ball for the students in the first year (which goes by the name "Gólya bál" in Hungarian – "Freshman's ball" in English). There is also the Monitoring Board which oversees the Students Unions general functioning. The boards' members come from among the members of the general assembly.

Webpage: http://ikhok.elte.hu