# DEPARTMENT OF TELECOMMUNICATIONS

5.3. COMMUNICATION AND COMPUTER ENGINEERING

NBU-DT

# THE DEPARTMENT

The Department of Telecommunications was established in February 1994. There are a lot of eminent specialists associated with the department from different universities, public and private institutions and firms directly engaged with the development of the telecommunications and information technologies in our country.

In its early years the departmental team was composed of distinguished professors and engineers comming from practice and the National Research Institute of Communications of the Bulgarian Telecommunications Company (now known as Vivacom) and its subsidiaries. At that time, classes, lectures, exercises and practice of students is held at the National Meteorological Institute of the Bulgarian Academy of Sciences. Students hold their practice in the Committee of Post and Telecommunications, Siemens, Ericsson, Vivacom, Mtel Globul, Electron-Radiocom, BASCOM, ASTEL, Multiplex .Ltd, and the Telecommunications Laboratory at NBU on the basis of frame contracts with these institutions.

All department programs (BS, MS and PhD) are acredeted by Bulgarian National Acreditation Agency. From 1994 to 2012 total number of successful graduates is nearly 550. A huge number of them work in the field of telecommunications, and most of our students in the MS program are employees of telecommunications companies wanted to improve their qualification or to change their professional field. Our department is a pioneer in the creation of training programs for education of "professional bachelors" (telecommunications associates degree engineers).

The current R&D of the department is related to participation of in international and national funding programs for scientific and applied research in interdisciplinary areas mainly related to ICT.

# NBU-DT

# OUR PROGRAMS

More than 200 students are studying in our undergraduate programs and specializations. About 20% of them select to continue their education in our master degree programs. Our graduate programs are adapted for training of specialists having a bachelor's and a master's degree in another area close to telecommunications (IT, general engineering, electrical engineering, physics, chemistry, energy, etc.).

## Bachelor of Science Degree

- Telecommunication Technologies and Services
- Technological Management in Telecommunications
- Logistic and Postal Services Technology

## Master of Science Degree

- Innovation and Entrepreneurship in Telecommunications
- Digital Telecommunication Systems and Networks
- Mobile Communications and Digital Media
- Telecommunication Project Management
- Regulation and Technology Management in Telecommunications

## PhD

The PhD in Philosophy as an academic degree in **Communication and Computer Engineering** enables students to be engaged in applied high-quality research and teaching. Young researchers can choose precisely the area to make their thesis:

- Mutual interference in mobile networks and electromagnetic compatibility
- Digital networks and services (modeling and simulation)
- Management and knowledge management in ICT
- Software systems analysis and design in telecommunications
- Innovations and trends in technical provision of telecommunications
- DSP, GP-GPU and modern electronic systems
- Fibre optical and free space communications
- Telecommunication regulations, spectrum management and planning
- Cloud Computing, Smart Home
- Intelligent transportation systems and smart city
- Telemedicine, e-Health technologyes

*NBU-DT*

# GRADUATES

We have more than 540 graduated students in various levels of education and training in several subjects, modules and profiles. Approximately 30% of students finishing with a bachelor's degree start working in the next months. Practically 30% of MS'c student are oriented to start their own business in the field of computer networking, instalation and maintenance of recently shaped software programs and systems.

| Graduates per years | BS | MS'c |
|---|---|---|
| 2000 | 12 | |
| 2001 | 16 | |
| 2002 | 65 | |
| 2003 | 12 | 14 |
| 2004 | 53 | 27 |
| 2005 | 50 | 24 |
| 2006 | 23 | 6 |
| 2007 | 32 | 10 |
| 2008 | 26 | 16 |
| 2009 | 16 | 24 |
| 2010 | 6 | 20 |
| 2011 | 5 | 41 |
| 2012 | 25 | 21 |
| 2013 | 26 | 14 |

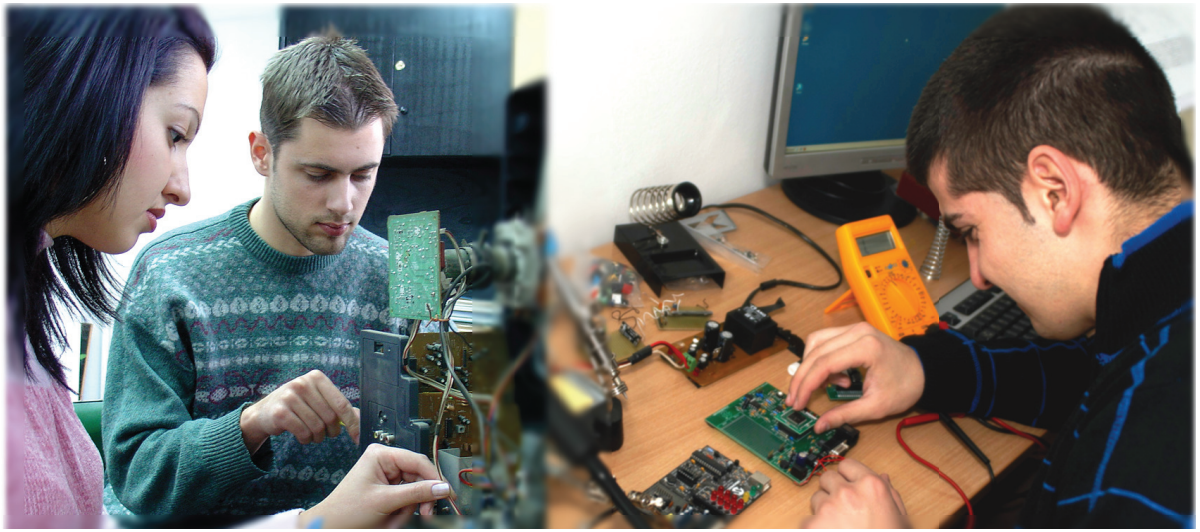
The Department provides open access to all students and Alumni to a Laboratory of electronics, Computer center of Radio communication and measurement equipment. Every year our students participate actively in various international conferences and EU projects. The University supports organization of student clubs and workshops, as well the creation of inovative technological ideas. Currently they organize courses on Amateur radio **LZ1KNB**.

# NBU-DT

# *ELECTROTECHNICS & ELECTRONICS LABORATORY*

## Overview

The department has three specialized classrooms for laboratory classes in courses related to electrical engineering, electronics, radio communications, broadcasting and receiving equipment, computer modeling and simulation, Internet communications, corporate communications, next generation networks, WEB services, cloud computing, software defined networks, digital signal processing,etc.



*NBU-DT*

The following exercises are performed in E&E lab:

- Basic electrical and electronic measurements (using osciloscopes, spectrum analyzers, digital multimer, current clams , frequency counters etc.; resistance, inductance, capacitance, resonant, semiconductors and IC measurements)
- Power supply systems measurements and repair (UPS)
- PC assembling and basic repair
- Advanced instrumentation and data acquisition (LabView, Elvis II+)
- Analog front-end design (Microchip amplifier kits, using of AMS modelling language)
- Digital logic design (Standard TTL & CMOS)
- Microcontroller assembly and C/C++ programming (PIC, AVR, ARM, Pinguino, Arduino based prototyping boards)
- Programable logic design using VHDL (Altera Quartus II CPLD/FPGA design kits, basic processor architecture)
- Embeded ethernet (Rabbit connect core)
- Internet of Things (intelligent sensor networks, RFID, robotics and actuators)
- Audio and video systems and signals
- Matlab & Mathematica signal and system modelling

# *RADIO, MICROWAVE & FIBRE OPTIC LABORATORY*

## RF, sattelite and microwave

We provide state of the art practical education in the field of RF transmitter and receiver design, electromagnetic field and radiowave measurements. Our lecturers are internationally recognized (ITU) experts in the fields of radio transmission and reception equipment, spectrum planning, management and regulation, spectrum monitoring, microwave technology, satellite and mobile communications.

In our RF laboratory you can learn how to create and tune your clasical analog transmitter and receiver; how to measure differnt radio signal characteristics, how to select proper anthenas for specific RF application; you will learn basic signal measurements from extreme low frequency to 6GHz, and advanced microwave measurements extending your practical experience up to 10GHz.

Students will learn how to use ANSYS HFSS software to design and simmulate basic and compicated RF and microwave devices, anthenas and even the whole systems.

We use some of the most advanced technologies in the teaching of radio communications provided by National Instruments - Elvis II + & Emona Tellecommunication Bundles. This is the fastes way to understand radio communications from very basic to the most advanced digital systems.

Department team includes the TOP-Leading experts (in Central and Eastern Europe) in the field of mobile radio network planning, digital terrestrial television planning (DVB-T), FM radio, special radio services (military, aerospace), satellite communications and navigation etc.

## Broadband and backbone technologies

In our laboratory we cover practical exercises from clasic digital telephone lines and switching systems, cable TV, to most modern fiber optic transmission lines (WDM), intelligent ethernet (LAN), data over cable service, power line communications, xDSL, signal coding and encription etc.

# *NBU-DT*

# *ADVANCED NETWORKING LABORATORY*

# *NBU-DT*

## IP networks and services

In our networking laboratory students are trained to install and maintain high-performance server configurations with Linux operating systems, how Cloud Computing works, they install and manage real WEB 2 services like: Apache web server, MySQL, PHP and Java web based applications, WEB monitoring tools. Linux based Open WRT router technology is coverd. They learn various network architectures, IPv4 & IPv6, VoIP, IPTV, MPLS, public telephone systems, convergence technologyes and services, high performance computing architectures (CUDA). Students learn how different networking protocols works.

## Telecom network management

Students learn how to design, plane and manage specific networks, how to detect problems, how to monitir different netrork services and traffic, how to create and manage user profiles, how to set up network security features, how to deploy services in large scale real environment, WiFi and LAN networking (VLAN). They learn how to use network simmulation software tools for contemporary network design and validadion.

## Internet of things

Students learn how to program embedded IP devices, thus understanding in deep how TCP & UDP protocols work. They create client-server based applications, voice and video transmission over IP, web based radio and video podcasting.

# *RECENT REALIZED PROJECTS*

# *NBU-DT*

## National Projects

The following scientific projects are developed as a part of legal agreements between NBU, Bulgarian ICT Development Agency, Bulgarian Standartization Institute and National Science Fund:

2002 Collocation  Provision of conditions for collocation

2002 Bulgarian National Radio Frequency Harmonization Plan with this of NATO member States

2003 Methodology for proving the deficiency in provision of the universal post services in case of non-favorable economic conditions

2003 Survey and analysis of the received documents related to the preparation of the Regional Radio communication conference RRC-04/05

2004 Project Strategy for establishment of the broadband infrastructure in Bulgaria

2005 Methodology for measurement of the service characteristics and quality in the terrestrial digital TV broadcasting in accordance with DVB-technology

2005 Analysis of the documents for preparation and participation of Bulgarian institutions in ITU International radio conferences

2006-2007 Methodology for measurements of working parameters for DVB-T

2013-2014 Measurement Modeling and Simmulations of Electromagnetic Field Strength from Mobile Base Stations in Urban Areas

## International Projects

There are also some major projects in which Department teams participate related to the development of broadband infrastructure, embedded systems and technology and training of Personnel management for the needs of telecom operators and national regulators in within EU.

2003-2005 **ITU** International Telecommunication Union, Center of Excellency for English Speaking Branch for Central and Eastern Europe

2007-2009 **SFERA** - Structural Funds for European Regional Research Advancemen two-year action intended to assist EU Regions on opportunities to make optimum use of structural funds for the deployment of innovative ICT networks of the future, and R&D infrastructures. FP7-ICT

2010 A joint project of qualification in the Department of Informatics and Tellecommunication of the NBU, project management, IT, Carnegie Mellon University, USA.

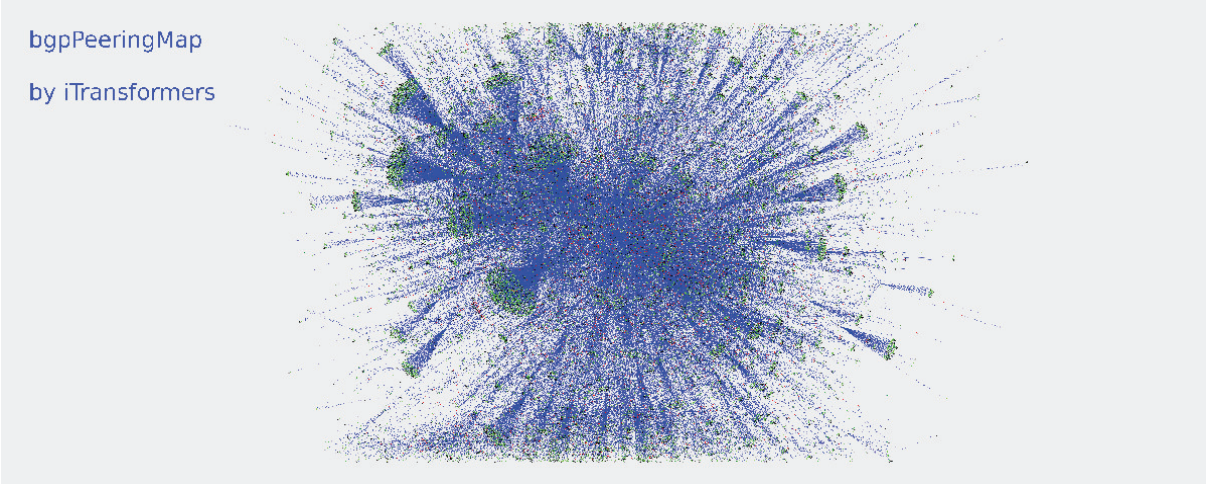
2009-2012 **I3E** Promoting Innovations in the Industrial Informatics and Embedded Systems Sector through Networking, funded under the South East Europe (SEE) initiative
http://www.i3e.eu/

2013 European Researchers' Night

# *RESEARCH, MEMBERSHIP AND AWARDS*

## Recent research

Some of the main research areas of our team members are associated with it IPv4 to IPv6 transition and Internet research. EMF modeling, radio spectrum management and DVB-T network planing, GSM-UMTS base station coverage and safety measurements and modeling.




Additional interests are associated with DSP, multidimensional image sequences analysis, GPR data processing and visualization etc. Radiocommunications systems for telecontrol and security. Internet of Things, Smart Cities & Home & Transportaion.

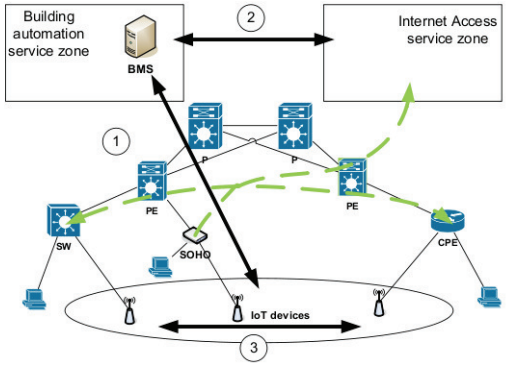



Figure 8.1: "Case Study - IPv6 Building automation solution introduction into an IPv4 Network Service Provider infrastructure"

## Important articles

Prof. Elisaveta Gurova - Knowledge management strategy for Small and Medium Enterprises; Challenges for career and mobility of researchers in Europe; M-Learning Systems Design - Technology and Pedagogy Aspects; Best paper award seccond place CELDA 2011 - IADIS International Conference Cognition and Exploratory Learning in Digital Age 2011

Prof. Antoni Slavinski - A Methodology for the Selection, Assessment and Analysis of Successful Experiences

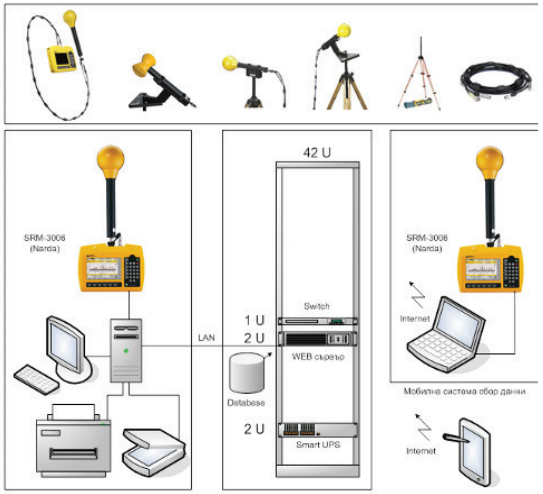
Prof. Plamen Tzvetkov - Applications of Mathematics and Computer Engineering Distance Monitoring of the Power Quality

# *NBU-DT*

# *RESEARCH, MEMBERSHIP AND AWARDS*


## Membership and awards

**Antoni Slavinski** - Special Award of IDG recognition his outstanding contribution to Bulgarian telecommunications; Award for contribution to the development of information society. Co-Founder and Chairman of Managing Board of Bulgarian Association of Telecommunications




**Peter Statev** - ETSI General Assembly Vice Chairman Co-Founder and Chairman of Managing Board of: Cluster for Information and Communication Technologies; Telecom Cluster; Cluster for Microelectronics and Embedded Systems;

**Angel Alexandrov** first place in Europe for Amateur radio in CQ WW DX Contest 2012 SSB and Oceania DX Contest 2012 for powerful transmitters single operator. First place from Bulgarian operators for International A.R.I. Associazione Radioamatori Italiani - A.R.I. International DX Contest 2013, SSB powerful transmiters.

**Elisaveta Gurova** Participant and expert at working groups at national and international level: FP7 People NCP since 2007; Member of Working Group Networking of EURAXESS, 2011; Member of Working Group Promotion of EURAXESS, 2008- 2010; EURAXESS national coordinator, 2004 Member of the scientific committee for John Atanassov award for young researchers of the Bulgarian president, 2004- 2005; EU/CEEC Joint High Level Committee on IS, 1999- 2000; Expert Council at the State body for Research and Education Network, 1999- 2000; Joint Parties and Signatories Study Group of EUTELSAT, 1997- 2000;

FP7 projects: People programme: PeopleNetworkPlus, EURAXESS TOP II, EURAXESS TOP I, PeopleNetwork, E*CARE, REACT, RE*CAME, REGGAE, RECSES, K-TRIO; SSH: I-SEEMob, REGPOT: SISTER FP6 projects: BulRMCNet, REKS, U*NIGHT Leonardo da Vinci project: TRAIN MOR, KNOW MORE

# *NBU-DT*

# *CONTACTS*

# *NBU-DT*

**Department Office**:
Bulagaria, Sofia-1618
Ovcha Kupel 2, Montevideo 21
block 2, fl. 6, office 609
phone: +359 02 811-06-09
Email: telecom@nbu.bg

## Head of Department

**Georgi Petrov, PhD**
Office 609
phone: +359 02 811-06-09
Email: gpetrov@nbu.bg

## Program Directors

**Prof. Anushka Stancheva, PhD**
Office 609
phone: +359 02 811-06-09
Email: astancheva@nbu.bg

**Rosen Pasarelski, PhD**
Office 616
phone: +359 02 811-06-16
Email: rpasarelski@nbu.bg

## Secretary

**Bilyana Benkova**
Office 609
phone: +359 02 811-06-09
email: bbenkova@nbu.bg