

FIRST BACHELOR STUDY PROGRAM IN GEODESY AND GEOINFORMATICS IN NORTH MACEDONIA

Bashkim IDRIZI¹

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SUMMARY

Geodesy and geoinformatics education as integrated studies at the bachelor level in the Republic of North Macedonia (RNM) started in year 2015, with the accredited program at the Faculty of Applied Sciences at the University of Tetova by the Ministry of Education and Science of RNM. The identical trend continued in the first accreditation for the establishment of a new university in Skopje named "Mother Teresa" in year 2016, where the program was initially accredited as part of the Technical Faculty, to be later transferred to the Faculty of architecture and civil engineering.

The geodesy and geoinformatics study programs have a five-year accreditation, while the duration of studies is 3 years which enables students to obtain the geodesy and geoinformatics engineer degree with 180ECTS according to the Bologna study system. The program is designed by taking into account contemporary trends in geodesy and geoinformatics in developed countries, as well incorporating local specifics of state systems for geoinformations in North Macedonia, Kosovo and Albania, with the sole aim of providing graduates with knowledge and skills to be capable to work in other countries outside RNM also. The curriculum includes all the contemporary elements of geo-information sciences, but due to mismanagement by the rectorates of the two universities, implementation is at a very low level.

Both departments are in crisis because of the management approach at both universities where this study program is accredited, resulting with low quality of offer to students in terms of technical equipment - adequate laboratory, adequate teaching staff, and collaboration with other scientific institutions in the field of geodesy and geoinformatics. If the trend continues as in the past three years, both departments obviously will lose accreditation, will be closed, and will issue low-quality bachelor engineers on geodesy and geoinformatics with 180ECTS.

Key words: Geodesy, Geoinformatics, curriculum, North Macedonia

¹ **Prof.Dr. Bashkim IDRIZI**, bashkim.idrizi@yahoo.com
University "Mother Teresa" – Skopje; Geodesy and geoinformatics department
Address: str. Djon Kenedi, 25/4-20; 1010 Skopje, Gsm. +389 75 712 998

INTRODUCTION

Formal education is education which is carried out in a variety of accredited educational institutions under approved programs to improve the knowledge, skills and competences for personal, social and professional needs and it leads to recognized diplomas and qualifications (Paar, etAll, 2014). In 1999 the European ministers of education started the Bologna Process, a series of reforms needed to make European Higher Education more compatible and comparable, more competitive and more attractive for our own citizens and for citizens and scholars from other continents. It is often unclear whether traditional long programs are being overhauled and replaced with genuine stand-alone bachelor and master's degrees based on defined cycle-specific objectives, or if they are simply being dissected into three- and two-year periods of study with little change to course content (Drobne, etAll, 2007).

Today the society is strongly influenced by globalization, carrying a number of challenges that require new knowledge and skills to help them be adequately answered. New processes affect the dynamics and adjustment of the entire society, and thus the daily activities of all stakeholders of the education system, society and individuals in it. Acquiring knowledge is a continuous process which does not end with the completion of compulsory education, but it begins before and lasts a lifetime (Paar, etAll, 2014).

Recent trends in Global Positioning Systems (GPS), Geographic Information Systems (GIS), photogrammetry, remote sensing and communication technologies require changes in surveying and related educational programs dealing with geoinformation, such as geography, environmental engineering, forest engineering and geology (Potuckova 2006). Geoinformatics as an educational package is a combination of introductory courses on Remote Sensing and Geoinformation Technique, such as basics of image processing as well as remote sensing technology, introduction to other digital spatial data collection methods like GPS, field measurements and digitizing and scanning of maps, more sophisticated courses on spatial data algorithms and geographical data management, visualization and spatial analysis as well as advanced courses on satellite image interpretation methods. Geoinformatics is not only for surveying or geography students but recently more and more students from other disciplines like Computer Science, Civil Engineering, Architecture, Geology etc. want to study Geoinformatics (RS + GIT) as their minor or even as their major subject. (Virrantaus and Haggren 2000).

The Bachelor in Geoinformatics program is intended to produce professionals who are capable of using information technology to handle geospatial information for the economic, social and physical development (Tarmidi, et All, 2015).

Changes in structure and format of University curricula across Europe within the past few years reflect this need as well as a diminishing number of survey engineering and geoinformatics students in some countries. Geoinformatics curricula at universities with a long tradition in geodesy and cartography education are usually built on solid training in mathematics, physics, programming, computer graphics, and web-applications. Multi-disciplinary education in information technologies (IT), management or economics and geoinformatics can increase employment opportunities in some labour markets. The terms 'geoinformatics' or 'geomatics' are used interchangeably in some university programs. The definition of both terms has not been standardized to-date (Potuckova 2006).

The goal of the reforms in geoinformation sciences, by clearly defined learning outcomes as instruments, is to make studies more successful, compatible and comparable, in order to increase the number of higher educated people ready for facing with the challenges in their professional life.

STUDY PROGRAMS ON GEOINFORMATIONS IN NORTH MACEDONIA

At RNM geodesy studies began in year 1978 within the Faculty of Civil Engineering in Skopje (University UKIM), as a five-semester course known as high school in the higher education system of the former Yugoslavia. The full five-year studies began in year 2001, after several years to begin reforming and implementing the Bologna system for the organization of bachelor (3 years) and master (2 years) studies [4]. These study programmes were the only studies of geodesy in RNM until year 2015, when the department of geodesy and geoinformatics at the University of Tetova (UT) started with organizing the bachelor studies in geodesy and geoinformatics in Albanian language [1].

A year later, with the establishment of Mother Teresa University (UMT) in Skopje, the UT geodesy and geoinformatics program was completely transferred to the new university in Skopje [2]. With this, today in RNM there are three geodesy study programs, two of which (those at UT and UMT) have also included geoinformatics studies, while the UKIM study program is a

classic geodesy but with the possibility of studying in bachelor and master levels [4].

The geoinformation sciences at other state universities in RNM and other faculties of UKIM are heavily involved in accredited programs of geography, agriculture, ecology, forestry, geology, mining, IT, architecture etc [1,2,3,4,5]. It is noteworthy that at Faculty of Natural and Mathematical Sciences at UKIM in Skopje, there is a separate GIS study program at bachelor level with 240 ECTS and master with 60ECTS [4].

All programs / courses accredited at different universities, even at different faculties within the same university in RNM, have been compiled individually by the respective departments and there is no organized coordination even though these are related courses / programs, which interconnects more fields that uses geoinformations.

GEODESY AND GEOINGORMATICS STUDY PROGRAMES in UT and UMT

At the beginning of year 2015, the preparation of the bachelor's degree program in geodesy and geoinformatics at the University of Tetova began, at the request of the rector and vice-rector for education. Although I wrote to the vice-rector for education in which I pointed out the potential dangers of a lack of teaching staff and professional laboratories, the rectorate of the university through the vice-rector for education gave a green light to me to start preparing the accreditation program, by accepting all risks addressed as essential to the implementation of the program.

The program presented in Table 1 [1] was accredited in spring 2015, where professors of the department of geodesy by the University of Pristina were listed as professional subject holders, with their CVs and statements agreeing to teach professional subjects in the new program on geodesy and geoinformatics. The Accreditation Council accredited this program for a five-year duration, precisely for the period 2015-2020. Implementation of the program at UT began in September 2015.

One year later, the same curriculum presented in Table 1 [6] was accepted for the study of geodesy and geoinformatics at the Mother Teresa University in Skopje, which was initially listed as part of the Technical Faculty of UMT, to pass a few months later before starting the new university as the third study program in the Faculty of Civil Engineering and Architecture. This program

at Mother Teresa University began in November 2016, with the first generation enrolled for studies at the new university. Even in this case, the professors of the University of Prishtina provided full support for starting the department and teaching. Base on the Law on high education, this study program should be reaccredited on year 2021.

Both study programs are implemented in Albanian language [1,2].

Table 1: Curricula on Geodesy and Geoinformatics in TU and UMT

Study program	Bachelor on Geodesy and Geoinformatics	
Semester	I	
Status O/E	Subject	ECTS
O	Mathematics 1	5
O	Databases	5
O	CAD	5
O	English language	2
O	Basics of geodesy and surveying instruments	7
O	Informatics	6
Semester	II	
Status O/E	Subject	ECTS
O	Mathematics 2	5
O	Geoinformatics 1	6
O	English language for engineers	2
O	Geodetic measurements and surveying	7
E	Programming	4
E	Physics	4
E	Topography	4
E	Subject from the free election list	2
Semester	III	
Status O/E	Subject	ECTS
O	Theory of errors	5
O	English language for surveyors 1	3
O	Geodetic networks	7
O	Cadaster 1	5
E	General cartography	4
E	Geoinformatics 2	4

E	Ecology	4
E	Subject from the free election list	2
Semester	IV	
Status O/E	Subject	ECTS
O	Mathematical cartography	4
O	English language for surveyors 2	3
O	Satellite geodesy	5
O	Cadaster 2	5
O	Field practice 1	5
E	Mathematical geodesy	3
E	Geodetic adjustments	3
E	Hydrographic measurements	3
E	Subject from the free election list	2
Semester	V	
Status O/E	Subject	ECTS
O	Engineering geodesy 1	7
O	Spatial planning and regulation	5
O	Photogrammetry	5
O	Physical geodesy	5
E	Legislation and legal provisions	3
E	Management with geodetic works	3
E	Geophysics	3
E	Subject from the free election list	2
Semester	VI	
Status O/E	Subject	ECTS
O	Engineering geodesy 2	6
O	Remote sensing	4
O	Real estate valuation	4
E	Real estate management	3
E	Geodetic legislation	3
E	Academic writing	3
O	Field practice 2	5
O	Diploma thesis	5

The essence of the accredited program is to prepare new bachelor-level staff who will have basic knowledge of geodesy and geoinformatics, including databases, CAD design, cartography, high geodesy, basic geodesy, engineering geodesy, photogrammetry, remote sensing, GIS, SDI, cadastre, real estate management and evaluation, surveying, satellite geodesy, physical geodesy, geodetic networks, English for surveyors, geodetic legislation, and geodetic project management. The main purpose is to prepare geodesy and geoinformatics bachelors with strong theoretical and practical background. Knowledge of the above-mentioned fields is of particular importance for the preparation of staff who will be capable of pursuing master studies in general geodesy or specialized for a given field.

At both universities, there is a lack of laboratories with professional equipment for performing exercises with students and conducting scientific research by the academic staff of the department. Although we have submitted the detailed design for a modern laboratory to the university leadership, no steps have been taken since 2015 to establish the laboratories at both universities. In order to perform some basic exercises with contemporary geodetic equipment, the teaching staff used the geodesy laboratory at the University of Prishtina, which was implemented as a support from the Prishtina department for students who do not have instruments for performing their basic exercises in their universities. To be even greater irony, rather than being invested by the ministry of education as the two universities are state-owned and rely on the state budget, the only two instruments owned by the UMT geodesy and geoinformatics department in Skopje are donated by an engineer Tush Kolaj from Kosovo, who works in Malmo in Sweden, as the human act for the benefit of Albanian young surveyors.

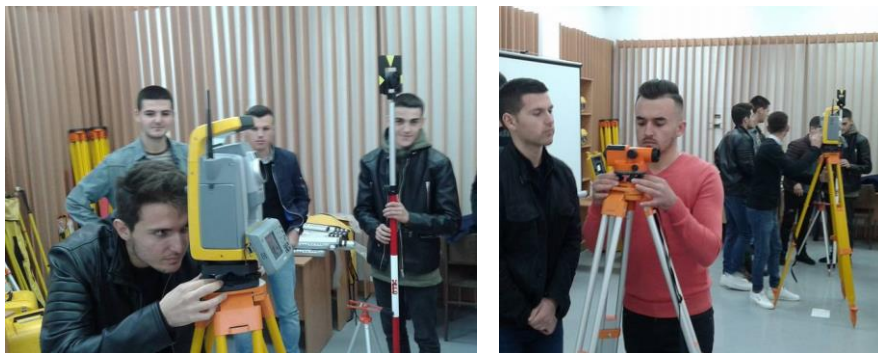


Figure 1: Exercises in the geodesy laboratory in Prishtina [6]



Figure 2: Exercises in field for 3d scanning and surveying with drone [6]



Figure 3: Teaching staff of first generation in UMT [6]
(first road: prof Bashkim Idrizi, prof Ismail Kabashi, prof Perparim Ameti;
second road: ass Veton Hamza, prof Subija Izeiroski, ass Fisnik Loshi, ing. Artan Rexhepi)

PERSPECTIVES OF STUDIES IN GEODESY AND GEOINFORMATIC IN UT AND UMT

Given the current state of affairs at the two RNM universities where geodesy and geoinformatics studies are conducted, the perspective for the foreseeable future is questionable. At UT, the teaching and exam evaluation of students is done by unauthorized persons with bachelor's or master's degrees, while other professors with academic degrees sign reports of unauthorized persons who actually carry out the whole process. At UMT also, the situation is deplorable, as faculty and university management have no interest in developing this department, but those with deliberate and deliberate actions intend to close the geodesy and geoinformatics study program.

At UT the unlawful actions of unauthorized staff are deliberate as they themselves have a desire to play the role of professor and to evaluate students' exams even though some of them are still masters students at other universities. At UMT, on the other hand, current staff with academic degrees want to work and to do the best in order to prepare professional staff, but faculty and university management with deliberate and background actions curb work with the sole purpose of closing the department. Such illegal, illogical, unethical and non-academic actions take courage from the politics, that in the North Macedonia plays a negative role and is a big barrier for development.

The dark perspective of graduated students in both departments also lies in the lack of alternatives for continuing of their education to master studies at their universities, while at other universities in the country and across the region the number of students admitted to masters is limited.

Given the regular staff and technical equipment in both departments, they risk being shut down by the state authorities, since they do not even meet the minimum requirements for academic studies in the technical field.

CONCLUSIONS

Geodesy and geoinformatics studies in bachelor level in North Macedonia began in year 2015 in University of Tetova. Same study program with same curricula began in University "Mother Teresa" in year 2016. Both study programs have five-year accreditations until years 2020 and 2021.

Given current situation in both departments, they can not be reaccredited, because of lack of academic staff and equipment. Although the project for laboratory has been submitted on time to top managements, any steps for establishing of laboratory has not been taken in both universities.

On year 2015 the rectorate of UT has accepted all risks addressed as essential to the implementation of the program, however they didn't do anything for improving the situation, even more they still allow unauthorized persons without academic degree to give lectures, to organize exams, and to evaluate students' exams. Responsible state institutions unfortunately don't take any action to stop this negative and dangerous phenomena.

Accredited curricula contain all global trends in the field of geodesy and geoinformatics, however its' implementation in both universities actually is in very low level, and can not deliver expected results!

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[4] http://ukim.edu.mk/en_index.php

[5] <https://www.uklo.edu.mk>

[6] <https://www.facebook.com/GeodesyMTU>