A Blended Educational Training in Surveying and Cadastre

Ana-Cornelia BADEA and Gheorghe BADEA, Romania

Keywords: Surveying, Education, Online, Blended Learning

SUMMARY

Changes from society in general and from the information society in particular implicitly influence the teaching methods of the education. Teachers need to keep up with new methods of teaching and strive to harmonize the means of interaction with students in the idea to cope with quickly flowing of information and of newest emerging technologies. In this context, universities have made efforts and have accessed European funds and performed functional platforms that provide students access to information. Some modern methods focus on the transfer of information using interactive means of new knowledge assimilation. In this paper we want to present some applications of interactive modules designed to facilitate understanding of the specific concepts of surveying and cadastre and advantages of the blended learning. One of the problems identified is how to ensure the sustainability of these successful initiatives in present, existing some practical issues relevant to consider in the purpose that the results be long term available.

REZUMAT

Schimbarile din societate in general si societatea informationala in special influenteaza implicit si metodele de predare din invatamant. Profesorii trebuie sa tina pasul cu noile metode de predare si sa faca eforturi pentru a armoniza mijloacele de interactiune cu studentii in ideea de a face fata modului rapid in care circula informatia si tehnologiilor nou aparute. In acest context şi universitătile au făcut eforturi, au accesat fonduri europene şi au realizat platforme functionale prin care să asigure accesul studentilor la informatie. Unele metode moderne se concentreaza asupra transferului informatiei folosind mijloace interactive de asimilare a cunostintelor noi. In articol dorim sa prezentam cateva module aplicative interactive create pentru facilitarea intelegerii conceptelor de specialitate din domeniul măsurătorilor terestre și cadastrului si avantajele instruirii mixte. Una din problemele identificate este modul in care se asigură sustenabilitatea acestor initiative de succes in prezent, existand anumite aspecte practice relevante care trebuie avute in vedere pentru ca rezultatele să continue să existe pe termen lung.

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1. INTRODUCTION

At international level the e-learning methods are growing in importance more and more.
FIG (International Federation of Surveyors) policy on e-learning - Commission 2 is to promote the use of e-learning in the surveying community and to encourage academic, professional and governmental institutions to use this technology. [9]
Activities of FIG in promoting new methods of education are:

- FIG distributes information on the topic of e-learning to the surveying community;
- FIG brings experts together to share their knowledge on the topic of e-learning;
- FIG promotes creating of e-learning networks, increasing cooperation on the topic of e-learning with other organisations in the field of geosciences;
- FIG encourages their members to develop and share e-learning contents within surveying education.

In traditional methods of education (expository learning methods) the content is transmitted to the student using a lecture, written material, face to face demonstration or other mechanisms.
In e-learning the human interaction is made through technology using synchronously or asynchronously communication between teachers and students:

- in the synchronous learning teachers are full controlling the educational process, creating, adjusting and monitoring the training environment;
- in the asynchronous learning students can study at their own space and can collaborate in projects. After completing the courses they are tested and evaluated. [10]

The main viewpoints [9] of e-learning are e-learning as computer assisted learning and e-learning as pedagogy for student-centred and collaborative learning.
It can be expected that the teachers "will become more and more facilitators, providing dynamic update of knowledge databases, give transparent and clear syllabus, reading recommendations, etc., and offering guidance and motivation strategies for students who should get used to self-organized study approaches". [1]
A mixed possibility of learning – especially in those areas where the practical lessons are a must - is blended-learning. Blended-learning means a combination between e-learning methods with face-to-face learning and/or other learning possibilities.
Consequently, in the Faculty of Geodesy, Technical University of Civil Engineering Bucharest had been chosen the approach of blended-learning education in land surveying and cadastral domain. Through blended-learning it is possible to execute some learning experiences which are not appropriate to e-learning [9] and need be taught in other way. For example, the practical lessons at Surveying, Cadastre or Geodesy courses can't be teached entirely theoretically. Physically operating processes are needed like to measure angles with a theodolite, to set the instrument precisely over a point, to point very precise the various objects to be measured, etc. Our concerns are now to sustain the Mobile-Learning, being a form of electronic education [7] realised using mobile ICT tools (smartphones, tablets, etc.).

The main advantages of M-Learning are mobility, possibility to learn anywhere, anytime and easy connectivity.
In this paper we will describe the main phases in implementing the blended-learning approach, especially highlighting the encountered problems in e-learning courses development and in sustainability phase of the project.

2. CREATING THE EDUCATIONAL PLATFORM

2.1 Reasons to Create the Platform: Advantages of Blended Learning in Cadastre and Surveying Domain

To establish the real advantages of blended-learning we must emphasize the characteristics of e-learning:

- can be taught many subjects in an asynchronous or synchronous way at the same time;
- the students can receive comments and evaluation of their homework and the teachers can suggests individually to them such subjects where they must study more;
- learning is becoming a process that involves interaction, collaboration and networking conferences;
- courses are formed by two components: a static and a dynamic one (questions, clarifications, comments, etc.)
- learning takes place in a virtual environment, with simulation of processes, audio and video interaction with teacher;
- specific information- especially the theory - is available on the Internet;
- the educational process is oriented by a teacher, with high attention and discussion on the more difficult subjects;

Table 1 – Advantages of blended learning

Classical educational model	E-Learning	Blended (mixed) learning
Lectures in class	Personal study	**Lectures in class and improved personal study, experiences, applications**
Passive assimilation	Proven level of understanding – estimating skills	**High level of understanding**
Freelance work	Team work	**Team work, social networks**
The teacher is the person who has all the knowledge	The teacher becomes a guide	**The teacher is a guide, in the real and virtual environment**
Invariably informational content	Variable information content (current)	**Complex information content**
Homogeneity	Variation	**Varied and homogenuous information**

In table 1 (adapted from [6]) the main advantages of blended-learning are emphasized by comparison with traditional education model and e-learning model.
As additional technological requirements of blended-learning approach can be mentioned:

- Computer network
- Needs to improve skills and simulations
- The use of media communication
- Collaboration with specialists trained in computer networks, ICT
- Requires high band width networks
- Requires a variety of methods to capture attention (appropriate software and creativity)

2.2 Our Approach

Faculty of Geodesy - Technical University of Civil Engineering Bucharest implemented an online platform in a project financed with European funds, in the idea of making a transition to a blended-learning education system. Strategic project was developed in partnership covering four development regions of Romania, being involved our university and another three important universities of Romania, as well as a partner from ICT domain.
To create courses that can be used in e-learning system, it is imperative that:

- university have a website;
- initiatives to introduce this method of education;
- management responsiveness of the faculty to find teachers who may be involved, considering that these implementations requires some effort on their part, both in time and the assimilation of knowledge;
- unitary creation of courses and questionnaires;
- manage information at the chair/department level;
- have a test period before using e-learning system for final examinations, a period in which to identify weaknesses.

First of all, being a project implemented in a university partnership, we tried to develop – from the curriculum viewpoint – the content of two possible new specializations.
Our involved teachers worked in interdisciplinary university teams and realised a study about the curriculum subjects at international and national level.
Based on this study were been harmonized a core of the curricum subjects and were proposed two new specializations: “Cadastre and Real Estate Management” and “Geodesy and Geoinformatics”.
Additionally to this activity, the project experts - teachers from the four universities involved – were been trained in how to develop a curriculum complying the quality directives of “The Romanian Agency for Quality Assurance in Higher Education”.
The next step was to establish the courses and their structure that can be partially implemented in an e-learning platform as core subjects for all the partners.
In this activity were involved interactive teams made by teachers who are teaching those disciplines from each of the four universities. They worked together and finally developed a common structure to be used by each university. The ICT partner worked with us to develop an appropriate product and provided the AeL platform for our project that can be found at web address http://www.geodesy-instruct.ro.

The main activities from the workflow is highlighted in figure 1.

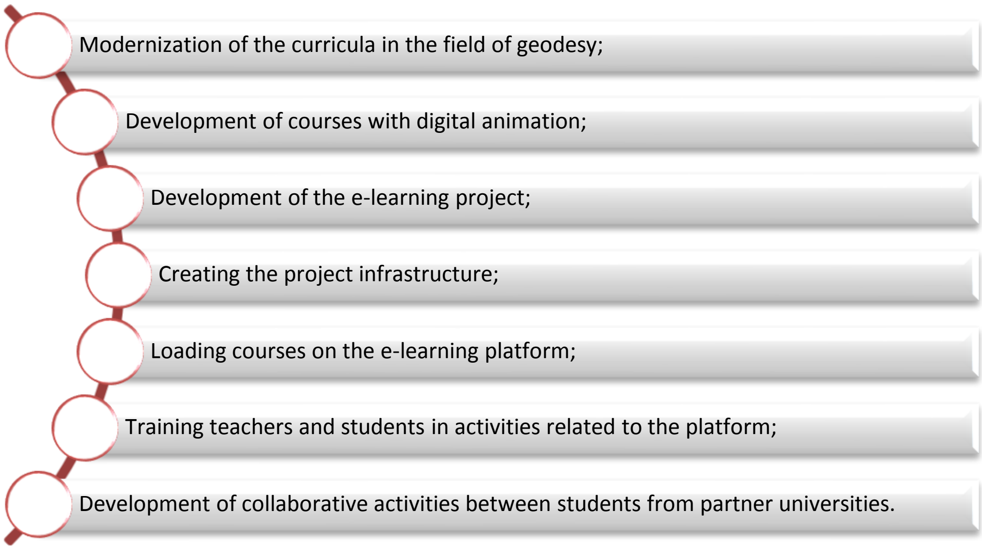

Figure 1 – Workflow of the project implementation

2.3 The Main Courses

Initially through the project were developed following courses: Surveying, Cadastre, Basics of Engineering Surveying, Basics on Waves Geodetic Surveying, Monitoring of Land and Buildings Deformations, Cadastral Information Systems, Geometrical Representations of Topographical Surfaces, Special Topographic Surveys, Topographical Drawing, Surveying Instruments and Methods, Infographics for Land Surveying, Design and Optimization of Geodetic Networks, Measurements Processing and Statistics, etc. (figure 2)

2.4 Specific Applications

We developed specific applications in the purpose of:

- use visual and audio aids with a special focus on thinking rather than just learning;
- increase the preparedness of teachers and involve teachers in preparing interactive teaching material;
- make courses more interactive;
- make the process of teaching and learning more enjoyable and less monotonous;
- make students work in collaborative and competitive environment.

Through the AeL platform we have the functionality of:

- teaching and learning;
- testing and evaluation;
- management and monitoring of the entire educational process;
- management of the digital content.

Figure 2 – Courses on Cadastral Applications

The e-learning activities in each applicative module include [2]:

- introductive videos – to capture the attention of students, outlining key aims and the learning outcomes;
- animations – short Flash movies made to understand better the phenomena and issues of the domain;
- synchronous and asynchronous courses – where the students can interact with their colleagues and teachers;
- glossaries and FAQs – essential terminologies and definitions with FAQs explaining common problematical areas;
- chat rooms – where can be discussed and solved problem with colleagues;
- self assessments – tests and themes to help assessing the gained knowledge.

In the cadastral domain we developed some specific applications in the course content, like those from the figures 3 to 7.

2.5 Assuring the Gender Equality

An important factor in our project implementation was the compliance of the principle of equal opportunities in all areas: equality between men and women - balanced participation was ensured by the management team.

Equality between women and men is recognized as a basic principle of democracy, both at international and European level. Romania is among the countries that have ratified the relevant documents relating to equal opportunities.[5] Gender mainstreaming in education both at formal and informal level must be a perpetual and concentrated action. From this viewpoint we must consider all aspects involved in the educational process and must change

the mentality and training in the field of personnel teaching to change school curricula at university levels of the education system, too.
We considered universally accepted approach integrating EU requirements and provided non-discriminatory access to the online platform both for students and teachers.[5]

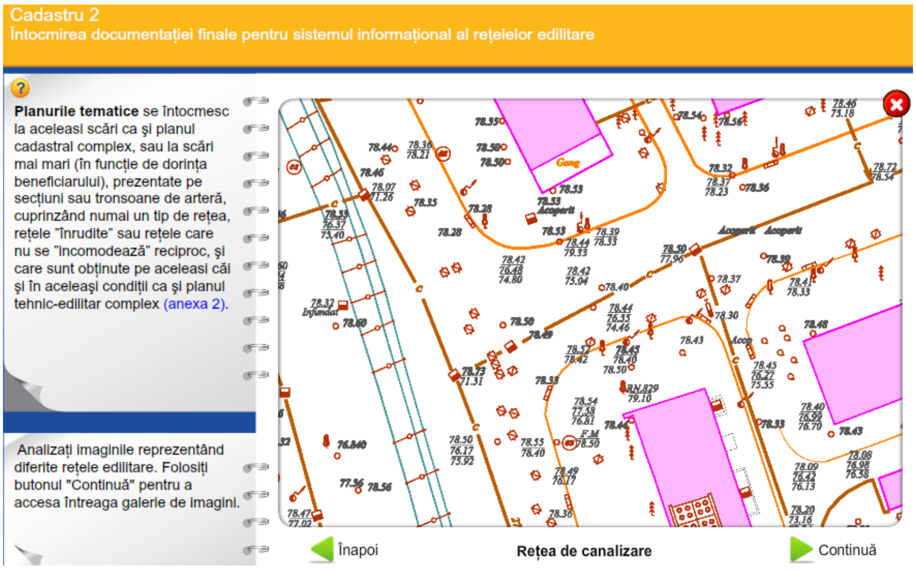

Figure 3 – Thematic Map: Utility Network

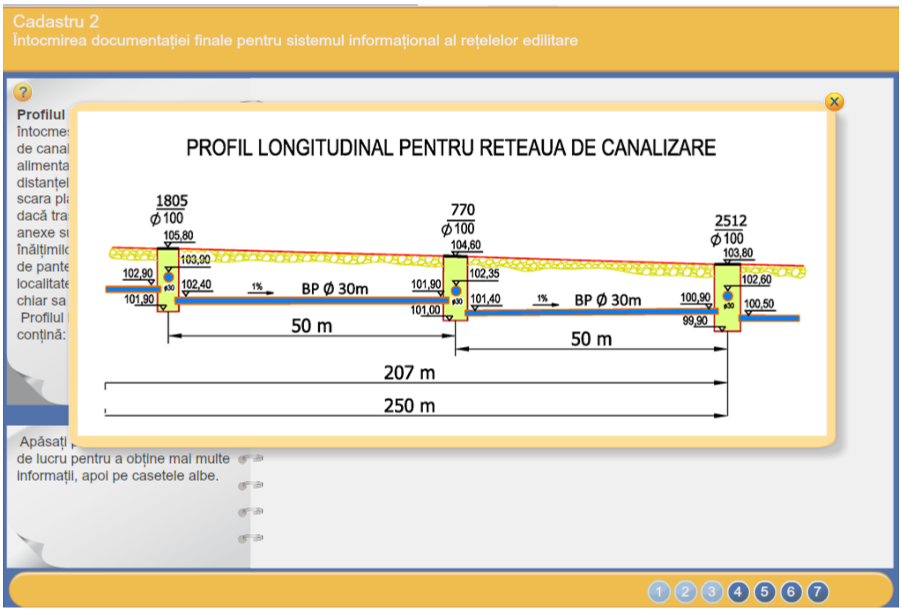

Figure 4 – Longitudinal Profile for Sewerage Network

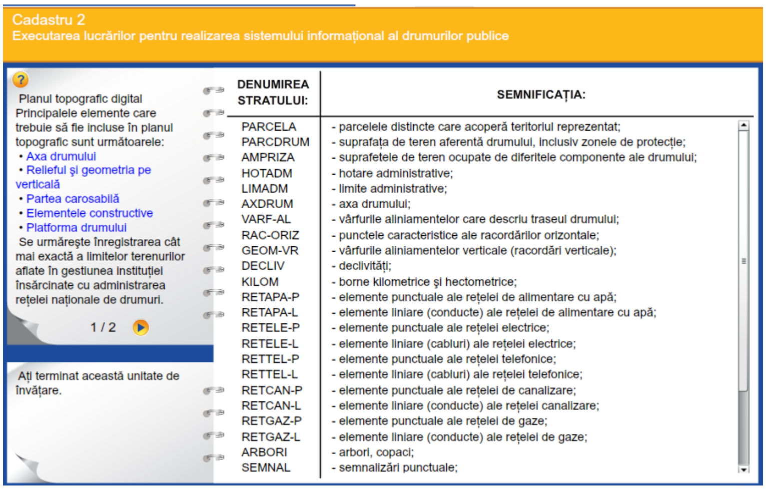

Figure 5 – Layer Structure for Information System of Public Roads

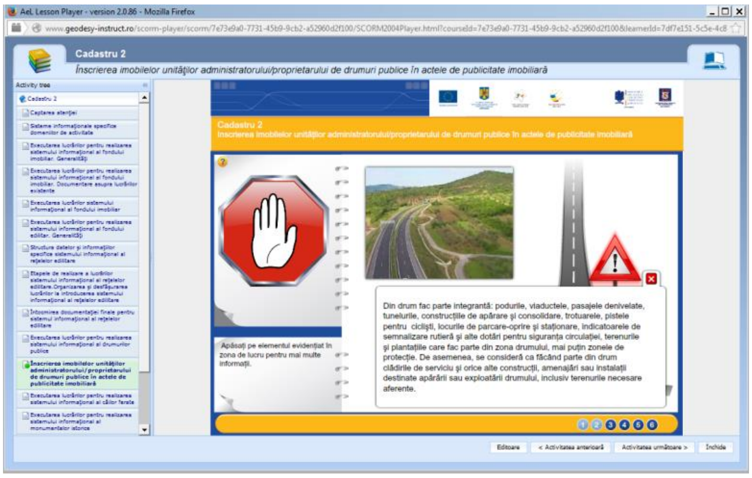

Figure 6 – Interactive activities

Figure 7 – Testing Area

3. MAJOR ISSUES IN SUSTAINABILITY

In Romania, most of these initiatives have been taken by European funds, as higher education institutions should be made to the financial terms. It is a reality that there are cases where the results of these projects, although extremely useful, fail to survive over time.
The project sustainability means the ability to provide an acceptable amount of benefits to target groups after technical and financial assistance received.
The main issues [3] could be classified as following:

- Sustainability in terms of human resources involved means:
    - assuring the functionality of the technical platform;
    - providing the necessary knowledge to work on the platform to the the teachers and students;
    - a continuous platform development;
    - completing the existing disciplines with new materials posted on the online platform;
    - introduction of online resources for new discplines;
    - training new users of the platform - with the trainers created in the project: teachers (in the purpose of the designing and use of teaching materials) and students (in order to create the possibility for new students to become users of the platform).
- Sustainability in terms of technical capacity means all the activities dedicated to assure a full functionability of the platform (hardware and software).

Any sustainability strategy must carefully manage two essential elements: the human factor (which is unpredictable) and the IT component (which undergoes rapid changes requiring a quickly accomodation). Preferably, in such educational projects, could be better to design new initiatives to come to improve what has just been done, possibly by developing new projects.

4. CONCLUSIONS

As advantages of the integration of online learning with traditional learning in the purpose to obtain blended learning approach [4] can be mentioned:

- partial flexibility offered in terms of where to teach;
- scheduling choice for the study of real-time access to knowledge anywhere and anytime;
- active, personal and interactive methods of instruction and easier access to information;
- can self-test knowledge acquired through online tests and questionnaires – tests results provided in real time;
- assessment objective, transparent, preferred by students;
- centering on student participant, personalised feedback from the teachers;
- information more tailored to the student's knowledge and past experience;
- integrated learning system provides facilities such as those related to registration, monitoring student progress, self testing;
- specialized software to create various courses have available teaching tools for teachers;

- for teachers work creating such a course is much more creative, even if time is more affected;
- various tools for monitoring the progress of the students;
- various statistics can be made much easier, possibility to compare the assessments. (figure 8,9)

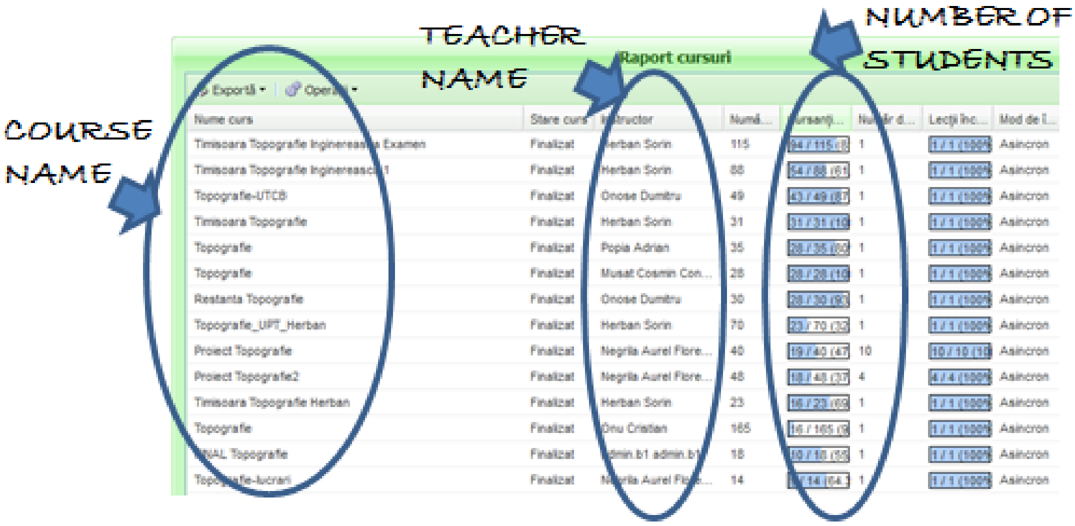

Figure 8 – Example of reports on courses based on topic filter (Surveying courses)

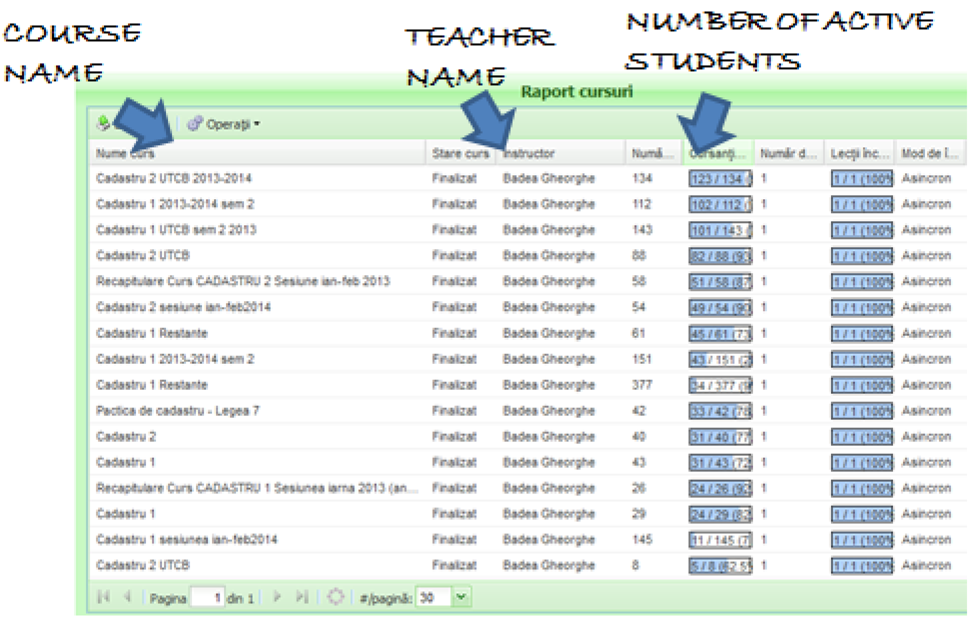

Figure 9 – Example of reports on courses based on teacher name filter

As disadvantages of integration between traditional and online learning we identified:

- students can access information materials during the examination;
- teacher-student communication is more difficult, resolving any problem is more difficult;
- high costs for university studies showing that the preparation of an online course is more expensive than the traditional one (but the costs are then amortized quickly), the team of "building" of a course includes people specialized in web design, instructional design - more human resources than the classical method of teaching;
- longer time affected to the design of courses and questionnaires;
- difficult communication with students, forcing them to wait more for the answers;
- lack of infrastructure, not all students have the benefit of an Internet connection at home, and university laboratories can not cope.

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BIOGRAPHICAL NOTES

Ana-Cornelia Badea is surveyor, Associate Professor at the Department of Surveying and Cadastre of the Faculty of Geodesy. In 2008 she received his PhD in Geodesy – Civil Engineering with distinction "Cum Laude". She worked as Logistics Coordinator in the European Project - Geodetic Online E-learning Platform. She was also Advisory Expert and Counselor at National Agency of Cadastre and Land Registration. She is member of National Union of Romanian Surveyors, founding member of Romanian Surveyors Order, member of Romanian Society of Photogrammetry and Remote Sensing.
She holds courses of “Cadastre and GIS Applications in Urban Areas”, “2D, 3D Concepts and GIS Analysis” and “Computerization of Land Registry Operations” at masteral level. Recently she participated in initiating and developing of new academic programs of Faculty of Geodesy at MSc and BSc level.
Assoc. Prof. Dr. Badea is president of the editorial board of “Journal of Geodesy” –Romania; “Higher Education Studies” Journal, Canada; “Earth Science Research” Journal, Canada; “Engineering Management Research” Journal, Canada; “Joint e-Conference Journals in Applied Science, Technology and Development”; “Science Publishing Group”, USA. She was member of the Technical Committee and chairman at many scientific conferences.

Gheorghe Badea is Professor at the Department of Surveying and Cadastre - Faculty of Geodesy, Technical University of Civil Engineering. He received his PhD in Geodesy - Thesis Title: "Some Results in the Study of Using Cadastral Data in Land Information Systems". From 2012 is Vicedean of Faculty of Geodesy. He was also Advisory Expert and Counselor at National Agency of Cadastre and Land Registration, Romania, being involved in creation of “Technical rules for the implementation of ETRS89 in Romania and the proposed law on the adoption of a new cartographic projections in Romania”.
He provides teaching activities at three remarkable universities from Bucharest: Technical University of Civil Engineering, Bucharest, "Ion Mincu" - University of Architecture and Urbanism and University of Bucharest, in five faculties.
Of the most relevant teaching courses can be mentioned: General Cadastre, Standard and Geoportals of Spatial Data, Information Systems Specific to Activity Fields, Surveying, Cadastral Database in Urban Areas, Specific Information Systems, Urban Cadastre, Methods of Real Estate Recording, Landscape Design and Planning, Cadastral System in Local Government.
From the resarch activity can be mentioned that he acts as Expert at strategic project co-financed by European Social Fund, "Development of an Operational System of Higher Education Qualifications in Romania (DOCIS)" - beneficiary National Agency for Higher Education and Partnership with Economic and Social Committee (ACPART), as Project Manager of the researh project “Techniques, Technologies and Ontologies for Data Portals and Spatial Data Services”, as Project Manager at strategic project co-financed by European Social Fund “Online University Collaboration Network in Order to Provide Superior Geodetic Skills”.
Prof. Dr. Badea is member of the Surveyors Union of Romania, founding member of Surveyors Order of Romania, member of National Society Photogrammetry and Remote Sensing.

CONTACTS

Assoc. Prof. Dr. Ana-Cornelia BADEA
Technical University of Civil Engineering Bucharest, Faculty of Geodesy, Surveying and Cadastre Department
Lacul Tei Blvd., 122-124, 2nd District
Bucharest
ROMANIA
Tel: +40212421208
Email: badeacadastru@yahoo.com
Web site: http://geodezie.utcb.ro

Prof. Dr. Gheorghe BADEA
Technical University of Civil Engineering Bucharest, Faculty of Geodesy, Surveying and Cadastre Department
Lacul Tei Blvd., 122-124, 2nd District
Bucharest
ROMANIA
Tel: +40212421208
Email: badeacadastru@yahoo.com
Web site: http://geodezie.utcb.ro