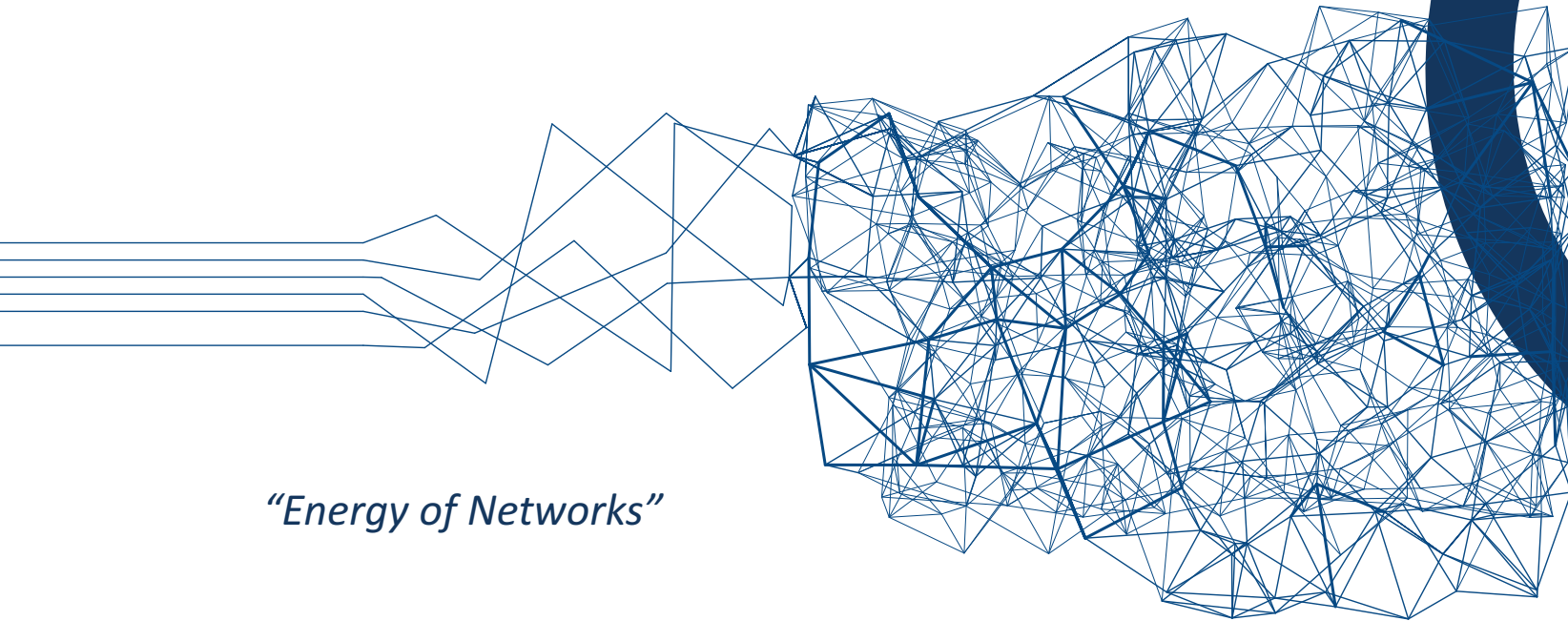




Budapest University of Technology and Economics  
**Faculty of Electrical Engineering and Informatics**

*“Energy of Networks”*



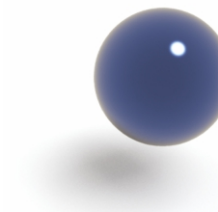


# Budapest University of Technology and Economics

## Faculty of Electrical Engineering and Informatics

*The 2001 January issue of Nature published an article with the title “The 20th century was created in Budapest”. It shows that Budapest irrevocably became part of history that determined the advancement of natural sciences in the last century. Many of the illustrious scientists either studied or taught at the University. This constitutes such a responsibility for current education that – inter alia – resulted in a prominent place in the Webometrics ranking of universities. Ancient Romans had a pertinent term “genius loci”, meaning the spirit of the place.*

*Join us to create the 21st century here, in the middle of Europe, Hungary, Budapest, a liveable and safe city with a colourful multicultural spirit, spicy dishes and true hospitality providing an academic student with experience and community that endure and are remembered no matter where the graduates of the University pursue their career in the world.*



# Introductio

**The Faculty of Electrical Engineering** founded in 1949 has been renowned for excellence in research and education throughout the years of changes in the scope of engineering. Over this period, the faculty has earned a wide-spread international reputation for its high academic standards and scientific achievements. Spearheading the movement to establish a modern education system, it has offered a comprehensive English curriculum since 1984. In 1992 the name of the faculty was changed to Faculty of Electrical Engineering and Informatics in order to give recognition to the growing importance of computer science and information technology. The education programs in English include a 3.5-year BSc, a 2-year MSc and a 4-year PhD program in the fields of electrical engineering and engineering information technology. Besides education, the faculty excels at research and development winning the title of a Research Faculty based on its scientific results and publications.

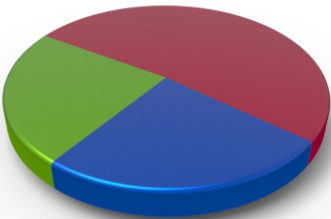
**Mission:** The basic objective of the faculty is to preserve the high standards of research and further develop into an innovative and research oriented higher education institution maintaining the outstanding quality of education and its leading role in electrical engineering, information technologies and computer science. A very important emphasis is given to spearheading and following the latest changes in technologies and to solving problems of engineering importance with sound scientific background. Thus, the spectrum of main activities include research, development, innovation and education pursued in the highest European standard.

## Facts and Figures (2016)

Total student body	5287
Doctoral students	98
Professors	30
Graduates	434
Doctorates	215
Staff (full-time equivalents)	463
Number of BSc programs:	2
Number of MSc programs:	4
Number of doctoral schools:	2
Number of industrial partners:	>120

## Annual Budget (2015)

Governmental subvention	2 922,4 MFt	
Tendering operations	1 323,7 MFt	
Others (education activites, industrial projects)	1 389,3 MFt	
<b>Total budget</b>	<b>5 635,3 MFt</b>	



**Education in foreign languages:** The faculty runs fully accredited English language versions of its BSc, MSc and PhD degree programs in Electrical Engineering and in Engineering Information Technology. The highly competitive, undergraduate German language program for interested students during the first four semesters is unique in the region. Such programs in foreign languages also allow offering a rich choice of courses (over 35 in English in every semester) to international students who spend only part of their studies at our faculty in the framework of an exchange or study abroad program. Customized programs can be also offered on demand.

**International students:** The international student population has been constantly growing during the last years, and passed over 300 during the 2014 Fall semester. This number includes more than 100 Brazilian students arriving in the framework of the Science without Borders program and also comprises a smaller number of students who participated in one of the double degree programs with partners in the EU and overseas (Ecoles Centrales – France, Herriott Watt University – UK, Florida Institute of Technology – USA, Kyungpook National University – South Korea, etc.).

**Project based internationalization:** Innovative curricula and novel overseas student exchange schemes were developed thanks to several Tempus, Erasmus-Mundus and Bilateral EU-Industrial Countries programs (145145-TEMPUS-2008, ECP-ICI 2004-3212, 2006-4564, 2009-4984, 2011-4537, PANTHER, EWENT, SSI, etc.) with partners such as the Simon Fraser University – Canada, University of Manitoba – Canada, Cornell University – USA, University of Michigan – USA, Auckland University of Technology – New Zealand, University of South Wales – Australia, Chonnam National University – South Korea, Royal Military Academy – Belgium, Warsaw University of Technology – Poland, Vestfold University College – Norway, to name a few.

**International relations:** The faculty is well embedded in the international network of research and education. It has several dual degree programs (University of Aalborg, Denmark, Kyngbook and Chonnam National Universities, South Korea, Florida Institute of Technology, University of New Hampshire, Ecole de Mines, France). The faculty also offers a one-semester program of IT for American students arriving from leading US universities (MIT, Yale ....etc.) in cooperation with the Aquincum Institute of Technology. We receive appr. 100 students from Brazil each year in the framework of the “Science Without Border” program operated by the Brazilian government. The faculty professors are members of several international editorial boards, program committees and scientific societies.

**Scientific performance and innovation:** The performance of the faculty is measured by the cumulated impact factors of its publications and by the number of EU and other internationally sponsored projects and its industrial partnerships. There are numerous publications in IEEE Transactions and Elsevier Journals, while a great number of EU projects has been won and carried out successfully. The Faculty counts many multinational companies among its research partners and many of them have established development laboratories in the campus running industrial development projects together with the faculty staff members and students. Our Technology Transfer Office helps to streamline innovation into products and industrial activities.

The faculty fares well in international university rankings. It is ranked 200-250. on the list of QS World University Rankings.

# Education BSc, MSc

Fully fledged English programs for a large variety of degrees

## BSc Programs (7 semesters, ECTS 210)

### Electrical Engineering BSc

Specializations:

- Embedded Information and Control Systems
- Infocommunication Systems
- Microelectronics Design and Technology
- Sustainable Electric Energetics

### Computer Science Engineering BSc

Specializations:

- Infocommunication
- IT System Design
- Software Engineering
- Enterprise Information Systems



## MSc programs (4 semesters, ECTS 120)

### Electrical Engineering MSc

Major specialization:

- Embedded Systems
- Control Systems
- Microelectronics and Electronics Technology
- Multimedia Systems and Services
- Engineering of Computer-based Systems
- Wireless Systems and Application
- Electric Power Systems

Minor specialization:

- Applied Electronics
- Applied Sensors
- E-Mobility
- Buildings Electricity
- Audio and Studio Technology
- Intelligent Robots and Vehicles
- Smart City
- Optical Networks
- Application of Field Programmable Gate Arrays
- Smart System Integration
- Engineering of Nuclear Safety

### Biomedical Engineering MSc

### Computer Science Engineering MSc

Major specializations:

- Integration of Mobile Networks and Services
- Internet Architecture and Services
- Applied Informatics
- Visual Informatics
- Critical Systems

Minor specializations:

- Data Service and Media Informatics
- IT Security
- Mobile Software Development
- Cloud and Parallel Computing
- Intelligent Systems
- Theory of Computation
- Physical Protection for IT Systems

### Business Information Systems MSc

Specializations:

- Financial Informatics
- Enterprise Level Information Processes
- E-Government and Public Services
- Analytical Business Intelligence
- Service Development and Management

## PhD programs (8 semesters)

### PhD School in Electrical Engineering

The doctoral school was established in 1994 to pursue research and development in the field of Electrical Engineering. The school integrates the research activities of ten departments in the Faculty of Electrical Engineering and Informatics. The main directions of the scientific activities in the school include embedded systems, electronics, electronic technology and devices, measurement, identification and control, infocommunication systems, electrical machines and drives, power engineering. Since 1994 more than 150 applicants have successfully defended their PhD theses and have been awarded with the degree. The school requires from applicants and supervisors proper scientific research with publications in peer reviewed journals and other professional forums.

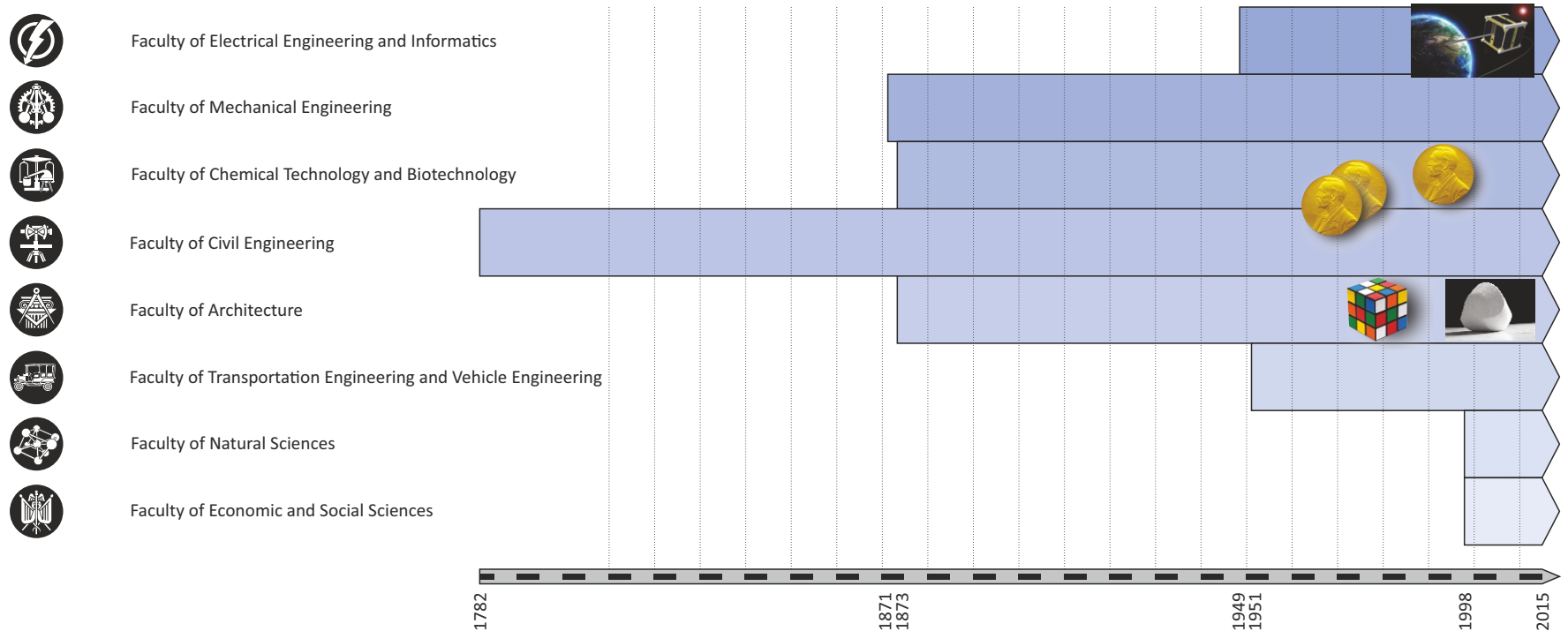
### PhD School in Computer Science and Information Technology

The doctoral school was established in 1994 to spearhead research and development in the field of the theoretical and practical aspects of computer science and information technologies. Its focus includes research in discrete mathematics, algorithms, optimization of info-communication networks, as well as software technologies, cryptography, embedded systems, and model driven approaches, etc. The school integrates the research activities pursued in 10 different departments in the Faculty of Electrical Engineering. The scientific activities in the school are conducted in two main groups: (i) info-communication systems; and (ii) intelligent systems. Since 1994 more than 100 students have successfully defended their PhD theses and have been awarded with the degree. As far as the scientific outcome is concerned, the members, supervisors and students of the school have published several hundreds of high ranking journal papers and the cumulative impact factor goes beyond 2000.



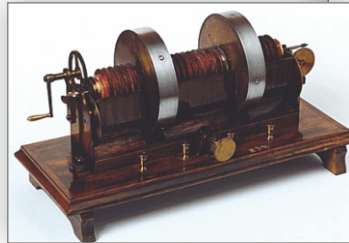
# Historical milestones in discoveries and technological innovations

Budapest University of Technology and Economics was established in 1782 by the Austro-Hungarian Monarch. It was created as one of the first higher institutions truly dedicated to engineering sciences in the region. Since its very beginning it has been committed to excellence in teaching and research of technologies with sound scientific foundations. Presently, the university has 8 Faculties (Schools), (i) the Faculty of Electrical Engineering and Informatics; (ii) Faculty of Mechanical Engineering; (iii) Faculty of Chemical Engineering and Biotechnology; (iv) Faculty of Civil Engineering; (v) Faculty of Architecture; (vi) Faculty of Transportation Engineering and Vehicle Engineering; (vii) Faculty of Natural Sciences; (viii) Faculty of Economics and Social Sciences. Out of this 8 faculties, the Faculty of Electrical Engineering and Informatics amounts to almost one third of the university according to its size, its budget and its number of students.

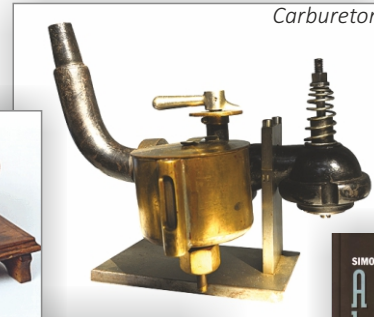




- 2012** First Hungarian Satellite, Masat-1 team
- 2006** Gömböc, Gábor Domokos and Péter Várkonyi
- 1994** Nobel Prize in Chemistry, György Oláh
- 1978** A Cultural History of Physics, Károly Simonyi
- 1975** Rubik's cube, Ernő Rubik
- 1971** Nobel Prize in Physics, Dénes Gábor
- 1963** Nobel Prize in Physics, Jenő Wigner
- 1950** Supersonic flight, Tódor Kármán
- 1946** Moon-radar experiment, Zoltán Bay
- 1929** Television, Dénes Mihály
- 1923** Electric locomotive, Kálmán Kandó
- 1895** Hungarian Parliament Building, Imre Steindl
- 1893** Carburetor, Donát Bánki
- 1885** Transformer, Déri-Bláthy-Zipernovszky
- 1861** Dynamo, Ányos Jedlik
- 1860** Modern photography optical lens system, József Petzval

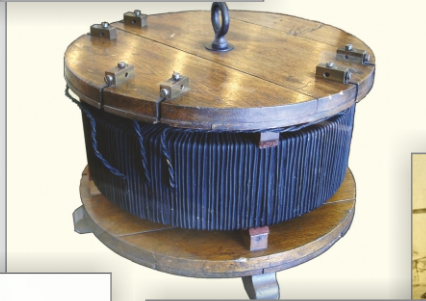


Dynamo



Carburetor

Transformer



History of Physics by Simonyi



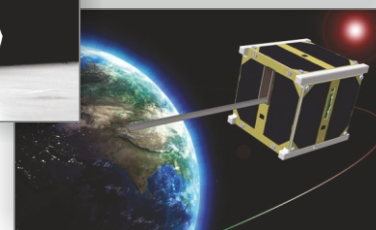
Tódor Kármán



Electric locomotive



Gömböc



Masat-1



## Department of Automation and Applied Informatics

Head: Hassan Charaf

[www.aut.bme.hu/en](http://www.aut.bme.hu/en)



**Mission:** BME AUT is one of the largest departments at BME with a diverse scope on control theory, embedded systems, software modelling, applied software development and many other fields. The department's main activities are education, research and development. Training versatile electrical and software

engineers with solid practical knowledge is our top priority. Our profile also includes developing high quality software and hardware solutions for industry partners. All of our activities are backed by strong research background.



**Brief description of R&D domains:** Computer Science related research areas: applied computer science, multi-mobile platforms, energy efficiency and scalability, biofeedback-based mobile systems, sensors and wearable devices, peer-to-peer network and communication, urban life, smart city, smart spaces, health and wellbeing, active ageing, social networks, location-based mobile social networks, communication intensive solutions, services and devices, privacy, security and trust in information society, distributed systems, data technologies and business intelligence, adaptive content presentation systems, cloud computing, distributed cloud storage, performance optimization, domain-specific modeling environments, model-based software engineering and software artifact generation, IoT.

Electrical Engineering related research areas: engineering of computer-based systems, high performance microcontrollers and interfaces, embedded systems, robotic intelligence, machine learning, power electronics, power controllers, mechatronics, control theory and system identification, utilization of waste energies, nonlinear dynamics in power electronics, renewable energy sources,

intelligent power conversion systems, electromagnetic energy converter.

BME AUT has strong software integration capabilities. We are successful in this field and several partners build upon these activities on our team in numerous international R&D projects.

We believe both in the industrial requirements-driven research and development method, and in the projects that produce working solutions. Our goal is to integrate the requirements coming from the industrial partners with the infinite capacity we have in the university. In one word we believe in cooperation between two parties: industry and university.

The Department works in a sustainable process circuit: we grow up talents and good engineers for the industry who function as a bridge back to the university. The process continuously generate common R&D domains and projects.



### **Selected publications or project details (2010-2015)**

- EBSF (European Bus System of the Future) research and development project, 2009-2011.
- Development of vehicle monitoring and announcement system, Centre for Budapest Transport, Hungary, 2012.
- URBMOBI: Urban Mobile Instruments for Environmental Modelling, EIT Climate-KIC, URBMOBI APIN0035, 2013-2015.
- FuturICT.hu, Infocommunication Technologies and Future Society, TAMOP-4.2.2.C-11/1/KONV-2012-0013, 2012-2014.
- BME Research University, Hungarian Academy of Sciences - the Office for

Subsidized Research Units and by the New Hungary Development Plan, Software Modelling and Model Processing, TAMOP-4.2.1/B-09/1/KMR-2010-0002, 2010-2012.

- MDV: Quality Assured Model-Driven Requirements Engineering and Software Development, GOP-1.1.1-11-2012-0260, 2013-2014.
- CONCERTO: Guaranteed Component Assembly with Round Trip Analysis for Energy Efficient High-integrity Multi-core Systems, ARTEMIS-2012-1-333053, FP7, 2013-2016.
- SOLSUN: Sustainable Outdoor Lighting & Sensory Urban Networks, Sustainable City Systems, EIT Climate-KIC, 2015-2017.

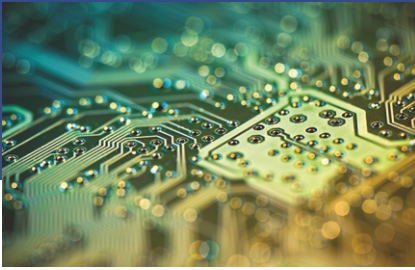


### **Laboratories**

*Applied Informatics:* modeling and software design, mobile (all platform) solutions, enterprise solutions (.NET, Java platforms), data management, portal technologies, performance analysis, embedded systems

#### *Electrical Engineering:*

- Control Engineering: engineering of computer-based systems, microcontrollers, robotics, mechatronics, embedded systems
- Power Electronics: applied electronics, power supply topologies and applications, power controllers



# Department of Electronics Technology

Head: Gábor Harsányi

[www.ett.bme.hu](http://www.ett.bme.hu)



**Mission:** The mission of the Department of Electronics Technology is to research, develop and teach electronic system integration and interconnection technologies, which can directly be exploited by the electronic components, modules and appliance manufacturing industry in the multidisciplinary areas of design, production technology, quality insurance, reliability theory, failure analysis, as well as production informatics, enterprise management systems, e-business and data protection. The four main areas of competences are the

following:

- 1) Electronics materials, components and technologies
- 2) Module circuit substrates and parts, multichip modules, electronics mounting technologies
- 3) Electronics production management, quality and reliability
- 4) Production informatics, enterprise management systems



## **Brief description of R&D domains:**

- Investigation of various reflow soldering processes from practical and methodic aspects
- Study of the whiskering behavior of different solder alloys and surface finishes
- Investigation of lead-free solder joint microstructures
- Electrochemical migration and corrosion investigations on solder alloys used in microelectronics
- Optimising packaging technologies and investigating quality and reliability of solder alloys

- Failure analysis methods for the components of electronic products and processes of production technologies
- Nanosecond pulsed laser based selective micromachining of electronic substrates for microelectronic technologies
- Synthesis of nanomaterials and nanoscale metrology
- Development of wearable sensors and biosensors with corresponding microfluidic components
- Business process modeling, enterprise information systems and application integration



### **Selected publications or project details (2010-2015)**

- F. M. Spiga, A. Bonyár, B. Ring, M. Onofri, A. Vinelli, H. Sántha, C. Guiducci, G. Zuccheri, “Hybridization Chain Reaction performed on a metal surface as a means of signal amplification in SPR and electrochemical biosensors” *BIOSENSORS & BIOELECTRONICS* 54: pp. 102-108. (2014), IF: 6.45.
- B. Medgyes, B. Horváth, B. Illés, T. Shinohara, A. Tahara, G. Harsányi, O.

Krammer, “Microstructure and elemental composition of electrochemically formed dendrites on lead-free micro-alloyed low Ag solder alloys used in electronics” *CORROSION SCIENCE* 92:(C) pp. 43-47. (2015), IF: 3.69

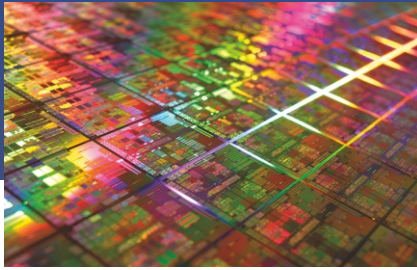
- B. Illés, A. Géczy, “Numerical Simulation of Condensate Layer Formation During Vapour Phase Soldering”, *APPLIED THERMAL ENGINEERING* 70 pp. 421-429. (2014) IF: 2.624



### **Laboratories**

- Electronic Failure Investigation Laboratory
- Printed Circuit Board Manufacturing Laboratory
- Surface Mounted Technology Assembly Laboratory
- Sensors and Microfluidics Laboratory
- Thin Film Technology Laboratory

- Thick Film Technology Laboratory
- Nanotechnology Laboratory
- Laser Technology Laboratory
- Computer Aided Design Laboratory
- Enterprise Resource Planning Laboratory



## Department of Electron Devices

Head: András Poppe

[www.eet.bme.hu](http://www.eet.bme.hu)



**Mission:** The Department of Electron Devices at the Faculty of Electrical Engineering and Informatics of BME is the only university department in Hungary, where the research and educational portfolio covers the entire spectrum of microelectronics starting from the physics and manufacturing processes of semiconductor devices including micro and nanoelectronic devices; VLSI ICs;



**Brief description of R&D domains:** The flagship R&D activity of the department is related to the multi-physical, especially thermal, electro-thermal issues of integrated systems at micro- and nanoscale. In this area our department is one of the best-known research centers world-wide. The Department has been one of the main organizers of the international THERMINIC conferences in the past 20 years. Involving young researchers the widening R&D activity of the department also includes photovoltaic devices, Lab-on-a-Chip devices and design of pico-satellites. Young researchers and students of our Department had significant contribution to the design and realization of the first Hungarian satellite Masat-1. The latest research areas of our Department include:

- thermal transient testing followed by *structure function analysis* to check the quality of the heat-removal properties of semiconductor device packages and thermal management solutions including TIMs
- material characterization with the above method including the in-situ

MEMS and semiconductor sensors; LEDs and solar cells; through modelling, simulation and design of such devices up to complex VLSI chips; up to complex hardware and system design from system on chip to complete high speed boards, space applications or systems realized with help of cyberphysical design platforms aimed at IoT applications and smart systems integration.

monitoring of aging of different structural elements of a semiconductor device package during reliability testing

- *combined thermal and radiometric/photometric measurement, modelling and simulation of power LEDs*
- new innovative thermal simulation algorithms, layout-based fully coupled transistor level electro-thermal simulation of analog IC circuit blocks and *logi-thermal simulation* of digital ICs
- thermo-electric circuits (TELC) based on conceptually new devices called *phonsistors* (in cooperation with the Oulu University, Finland)
- *micro-calorimetry of enzyme reactions* implemented as two-phase Taylor flow in microfluidic devices (in cooperation with the Department of Organic Chemistry and Technology of BME)
- development of new test techniques and test benches for the *multi-physical characterization of solar cells*



## Public funded R&D projects (2010-2015)

### *EU funded projects:*

- **EuroCPS H2020-ICT IA** (2015-2018): European Network of competencies and platforms for Enabling SME from any sector building Innovative CPS products to sustain demand for European manufacturing
- **NANOTHERM FP7 IP** (2012-2015): Innovative Nano and Micro Technologies for Advanced Thermo and Mechanical Interfaces
- **SMARTPOWER FP7 IP** (2012-2015): Smart integration of GaN & SiC high power electronics for industrial and RF applications
- **THERMINATOR FP7 IP** (2010-2012): Modelling, Control and Management of Thermal Effects in Electronic Circuits of the Future
- **NANOPACK FP7 IP** (2008-2012): Nano Packaging Technology for Interconnect and Heat Dissipation
- **Fast2Light FP7 IP** (2008-2011): High-throughput, large-area and cost-effective OLED production technologies



## Laboratories

BME EET Integrated Smart Systems Laboratories was declared “Strategic Research Infrastructure” of Hungary in 2015. The research infrastructure consists of four laboratory units.

- The Semiconductor Technology Laboratory has a cleanroom with 2-3 inch silicon wafer processing capabilities for realization of diodes, MOS circuits, sensors, novel devices, microfluidics and solar cell structures.
- The Thermal and Reliability Testing facility (as part of the Ericsson Complex Hardware Design Laboratory) is specialized mainly in the thermal and multidomain characterization of semiconductor devices and their assemblies, like packaged ICs, power electronics, solar cells, LEDs, solar cells and MEMS.
- The Integrated Smart System Design facility (also known as Mentor Graphics

- **JEMSiP\_3D ENIAC** (2009-2012): Joint Equipment & Materials for System-in-Package and 3D Integration
- **SE2A ENIAC** (2009-2012): Nanoelectronics for Safe, Fuel Efficient and Environment Friendly Automotive Solutions

### *National projects:*

- **KÖZLED** (2009-2011): Development of an energy efficient LED based streetlighting luminaire family
- **PVMET** (2008-2012): Development of equipment aimed for quality control of thin film solar cells
- **OTKA 100794** (2012-2015): Novel electrical and radiometric multidomain methods and models for the qualification of solar cells
- **OTKA 109232** (2014-2017): Integrated thermal management solutions for System-on-Package devices
- **OTKA 110867** (2014-2017): Nanoelectronics based on vanadium-dioxid thin films

VLSI Design Laboratory) has the latest industrial CAD software tools for complex, highly integrated, mixed-signal IC and RF PCB design with functional pre-layout and post-layout simulation. Multi-domain modelling of integrated circuits and numerical modelling and simulation of MEMS are also possible with in-house logi-thermal and thermal simulation tools as well as with commercial CFD tools.

- The Chip Based Biomedical Devices Laboratory is capable of prototyping and production of microfluidic devices. It is equipped with integrated, programmable and thermally stabilized test environment based on Micronit Fluidic Connect Pro standard, for the generation of controlled flows with optical and pressure sensors.





## Department of Networked Systems and Services

Head: Sándor Imre

[www.hit.bme.hu](http://www.hit.bme.hu)



**Mission:** The Department of Networked Systems and Services, formerly known as the Department of Telecommunications, is focusing on the key areas of networking and networked systems: analysis and design of wired and wireless networks, new network architectures and protocols, mobile communication systems and services, multimedia networking and media distribution systems and services, cryptography and network security. Additional strengths that complement the key areas include quantum computing and communications, acoustics and studio technologies, signal processing, financial information systems.



### **Brief description of R&D domains:**

**ICT Networks:** development of network technologies, cloud computing, performance and reliability modelling and evaluation of computer and communication networks, the design and analysis of telco networks and ICT systems, performance analysis, “green networks”, reliability studies, and automatic testing solutions to enhance the reliability of networking software solutions.

**Mobile Communications:** digital radio transmission and reception; signal processing; radio capacity and performance evaluation; multi-antenna techniques; energy efficiency of radio access networks; medium access and radio resource management algorithms; mobility management and network mobility solutions; smart metering and applications development.

The recent change of our name from Department of Telecommunications to Department of Networked Systems and Services reflects the fact the competences of the department have shifted significantly during the last decades. This change has been motivated by the convergence of telecommunication systems and the Internet, resulting in a global integrated network of heterogeneous devices, as well as by the widespread deployment of information technologies, and in particular the Web, resulting in innovative new network based services.

**Media Networks and Services:** infrastructures and services for smart cities, self-organizing networks, mobile e-health services, 3D video communications, mobility management in IPv6 networks.

**Quantum Computing and Communications:** quantum key distribution protocols, data base handling algorithms, medium access control, modelling and superactivation of quantum channels.

**Cryptography and Systems Security:** security protocols and privacy enhancing mechanisms in embedded wireless networks (such as sensor networks, inter-vehicle communications, RFID systems, smart metering applications, Internet of Things); OS level security problems (including malware analysis and detection, security in virtualized environments, vulnerability analysis of virtual machines, security issues in cloud computing); economics of security and privacy (e.g., risk analysis and management, incentive compatible security architectures, reputation metrics, cyber insurance, spam and DNS economics).



**Financial Computing:** algorithmic trading, optimizing protocols for financial computing applications, and digital signal processing. The covered research topics include adaptive algorithms, statistical resource management, risk management, times series analysis and prediction, real-time trading, and modelling financial market dynamics.

**Acoustics and Studio Technology:** electro-acoustics and television of audio and video technologies, tools, input and output devices, methodologies and systems of radio, tv and film studios, media content production, measurement, analysis, prediction and control of environmental noise & vibration, room acoustics, sound quality engineering, active noise control, numerical simulation of sound and vibration generation and propagation as well as modelling of interactions of aerodynamic and acoustic phenomena.



#### Selected publications or project details (2010-2015)

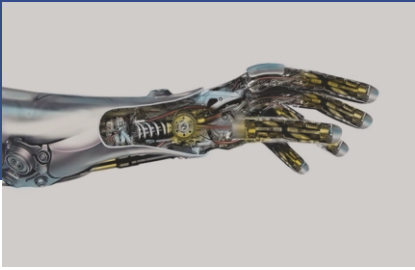
- **CONCERTO:** Content and Context Aware Delivery for Interactive Multimedia Healthcare Applications
- **CHIRON:** Cyclic and Person-centric Health Management
- **SAMURAI:** Spectrum Aggregation and MU-MIMO- a real world impact
- **EULER:** European Software Defined radio for wireless in joint security operations
- **EARTH:** Energy Aware Radio and neTworking tecHnologies
- **OPTIMIX:** Optimisation of multimedia over wireless IP links via X-layer design
- **NAPA-WINE:** Network-Aware P2P-TV Application over Wise Networks
- **WSAN4CIP:** Wireless Sensor and Actuator Networks for Critical Infrastructure Protection

- **EU-MESH:** Enhanced, Ubiquitous, and Dependable Broadband Access using MESH Networks
- **BIONETS:** Bio-Inspired Service Evolution for the Pervasive Age
- **SeVeCom:** Secure Vehicle Communications
- **COSMA:** Community Oriented Solutions to Minimize Aircraft Noise Annoyance
- **INNOSOUND:** Innovative Methods and Tools for the Sound Design of Organ Pipes
- **QKD:** Second generation Quantum Key Distribution System



#### Laboratories

- AddICT- Analysis, Design and Development of ICT systems Laboratory
- CrySyS- Laboratory of Cryptography and System Security
- FCSP- financial computing and signal processing
- MCL- Mobile Communication and Quantum Technologies Laboratory
- MEDIANETS- Laboratory of Multimedia Networks and Services
- LAST- Laboratory of Acoustics and Studio Technologies



## Department of Control Engineering and Information Technology

Head: Bálint Kiss

[www.iit.bme.hu](http://www.iit.bme.hu)



**Mission:** BME Department of Control Engineering and Information Technology celebrated its 50th birthday in 2014. Besides educational responsibilities for core electrical and software engineering courses in the BSc degree programs in the faculty the department has expertise in the fields of image processing, computer graphics, software technology and control engineering, the department aims at providing specialized and innovative training in visual informatics, high level logic

synthesis, cloud systems, parallel computing, industrial automation, robotics, and autonomous vehicles. While releasing generations of successful graduates serving the industry or academic and research institutions in Hungary and abroad, our staff strives to provide a solid fundamental and applied research background for all stakeholders in our fields of expertise.



**Brief description of the R&D domain:** Activities are focused into five key areas such as control engineering and robotics (including control theory, system identification, soft computing in control, process instrumentation and control, programmable control devices and systems, intelligent autonomous systems, robot control and robot systems, vehicle control); computer graphics (including modelling, photo-realistic and illustrative rendering, animation, game development, scientific visualization, medical imaging, machine vision, and image

processing); software technology (including programming languages and methodologies, software quality, security of information systems, cloud technology, distributed and concurrent systems); customized digital systems (including high level logic synthesis, system level synthesis, hardware-software co-design in embedded systems); biomedical engineering (including modelling and simulation of biological processes, bio-informatics, medical information systems).



### Selected publications or project details (2010-2015)

- Lantos B, Márton L. Nonlinear control of vehicles and robots SPRINGER, 2011. 458 p. (Engineering) Ser: Advances in Industrial Control
- Szlávecz Á, Benyó B. Practical estimation method of the optimal scanning protocol for 180° data acquisition in parallel SPECT imaging. BIOMEDICAL SIGNAL PROCESSING AND CONTROL 12: pp. 19-27. (2014)
- Szirmay-Kalos L, Umenhoffer T, Tóth B, Szécsi L, Mateu S. Volumetric Ambient Occlusion for Real-time Rendering and Games. IEEE COMPUTER GRAPHICS AND APPLICATIONS 30:(1) pp. 70-79. (2010)
- Emission tomography reconstruction for PET on GPU (NKTH Teratomo 2008-2011)
- Fitting multiple surfaces with geometric constraints (OTKA 2012-2016)

- GPU-Based Visualization and Image Processing (OTKA 2012-2015)
- Physics Simulation and Inverse Problem Solution on Massively Parallel Systems (OTKA 2012-2016)
- Modelling and control of airport passenger flow (with Budapest Airport, 2013)
- Advanced Control Theory and Artificial Intelligence Techniques of Autonomous Ground, Aerial, and Marine Robots (OTKA 2008-2012)
- Novel methods for the improvement of medical diagnostics (OTKA 2010-2015)
- Development of solutions to install sensitive applications in remote devices using chip-card technologies (KMR BAKTAT 2013-2016)
- Engineering Technology-based Innovation in Medicine (EU FP7 2013-2016)
- Enabling grids for E-science (consortium: <http://eu-egee.hu/>)



### Laboratories

- **Intelligent robotics:** control of mechatronics systems and weight handling equipment, cooperative localization, multi-agent robotics, indoor UAVs, industrial control systems
- **Medical informatics:** modelling, identification and control of physiological processes, medical instrumentation, research of orthopedic devices

- **Computer graphics:** real-time GPU based photorealistic rendering, off-line CPU based global illumination methods, Monte Carlo techniques, non-photorealistic and expressive rendering styles, medical/physical/engineering simulation and visualization
- **Image processing and 3D vision:** 2D/3D image processing, virtual reality systems and related sensor technology



# Department of Measurement and Information Systems

Head: Tamás Dabóczi

[www.mit.bme.hu](http://www.mit.bme.hu)



**Mission:** The Department of Measurement and Information Systems delivers dependable and intelligent services, devices, technologies and tools for Cyber-Physical Systems(CPS) to turn embedded systems into smart objects of everyday life by tightly combining computation, communication and signal processing approaches with physical processes of different nature (e.g., electrical,

mechanical or biological) over a trustworthy Internet-of-Things. Our focus includes foundation research to provide core insights as well as applied research to innovatively exploit existing technologies and deliver business value in multiple application domains. Our research has translational potential so it can be used for cognitive and therapeutic services and diagnostics.



## Brief description of R&D domains:

- **Sensing and signal processing:** intelligent medical image processing (X-ray image analysis), real-time signal processing (video and radar), biomedical sensing (blood pressure, motion-based monitoring), digital signal processing with acoustic applications (active noise control, digital sound synthesis), calibration (ADC testing)
- **Intelligence:** machine learning, Big Data analysis (statistical exploratory and confirmatory), decision support systems, medical image processing and diagnostic systems, optimization and simulation, semantic knowledge representation & query processing, data and knowledge fusion (logic/systems/kernel-based)
- **Systems & software engineering concepts:** model-based design, hardware-software co-design, verification & validation, testing, fault tolerance, deployment automation, runtime monitoring, certification, open source software projects
- **Computational technologies:** Distributed computing over the Cloud, high-performance computation by reconfigurable FPGAs, dedicated technologies (DSP, real-time embedded operating systems), computational biomedicine
- **Communication technologies:** sensor networks, automotive & avionics communication protocols & architecture (AUTOSAR, ARINC653), protocols for smart devices & Internet
- **Infrastructure technologies:** Carrier-grade Cloud, Educational Cloud (Apache VCL), Virtualization, Microcontroller boards, Heterogeneous embedded computing (CPU, GPU, FPGA)
- **Application domains:** ambient-assisted living, bioinformatics & biomedical, business intelligence and optimization, critical embedded systems (automotive, avionics, railway), IT systems infrastructure, telecommunications (infrastructure & software technology)



### **Selected publications or project details (2010-2015)**

- EU (FP7): CECRIS, CONCERTO, E-Freight, MONDO, R3COP, R5COP, SecureChange
  - National: CERTIMOT, FIRST, FutureICT, GENAGRID, iMEDA, KOBAC, TOMO
  - Industrial projects with: Budapest Bank, Embraer, Ericsson, EvoPro, Innomed, IBM DSS, IBM Research Triangle Park, Morgan Stanley, Nokia-Siemens, National Instruments, Prolan, Xilinx, Semmelweis University, ThyssenKrupp Presta, TTTech
- 



### **Laboratories**

- Embedded Systems Research Group (with Digital Signal Processing, FPGA, Biomedical Engineering, Network Embedded System Labs)
  - Fault-Tolerant Systems Research Group (Dependable Systems, Model Based Systems & Software Engineering, Formal Methods for Verification & Validation)
  - Intelligent Systems Research Groups (computational biomedicine, medical informatics, ambient assisted living, intelligent medical image processing)
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## Department of Computer Science and Information Theory

Head: Gyula Y. Katona

[www.cs.bme.hu/eng](http://www.cs.bme.hu/eng)



**Mission:** While the basic calculus and linear algebra is taught by the Mathematical Institute of the Faculty of Natural Sciences, our department is responsible for teaching mathematical subjects are related to modern computer science. The core curriculum of the electrical engineering BSc majors contains a course on linear algebra, number theory, discrete mathematics and the theory of algorithms. For the technical informatics majors we offer obligatory courses on linear algebra, number theory, discrete mathematics, theory of algorithms and declarative programming. Another stream within that core curriculum consists of probability and statistics, stochastic processes, information theory and coding theory.



**Brief description of R&D domains:** The staff of the department is involved in research in several different areas of pure and applied mathematics. This activity has been sponsored by some 25 research grants in the last 20 years, partly by various Hungarian sources, partly by projects of the European Union and by

For informatics students at MSc we offer specialization in Theory of Computing. This consists of courses in complexity theory, advanced graph theory, data mining, high efficiency declarative programming and semantic technologies. Also, our courses on system optimization, languages and automata, queuing theory is obligatory for most of the informatics MSc students.

Our department is also responsible for the courses on the above topics in the curricula of the applied mathematics majors of the Faculty of Natural Sciences.

bilateral projects with the USA and Japan. Research topics include: combinatorics, graph theory, combinatorial optimization, hypergraphs, combinatorial geometry, VLSI design, theoretical computer science, formal languages, number theory, probability theory, statistics, declarative programming, logic programming.



### **Selected publications or project details (2010-2015)**

- Fleiner T: A fixed-point approach to stable matchings and some applications, MATHEMATICS OF OPERATIONS RESEARCH 28:(1) pp. 103-126. (2003)
  - K Friedl, G Ivanyos, F Magniez, M Santha, P Sen: Hidden translation and orbit coset in quantum computing In: Proceedings of the Thirty-Fifth Annual ACM Symposium on Theory of Computing. San Diego 2003. pp. 1-9.
  - Katona GY, Kierstead HA: Hamiltonian Chains in Hypergraphs, JOURNAL OF GRAPH THEORY 30:(3) pp. 205-212. (1999)
  - P Arató, Z Á Mann, A Orbán: Algorithmic Aspects of Hardware/Software Partitioning, ACM TRANSACTIONS ON DESIGN AUTOMATION OF ELECTRONIC SYSTEMS 10:(1) pp. 136-156. (2005)
  - Pach PP, Pinski M, Pongrácz A, Szabó C: A new operation on partially ordered sets, JOURNAL OF COMBINATORIAL THEORY SERIES A 120:(7) pp. 1450-1462. (2013)
  - A Recski: Matroid Theory and its Applications in Electric Network Theory and in Statics, Berlin; Budapest; New York: Springer, 1989. 531 p. (Algorithms and Combinatorics; 6.)
  - Dániel Marx, Ildikó Schlotter: Stable Assignment with Couples: Parameterized Complexity and Local Search DISCRETE OPTIMIZATION 8: pp. 25-40. (2011)
-



# Department of Broadband Infocommunications and Electromagnetic Theory

Head: Lajos Nagy

<http://hvt.bme.hu/index.php?lang=en>



**Mission:** The Department of Broadband Infocommunications and Electromagnetic Theory aims at educating specialized engineers for research and development and engineers for operating complex systems. The department provides skills in the domains of satellite and terrestrial broadcasting; digital and analogue radio systems; optical telecommunication systems; microwave telecommunication

systems; mobile systems and wave propagation; position detection; navigation and RDF (Radio Detection Finder) Systems; radio measuring (localization and remote sensing) systems; Electromagnetic theory: non-destructive material testing, meta-materials and nanostructures.



**Brief description of R&D domains:** The department has a wide-ranging research activity in national and EU funded projects. This activity includes the telecommunication, space research, radio location and remote sensing, radio detection finding, optical and microwave-optical transmission, antennas and wave propagation, microwave and electrical circuits. On these fields, there are

theoretical base researches, computer simulation and developments, as well as works on experimental circuits. The active fields of the telecommunication are the following: digital communication, terrestrial digital radio, satellite communication, optical and microwave communication, indoor communication.



## **Selected publications or project details (2010-2015)**

The department was involved in 14 international and 13 national research projects. We have a very strong cooperation with several industrial partners dealing with development projects. The staff has published 72 journal and 134 conference papers in the last 5 years.

Selected projects:

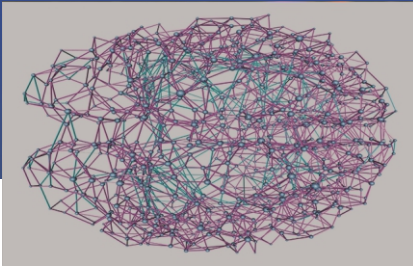
- FERFIT – ERA-NET framework project, nonreciprocal microwave ferrite devices, 2010-2013
- QoS MOS- FP7 ICT project – cognitive radio systems in analogue TV bands, 2010-2013
- REXUS Gekko- study the ionization of the atmosphere in different altitudes by using rocket-borne Gerdien condensers, ESA, 2011-2013
- BEXUS BioDos- UV biodosimetry experiment within the frame of ESA BEXUS program, ESA, 2011-2013
- BEXUS Daemon- Astrobiological experiment to investigate the effects of UV radiation to DNA, ESA, 2011-2013
- IDEATA- Low profile electronically steered “tile” antenna using compact RF Front-end, 2012-2015
- Metafer - Eureka framework project, investigation of ferrite and metamaterials, 2013-2015
- Cognitive Millimeter-Wave Radar for UAV – KMR\_12-1-2012-0008, Development of Millimeter-Wave radar using MIMO technique, 2013-2015
- ESEO EPS- European Student Earth Orbiter- Electrical Power Subsystem for satellite, ESA, 2009-2015
- ESEO LMP – investigation the composition of the plasma, the effects of Sun activity and the anomalies of the plasma, ESA, 2009-2015





## Laboratories

- Digital and optical communication systems laboratory state-of-the-art modulations and cognitive systems improving spectral efficiency system-level evaluation of digital terrestrial and satellite-based fixed and mobile communication systems
  - Electromagnetic field simulation and design laboratory research of numeric methods applicable for solving practical electrical engineering design tasks solving the direct and inverse problems of non-destructive material testing
  - EMC laboratory and antenna measurement chamber simulation, design, construction and testing of antennas, high frequency active and passive electronic circuits the laboratory is equipped with electromagnetically shielded anechoic EMC chamber
  - Laboratory of multiscale electromagnetic systems
  - research of structures and metamaterials possessing novel electromagnetic properties utilization the designed metamaterials in antennas for new generation LTE telecommunication
  - MASAT-1
  - Microwave remote sensing laboratory imaging radar (synthetic aperture radar), air traffic control radar supplementary systems (radar tester), air traffic monitoring passive radar (WAMLAT); UAV anti-collision radar; antenna systems with electronic beam scanning
  - Optical and microwave telecommunications laboratory optical and microwave telecommunications, electro optical device modelling, applications and interaction, free space optics, high speed optical telecommunications, microwave circuits
  - Rohde&Schwarz reference laboratory broadcast technology (DAB, DVB, DRM), transmitting and receiving radio and television broadcast signals analogue and digital circuit design, development and implementation of signal processing methods
  - Space technology laboratory hardware design, development, testing, mechanics, construction, power supply and distribution, space research programs, satellite on-board systems, vertical rocket and stratosphere balloon experiments
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## Department of Telecommunications and Media Informatics

Head: Gábor Magyar

[www.tmit.bme.hu](http://www.tmit.bme.hu)



**Mission:** The department is one of the largest departments at BME with strong relations to industrial partners and international research communities. The mission of the department is to ensure the highest level education at BSc/MSc/PhD levels and to pursue an active role in national and international scientific research and development in the area of infocommunications and media informatics. It focuses on the Internet and content/data technologies. Our

aim is to deploy the opportunities deriving from the Internet based convergence of the communication, information and media technologies in the evolving Internet ecosystem. The department is involved in the majors of Electrical Engineering, Computer Engineering, Business Information Systems and Biomedical Engineering and undertakes an outstanding share in the PhD education within the Faculty of Electrical Engineering and Informatics.



### Brief description of R&D domains:

#### **Infocommunication systems, Internet engineering and practice:**

- IP based networks and services: Internet architecture, network virtualization, cloud services, resource engineering, performance and reliability analysis, network and service security, Future Internet technologies, ambient intelligence, energy-aware solutions, smart city applications
- Planning of infocommunication networks development, operation, monitoring and management. Optical networks, optimization of heterogeneous networks, developing and testing protocols

**Data science, content management and multimedia systems:** database-management, Big Data engineering, data, text, media and web mining, information retrieval, multimedia information systems, media-databases, digital archives, database and media-security

**Speech technology, acoustics and multimodal information systems:** speech processing, synthesis and recognition, speech acoustics, speech databases, speech information systems in customer and content services, speech diagnostic systems, intelligent human-computer interaction, smart user interfaces, smartphone, smartTV, smart robots, in-car information systems

**Intelligent and cognitive infocommunications:** intelligent computational systems, cognitive infocapabilities, 3D Internet based virtual collaboration, enhanced and virtual reality applications

**Engineering management and infocommunication regulation:** engineering management methods, development strategies, technology regulation, information economics, Internet pricing



### Selected publications or project details (2010-2015)

- **Future Internet Research Group** – Momentum Grant of Hungarian Academy of Sciences, 2012-17
- **5GEx** – 5G Exchange, EU-H2020 ICT-14-2014, 2015-17
- **COALA** – Computerised Analysis of Language Phenomena – Phonetics Analysis, ESA, 2013-2015
- **COMBO** – Convergence of fixed and mobile broadband access/aggregation networks. EU-FP7. 2013-15.
- **CONCERTO** – Content and context aware delivery for interactive multimedia healthcare applications, EU-FP7 STREP, 2011-14
- **EARTH** – Energy Aware Radio and Network Technologies, EU-FP7 IP, 2010-12
- **EARTH SCIENCE** – Data mining analysis system, TAMOP 4.2.2.C, 2012-15
- **ENERGIC** – European Network Exploring Research into Geospatial Information Crowdsourcing, COST, 2012-16

- **FIRST** – Future Internet Research, Services and Technology, TAMOP-4.2.2.C, 2012-14
- **FuturICT.hu** – Infocommunication Technologies and Future Society, TAMOP-4.2.2.C, 2012-14
- **IntelliCIS** – Intelligent Monitoring, Control and Security of Critical Infrastructure Systems, COST, 2009-13
- **MINERVA** – Implementing network coding in transport networks to increase availability, GN3+ 2013-15
- **NeuroCogSpace** - Virtual NeuroCognitive Space for R&D of future immersive mediatechnologies, KTIA AIK, 2013-15
- **UNIFY** – Unifying cloud and carrier networks, EU-FP7 IP, 2013-16
- **PAELIFE** - Personal Assistant to Enhance the Social Life of Seniors, AAL Joint Programme (AAL JP) 2012-14



### Laboratories

- **HSNLab** – High Speed Networks Laboratory: Infocommunication networks, services and applications, Internet architectures and engineering
- **DCLab** – Data Science and Content Technologies Laboratory
- **SpeechLab** – Speech technologies and intelligent interactions Laboratory
- **CogInfoComLab** – Cognitive Infocommunications Laboratory
- **EMLab** – Engineering Management laboratory



## Department of Electric Power Engineering

Head: István Kiss

[www.vet.bme.hu/en](http://www.vet.bme.hu/en)



**Mission:** The department is one of the successors of the one established in 1893 by Professor Zipernowsky, who is the well known inventor of the transformer. Our important task is to follow these traditions and to open new fields both in research and in education. We are very proud of being long-time and important partners of local industry since the early stages of electrification. This collaboration ranges from the construction of the 750 kV line to today's "Smart" era. Staff members are

well-known scientists, having several years experience in research and in industrial consultancy. Many serve on European or national standard, academic and industrial committees. The staff members regularly organize international conferences and training courses. Closed cooperation has been established with several universities and other segment of the academic world.



### Brief description of R&D domains:

- Electric power system and its information technology, electricity markets
- High voltage, high current and insulation engineering
- Lightning and overvoltage protection (buildings, wind turbines, solar panels)
- Electrostatic hazard protection, electrostatic precipitators, Electrical security technology
- Electric machines and intelligent drives
- Electric systems of buildings, lighting technology
- Electrical switching devices and installations
- Measurements and monitoring, Electro-Magnetic Compatibility
- Modern asset management
- Smart Grids (Island operation, Multi-agent modelling of various DG sources

and storage systems, Stochastic simulation of EV charging and their grid impact, Reliability analysis of networks, Load and Wind forecasting, DSM optimization)

- Electricity markets (power exchange simulation and forecasting, EU and US market designs, co-optimization of DAM and Reserve markets, flow-based market coupling)
- Energy audits of medium/large consumers (Warehouse, school, hospital, factory: measurements, modelling, evaluation of energy/cost saving investments, incl. renewables)
- Classical Power Systems topics (power system analysis and simulation, protection, substation and network automation, power quality, on-site measurements)



### Selected publications or project details (2010-2015)

- Embedded IT Design for the Optimisation of an Energy-positive Public Lighting System – GE
- Integrated Energy and Schedule Control System for Railways – Prolan
- Optimisation Technology Design of EVs' Drives and Energy Supply System – SIEMENS
- Intelligent MV Fault Location (2 prototype units in test operation at DSOs)
- Electricity Market Modelling, Co-Optimisation of Energy and Ancillary Service Markets
- TSO Interaction of Network Inverters
- Smart Meters in the 2-150 kHz domain (DSO)
- Ripple Control in Terms of Smart Metering (EON)
- New approaches regarding MV network structure & operation (EON)
- Development of a Hub Motor for a formula racing car
- Risk based maintenance and lifetime management of electricity distribution network (EON)
- Primary equipment diagnostics and expert system development (EON)
- Equipment diagnostics and procurement of distribution network (EON)
- Cable diagnostics and lifetime management (EON)
- Asset management and substation equipment diagnostics expert system development (ELMÚ DSO)
- Ageing management of nuclear power plant secondary cable system (Paks NPP)
- Investigation of brittle fracture of composite high voltage insulators (MAVIR TSO)
- Live working technology development (MAVIR TSO); FP7 project – Best Paths (Demo 4)



### Laboratories

- **High Voltage Laboratory** (<http://nfl.vet.bme.hu/en>) – insulation diagnostics, Live line maintenance, Training courses, HV AC, DC test equipment (up to 600 kV) and impulse generators (up to 1 MV), EMC testing instruments (incl. GTEM cell)
- **Smart Grid Lab** – PV infeed and flexible network model, PLC / BPL / flexibly configurable LV test network (with >1km line), Power Quality measurement devices, Protection and revenue meter testbeds, Dispatcher training simulator
- **Laboratory of Electric Machines and Drives**

## Research Centres and Services

**Federated Innovation and Knowledge Centre (BME EIT)** coordinates and stimulates the research and development activity and the utilization of research results of the Faculty. BME EIT operates as an R&D service centre. Its tasks include initiating cooperation among the various faculties of the University, other tertiary institutions, industrial companies and other domestic and international organizations. BME EIT coordinates areas spanning several faculties such as BME space activities, BME intelligent solutions, and integrates several research knowledge centres as the Healthcare Technologies Knowledge Centre, the Integrated Energetic Centre, etc. Furthermore, EIT has regional research centres in Debrecen city (Future Internet) and Szeged city (Future ICT) to strengthen the cooperation with companies, and EIT also manages BME participation in the EIT Digital Budapest Associate Partner Group.

<http://eit.bme.hu>

**The Smartpolis Knowledge Centre (SKC)** recently established under the Horizon 2020 program of the EU is currently working on the preparation of the building up the Budapest Centre of Excellence for Smart Cities based on the innovation capacity, know-how and expertise of BME and project partners. SKC contributes knowledge creation, knowledge transfer, as well as research, innovation and deployment projects in the Central and Eastern European region to reach the European goals defined by Horizon 2020.

<http://smartpolis.eit.bme.hu>

**BME Technology and Knowledge Transfer Office (MTTI)** facilitates the transfer of research results achieved at BME into business and industry, and disseminates innovation culture among the citizens of the University. MTTI's clear objective is serving scientists and creating an environment in which the parties' mutual interest is to utilise the R&D results.

<http://tti.bme.hu>

The mission of the **EIT Digital** Budapest Associate Partner Group is to give a boost to the development of an innovative ICT ecosystem in Hungary and in Central and Eastern Europe, being the only EIT Digital centre located in this region. The EIT Digital Budapest Associate Partner Group is a consortium of two local universities – namely, Eötvös Loránd University with its Faculty of Informatics and Budapest University of Technology and Economics with VIK under the management of EIT – and their leading industrial partners.

<http://budapestictnetwork.elte.hu>

**Demola**, located at BME VIK, has an international pool of young talent from all fields of science, university partners with the latest research, and an award-winning innovation platform to guarantee real results. “Building the World's Strongest Innovation Ecosystem”, Demola is an international organization that facilitates co-creation projects between university students and companies, either locally or internationally.

<http://budapest.demola.net>

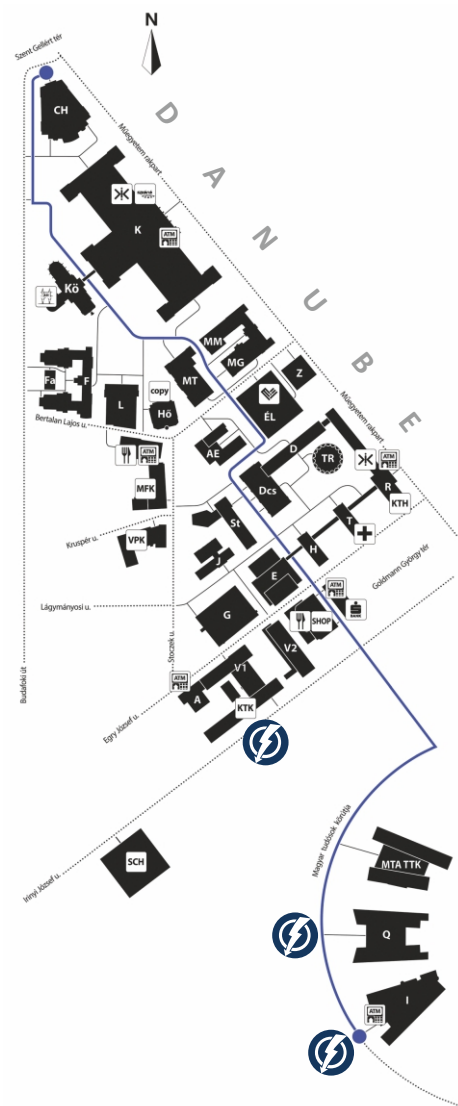
**Climate-KIC** is the European knowledge and innovation community specializing in climate change mitigation and adaption. They create new partnerships to integrate research, business and technology to transform innovative ideas into new products, services and jobs.

<http://www.klimainnovacio.hu/en>

[www.vik.bme.hu](http://www.vik.bme.hu)

[www.eit.bme.hu](http://www.eit.bme.hu)

# Map of University



## Budapest University of Technology and Economics

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**Publisher:** BME  
Faculty of Electrical Engineering and Informatics,  
Dean's Office





<http://www.vik.bme.hu/en/>