DEVELOPMENTS IN GEOMATICS EDUCATION (1)

Geomatics Education in Croatia

During the past year the Faculty of Geodesy at the University of Zagreb has introduced fundamental reform of all its education programmes, undergraduate, graduate and postgraduate doctoral studies, and established a completely new postgraduate specialisation course. The author provides detailed background information and preliminary evaluation. Croatia has a longstanding tradition of higher education in surveying and geodesy. The seminal textbook by Martin SaboloviÂ´c, Exercitationes Gaeodeticae, was printed in 1775 and the first academic diplomas certifying that one could act as surveyor date back to 1811. At the Royal Forestry Academy, founded in Zagreb in 1898, geodesy was from the start taught as a technical subject. The â€˜learning basisâ€™ of the Geodetic Course (Geodetski te_caj) was adopted from geodesy studies in Prague and Vienna. When the Technical High School was founded in Zagreb in 1919 the geodesy programme moved to a newly founded school and its academic status was defined. In 1962 the Faculty of Geodesy was founded at the University of Zagreb and has since offered undergraduate degree courses and postgraduate studies leading to MSc and PhD degrees. The University of Zagreb is the only public institution for higher education in Croatia, offering university studies and performing research in geodesy and geomatics (see text-box for background notes on the University of Zagreb).

New Curricula

The curricula of the university have been altered several times over the past century. Based on the Bologna Declaration, the Faculty of Geodesy in 2005 carried out fundamental reform of all its education programmes, and even the title of the course changed from â€˜Geodesyâ€™ to â€˜Geodesy and Geoinformaticsâ€™. The new name will help improve the image of the course and its presentation to the profession. The new bachelor and masters cur-ricula inGeodesy and Geoinformatics have been approved and the Bachelor course began in academic year 2005/06. The masters course is to begin in 2008/09 and will last two years (four semesters), each year consisting of a study load of sixty ECTS; total load thus 120 ECTS. At the end the student has to write a diploma thesis and pass an exam. After successfully completing the course, the student receives a masterâ€™s degree in Geodesy and Geoinformatics. In 2006 we also prepared two new curricula in postgraduate studies leading to the degrees of Specialization (Spec.) and Doctor of Philosophy (PhD). Both require course study and dissertation work. The Spec. degree theoretically takes one year of full-time studies (sixty ECTS) and the PhD degree three years (180 ECTS). When competition for enrolment was announced twenty-four students were interested in the PhD studies and only six in specialisation studies. Due to the small numbers the specialisation course will not be held this year. Doctoral degree courses started in December 2006.

Design Philosophy

The basic elements of the new curricula are: introduction of law and management, considerable reduction in number of classes in some traditional subjects, and introduction of numerous new professional subjects relating to informatics, a field of increasing importance. Faculty Council decisions are a vital element in the success of new or amended curricula, according to which professors are required to prepare their lectures for new subjects in digital form and make them available to students via web pages. We have also recently introduced e-learning, although experience so far is limited; first attempts at use of the Moodle program are accessible in Croatian at the web page www.geof.hr. It may generally be stated that e-learning can be useful but the preparation of proper educational material is very time-consuming. Discussion meetings held at the end of 2004 involved professionals from both the public and the private sector in the design of the new curricula. Participants unanimously supported the process of change in higher Geodetic and Geomatics education.

Bachelors Studies

The new undergraduate courses last three years (six semesters), each year consisting of a study load of sixty ECTS; total load 180 ECTS. After successful completion of the course the student receives the degree of bachelor, or baccalaureus, in Geodesy and Geoinformatics and is qualified to perform all professional work in surveying, geodesy, geoinformatics or geomatics, albeit at a lower level of responsibility than masterâ€™s graduates. Undergraduate studies end in a final exam for those students who do not wish to step into the graduate programme. At least 27 ECTS or 15% study load are electives. Up to the fourth semester, students perform two hours of sports weekly. Tables 1 to 6 give the complete programme.

Facilities

The optimal number of students with respect to space, equipment and staff numbers is about 150. The number of students enrolled in 2005/2006 was almost double (224) numbers for 2004/05 (115 students). But this is exceptional, since the enrolment quota was increased from 115 to 135 students. Also, 26 students were enrolled by special dispensation, while 63 students did so because they had failed the first year of the former programme and it was impossible to do the first year of the old and new programmes simultaneously. The large student numbers hindered continuous evaluation, and mentor work with smaller groups was impossible because of lack of professors and assistants. At present there are 31 teachers, professors and researchers, 28 assistants and scientific novices, thirteen visiting professors, thirteen technicians and collaborators, and 22 administrative and members of support staff.

Student Theses

Five examples of diploma theses completed by the end of the academic year 2004/05 are: (1) City Plan of the Town of Sisak, (2) Cadastre of Flora of the Recreation and Sport Centre Jarun, (3) Determination of the Precision of the Wild Na2 Level According to the ISO 17123-2 Standard, (4) 3D Visualisation in GRASS, Analysis of the Mapmaker V3.5, and (5) Organisation and Role of Geodetic Profession in Military Systems. Five examples of Master Thesis subjects completed in 2005 are: (1) Determination of Normal Orthometric Heights of GPS Points of Homogeneous Fields by Means of Transformation Method, (2) Facility Management of Distributed Electric Power Infrastructure, (3) Digital Orthophoto in the Republic of Croatia and in the World: Rules and Situation in Practice, (4) Processing and Interpretation of Geodetic Measurements in the Zagreb Geodynamic Network and (5) New Improved Software for DeSKan Express 5.0 (2005). In 2006 three students received their PhD degree; they investigated the following subjects: (1) A New Approach to the Production of Electronic Navigation Charts in Croatia, (2) Modelling Change in Cadastre and (3) Cartographic Representations of Croatian Towns from the 16th Century. In 2005 one PhD student began researching Dynamisation of the Official Topographic and Cartographic System of the Republic of Croatia, and in 2006 another PhD student started research into Theoretical and Empirical Analysis of Special Positional and Height Networks in Construction.

Financial Aspects

In addition to the many benefits, the Bologna Declaration would also bring financial uncertainty. Past financing was based on numbers of students or of educational staff, whilst future faculties will get more autonomy and be paid by â€˜lump-sumâ€™ financing. Although the new programmes are estimated to be 30% more expensive, the Ministry of Science, Education and Sport has not yet allotted the required resources and it is not known how things will work out in the future. The lump-sum financing system looks quite sophisticated and the lump-sum
model is the topic of the TEMPUS project Finances Management at Croatian Universities, which includes the universities of Split, Osijek, Rijeka, Udine, Vienna and Heidelberg. Transparency is needed and faculties must be motivated to obtain their own resources. The university itself, rather than (as now) government, should act as financier of study programmes. Because subjects were unready for the financing process the start of model functioning was unofficially delayed and is now scheduled for gradual application during 2006, to be completed in 2007.

Co-operation

The need for guest professors is satisfied both by professors coming from within the same university, such as from the Faculty of Architecture, the Faculty of Civil Engineering, the Faculty of Sciences, and the Faculty of Law, and from abroad. Our professors lecture outside their own faculty, such as at the Faculty of Science and the Academy of Arts, at other universities in Croatia (University of Zadar), and at foreign universities such as the University of Sarajevo, Bosnia and Herzegovina, and Technikum Kaernten in Villach, Austria. Student exchange is mainly organised by IASTE (The International Association for the Exchange of Students for Technical Experience). Graduate engineers have always been able easily to find work in Croatia and, today, of the 120 annual novices around forty engineers graduate and immediately find fitting jobs. Private companies and the public sector grant scholarships and in other ways stimulate students in their contacts with high-quality experts. As a result, interest in studying geodesy and geoinformatics in Croatia is increasing, whilst it seems that in many Western European countries it is not that easy to find employment in the field of geodesy and geoinforâ€“matics. We also try to attract students from abroad. In October this year we joined the initiative of the State Geodetic Administration of the Republic of Croatia and participated at the Intergeo trade-fair where it had a stand. The motto for Croatian participation at the Munich fair was â€˜Croatia: Public-Private Partnership in Geodesy, Geomatics and Geoinformaticsâ€™.

Further Reading

â€¢ Lapaine, M., KapoviÂ´c, Z., Frange_, S., 2006, New University Curricula of Geodesy and Geoinformatics in Croatia, on CD Proc. XXIII International FIG Congress, October 8-13, 2006, Munich, www.fig.net/pub/fig2006/papers/ts34/ts34_04_lapaine_etal%20_0599.pdf.
â€¢ KapoviÂ´c, Z., Frange_, S., Medak, D., 2006, Bolonjski proces na Geodetskom fakultetu Sveu_cilita u Zagrebu, Geodetski list; No. 1, pp 29-50.

Textbox:

University of Zagreb

The University of Zagreb (1669) is the oldest and biggest university in south-eastern Europe. Since its founding the university has been growing continually and now consists of 29 faculties, three art academies and the Centre for Croatian Studies. With its comprehensive programmes and more than fifty thousand full-time undergraduate and postgraduate students, the university is the strongest teaching institution in Croatia. It offers a wide range of academic degree courses leading to bachelor, masters and doctoral degrees in the following fields: Arts, Biomedicine, Biotechnology, Engineering, Humanities and Natural and Social Sciences. The university is also strongly research-oriented, contributing over 50% of Croatiaâ€™s research output.

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