

# GIS Education in Ablania

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**Key words:** Albania, GIS education, high education.

## SUMMARY

The use of Geographic Information Systems (GIS) and Geographical Information (GI) plays a key role in human activities today. GIS is widely applied in everyday life by many of the services we rely on. It is one of the fastest growing uses of computer technologies and is a fundamental part of modern geography.

GIS is a tool that is being used extensively by researchers, scientists and administrators to inform decision making about real issues. The application of this technology is increasingly being found in such areas as the environment, resource and hazard management and infrastructure development.

GIS operates at many different scales, including whole countries and increasingly in international circumstances. Educators are now investigating innovative approaches to using GIS in learning/teaching environments.

Geographic Information System (GIS) has aroused extensive concern in the whole world and developed rapidly. The potentials of utilization of GIS have been pointed out not only in geography but also in other related subjects in recent years, however, GIS is not actually in wide-spread use in the field of education.

GIS education in Albania started in 1994 year. Now, a relatively complete GIS education system with specifically Albanian characters has been established in Albania. GIS education in Albania is offered at one level in Albania by universities.

This paper contains the survey of the current state of GIS education at Albanian universities. The course content as well as the availability of lecturing staff, teaching materials, and technical and software facilities is considered. As is noted, the lectures on the basics of GIS dominate so far in university curricula. On the other hand, the situation constantly improves due to the radical reforms of academic programmers at all universities. The tendency suggests that over the coming years the level of GIS education will increase to a considerable extent. Great efforts are made now in training of specialists and lecturers, developing research and academic programmers. The use of commercial GIS software is widespread. Attention is paid to both the theoretical problems and the practical applications of GIS

# GIS Education in Albania

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## 1. INTRODUCTION

Geographical (Geospatial) Information System is recent addition to our vocabulary. It does a complex analysis of spatial data and non spatial information. Most of the information contains spatial data and this feature can be used while making analysis. Analytical analysis provides faster and more accurate interpretations. Converting the data to information, evaluating the information and making analysis using this information, which is the basis of the scientific and engineering studies, are made in different environments depending on the today's rapidly developing technologies.

Remote Sensing (RS) and Geographical Information Systems (GIS), together, introduce a method supported with technological developments capable of planning the studies carried out by related scientific and engineering branches, coordinating the data, using and evaluating the produced information properly.

Geographic Information Systems (GIS) education in Albania, in true sense, started about fifteen years back. However, since then there have been discussions among academicians regarding the format and curriculum of GIS teaching. Since then GIS has evolved and come out with full vigor and implementation possibilities. The time, when there used to be talk of the great potentials of GIS, has passed.

These days, GIS courses begin to be developed in graduate programs especially in geography, geodesy, computer sciences, and geology departments of the universities in Albania. Also GIS based graduate programs have been developed by the graduate schools of natural and applied science of the universities. But these education programs are not enough to reduce lack of GIS experts of Albania. For these reasons, online education opportunities should be developed by the universities.

Most of the GIS courses are taught in government universities. One graduate program was developed by Polytechnic University of Tirana. The main objective of the program is to train GIS experts who can serve in a large range of disciplines for private sector, industrial, commercial, municipal, military and governmental applications to meet various needs. The main goal of the programmer is to teach these techniques with the support of current technologies and applications. For this purpose, graduate programmer and projects for students from various disciplines have been suggested to take place in the GIS laboratories of Polytechnic University of Tirana.

GIS Graduate program was also developed by the Tirana University, Shkoder University, Gjirokastra University and Agricultural University of Tirana. The Geography Department of Tirana University was the forerunner in pioneering of GIS education in Albania by the establishment of the first GIS Laboratory and the introduction of a graduate program at the Professional Master's level in the country.

## 2. GIS EDUCATION IN ALBANIAN UNIVERSITIES

GIS today is one of the major decision making tools in the area of resources planning and management. Integration of high resolution satellites remote sensing technology with Geographic Information Systems has widened the potential of both these technologies. Transfer of this technology from academic and research community to hard core planners is a major and complex task.

Implementing GIS in to the curriculum may encourage students to examine data from a variety of fields. The power of GIS is that it allows us to ask questions of data. Students using this inquiry approach form research questions, develop a methodology, gather and analyze data, and draw conclusions.

The role of higher education is to assist students in becoming effective thinkers with the knowledge and skills that will lead them toward becoming meaningful contributions in society. Geographic Information Systems in higher education provide an integrated solution to assist faculty and students with their educational goals.

All over the globe, GIS education has been amazingly successful. This claim of success can be demonstrated by the fact that ESRI has over 21,500 clients at institutions of higher education. This represents approximately 7,000 universities in about 150 countries. This list includes almost every major university in the world.

Based on information from many sources, was estimated that there are approximately 150,000 students a year taking at least one course in geospatial technology, and these courses are being taught in many different disciplines. On some campuses, 40 or 50 different faculties (departments, disciplines or institutes) are using GIS for research and/or teaching. These faculties are as diverse as agronomy, criminal justice, chemical engineering, environmental law, forestry, marketing, religion, and veterinary medicine. For a complete list of disciplines using GIS see (<http://www.esri.com/industries/university/deptlist.html>). Some universities have as many as 30 or 40 different geospatial courses in their catalogues.

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During early stages of GIS education in Albania, the irony was that no one was ready to accept GIS as its discipline. In the year 1994 Albanian Geographic Center (Science Academy of Albania), started to establish and development a GIS system. GIS higher education in Albania started in 1998 year. In about 1999 year with the pioneering efforts at the Institute of Geography, University of Potsdam (Germany) GIS courses begin to be developed in undergraduate programs in Geography Department, Tirana University. At the same time with these courses, Geography Department of Tirana University and Geography Institute of Potsdam began a pilot project about creation of the Albanian Demographic Atlas. Two or three year later GIS courses begin to be developed in undergraduate, graduate programs especially in geodesy, geography, computer sciences and geology departments of the universities in Albania.

The department of Geography of Tirana University was the forerunner in pioneering of GIS education in Albania by the establishment of the first GIS Laboratory and the introduction of

a graduate program at the Professional Master's level in the country. The software complement was an integration of both vector-based and raster-based software, and they are listed in Table 1.

Table 1 Installed software (1999)

<b>Vector-based software</b>	<b>Comments</b>
AtlasGIS	A vector based package that is easy for thematic mapping with good import/export and map projection capabilities
ArcCAD/Autocad	A vector based GIS software based on an integration of AutoCAD mapping capability with the analytical capabilities of Arc/Info.
ArcView 3.0	A highly user friendly and very popular GIS vector data software
Idrissi for Windows	A raster-based package with import/export capability and raster modeling strength. Idrissi bridges the interface between GIS and Remote Sensing. Also it has limited vector data processing capability, which classifies it is hybrid GIS software.

The establishment of the GIS Laboratory at Geography Department spanned about three academic sessions. This entailed in the first instance, development advisory team workshops to raise awareness and to provide avenues for Albanian participants to identify research priorities in the areas of spatial decision support systems and environmental monitoring and management and establish a need for GIS technology as a decision-making tool in a problem-solving environment came in stages, the last set were installed in 1999.

Currently, the GIS laboratory of about thirty (30) new computers networked and fully internet ready. Three of the computers have been fully activated for internet browsing for students' use. They were purchased about five years ago, and the department is putting in place a scheme whereby computers would be upgraded or renewed every three years.

Other currently available peripheral equipments include: Color printers, scanners, plotters etc. Currently installed software include vector based software like ArcView 3.2a, AtlasSelect, PC Arc/INFO 3.5.1 and MapInfo 5.5 while Idrissi for Windows is the only raster based software. This mix enables students to attain proficiency and familiarity with the most number of the more popular and user friendly GIS software currently available in the market. Efforts are on-going to purchase the current versions of this software as well as to introduce new software like GRASS and Maptitude.

GIS is taught at the Faculty of Geology and Civil Engineering Faculty in Polytechnic University of Tirana as independent subject for geodes, geophysicists, miners, geologist etc and as a specialized program for general geo-engineers. These courses are intended to be for specific groups of experts. The overall program covers the following topics:

- Information basics with an emphasis on data-base management;
- acquiring geo-data with an emphasis on Remote-sensing and photogrammetry;
- Basics of geodesy, cartography and thematic Mapping;
- GIS' types and elements of GIS;
- Geo-objects and geo-modeling.

The courses are complemented by information technology topics (such as computer hardware, operating systems, computing, programming, software engineering) and introductory lectures and exercises on specific GIS programs like Geomedia, ArcInfo and GRASS as part of the specialized program.

On analysis it is clear that this type of 'expert' curriculum could not be used as part of a continuing education program for history, economics, geography or even information technology teachers. The expert curriculum described here is rather 'typical' of those that have developed in European Universities; therefore it might be implied that as yet there is no higher education expert curriculum for teachers on the use of GIS. The remainder of this chapter therefore seeks to contribute to a possible elaboration of this curriculum and to suggest some of the associated teaching materials which might be required

The advancement in computing technology which resulted in the development of high speed computers with large memory, coupled with the need by surveyors and other professionals to store, manage and retrieve geo-reference data quickly has led to the changing pattern in training. Furthermore, there is the tremendous impact that advances in technology, modern instrumentation and techniques have had on the Surveying profession. Though most of the traditional courses are still being offered in Albanian Universities; new courses like Principles of Geoinformation systems, Digital Mapping, Coastal Mapping and Management, and GIS Tools and Applications are now being taken in the universities.

The course curriculum of Bachelor program includes the subject of Remote Sensing and Geographical Information Systems and Thematic Cartography and Fundamentals of Cartography and Project in GIS. The new degree will draw upon several core geographic information-related subjects already taught in the current Bachelor of Geology and Geodesy Engineering degree. These subjects include Geomatics Science (dealing with the fundamental principles of geographic data collection), Introductory GIS and Remote Sensing, Imaging in the Geosciences, Environmental Visualization and Mapping, Land Administration (including Spatial Data Infrastructures), Applications of Remote Sensing, Spatial Analysis, and Application and Development of GIS. Furthermore, the degree will include other Department-taught subjects in Computer Systems and Graphics, Information Systems and Programming, Professional Development, and Research Studies. The degree will also draw on subjects taught by other Faculties including several units of mathematics, Experimental Design and Data Analysis, Database Systems, Management principles, and Management Information Systems.

The course curriculum of the Masters program from inception covers the functional elements of geographical information systems with courses dealing at some depth with data structures, computer programming, spatial statistics, spatial decision support systems, maps and map projections, digital image processing and GIS/remote sensing applications in different areas of the human and natural environments. Surveying concepts and techniques taught include geodesy, GPS observation and reduction, and strategies of integration of surveying, GPS and GIS.

### 3. ACTUAL PROBLEMS ABOUT GIS EDUCATION

GIS is used as an essential research tool in all institutions of higher education in geography, geology, geodesy and other disciplines by instructing educators in the use of teaching with and about geographic information systems (GIS) and other geographic technologies (remote sensing, Global Positioning Systems (GPS)), community college, and university curricula through the use of online guidelines, online courses, and hands-on training events and provides spatial data to support the teaching with geospatial technologies in the curriculum.

In the developed countries of Europe and the United States, due to their relatively early start, both in the GIS theory, technology, scientific research, education, popularization, institutions, and organizations are more mature, each forms a complete and scientific system. We should learn from the successful experience of foreign countries to establish and improve GIS education system at all levels based on different GIS personnel levels, such as higher professional education, science popularization, certification training, and so on.

GIS education in Albania is at a young stage and it is gradually approaching towards maturity as more and more educational institutes are offering degrees in this field. In Albania, GIS courses and training programmes are offered by research-intensive government agencies and universities. Today, GIS education has become extremely important in Albania, especially for management and monitoring of natural disasters, floods and landslides that have become endemic to the region.

Most of the GIS courses are taught in government universities, but there are a number of private companies that run short courses in remote sensing and GIS. However, prices of the courses are considered too high for anybody not under sponsorship.

GIS will play a more important role in education and development in Albania. Google Earth has made a big impact in Albania. People are now more aware about maps and satellite images. The Digital Albania program will create demand for geography and GIS.

GIS is increasingly being used by experts to analyze the environment, natural resources, and management problems in the developing nations including Albania. Therefore, there is an urgent demand locally for professionals trained in GIS who would help to integrate these concepts and technology into the spatial decision making processes in the country. There is the need also to train and continually re-train teachers who would assist in integrating GIS concepts and applications into programs taught by disciplines concerned with spatial phenomena such as geography, land surveying, architecture, forestry and resources management.

The main problem today in using GIS in spatial modeling is first, the lack of GIS integrated modeling tools and second, the users' low level of theoretical understanding of the use of tools. On the other hand the problems still exist with data integration (standardization) and user interfaces.

The development from GIS to Geographic Information Science in university education needs development in both of the fields: spatial modeling and system development. The new scientific topics which have been introduced during the recent years like geocomputation seem to touch both of these areas. Researchers' interest to mathematical modeling and new computation methods is raised up; approaches like cellular automata and fuzzy modeling, new programming approaches for computation like parallel programming and genetic programming is the new approaches and technologies for spatial modeling and model

implementation. The vast amount of spatial and related data bases in the network require more efficient tools for queries like spatial and visual data mining technologies. Multimedia and virtual realities bring GIS to the cyber reality.

GIS is dependent on new technology developments and as such it is important to develop a curriculum which provides the bases to implement and understand all components of such a system at any depth. The efficient utilization of the computer laboratory helps to create alternatives for the best preparation of course material and lab assignments. New technology provides a big challenge for faculty and students to experiment complicated theories and ideas. It is an ideal tool particularly for courses such as GIS because it permits direct implementation of theoretical developments providing immediate solutions to experimental and real problems. The goal of curriculum development in GIS in the departments of Albanian Universities is to generate quality knowledge through a limited number of courses so that the students will be able to understand and implement such knowledge in their major field and at the same time they will have the potential to be smarter than the machine.

#### 4. CONCLUSIONS

Technical development and globalization, as a process and a condition of the space for higher education, dictate the guidelines for development of GIS study programs all over the world.

GIS in Albania is taught in Tirana University since year 1998. Furthermore, GIS is taught as a part of undergraduate geography and as area of specialization at post-graduate level in Tirana University. GIS Graduate program was also developed by the Polytechnic University of Tirana, Shkoder University, Gjirokastra University and Agricultural University of Tirana.

The recognition of GIS as a separate discipline has long been achieved, but no bachelor degree programmer in the field is available in any Albanian University.

The following recommendations if pursued and implemented will go a long way to solve the numerous problems facing GIS education in Albania, and also help to promote the GIS industry.

1. All departments and institutions offering survey related programmers should constantly review their curricula to reflect the changing needs of the GIS industry. Emphasis must not only be placed on traditional survey techniques; attention should also be given to modern techniques in data acquisition, data management and data presentation. New courses should also from time to time be introduced in the training programmers.
2. Government should give education the right priority and make funds available to universities and all other relevant organizations and firms so that the necessary equipment would be purchased to facilitate the training being offered by these institutions.
3. Tertiary institutions should also look beyond government subventions for funding of geomatics education. They should also seek for help from non-governmental agencies such as oil companies and some international organizations.
4. There should be a high degree of collaboration among the tertiary institutions. International research fellowships and scholarship awards to deserving young lecturers would also be of immense benefit to the geomatics industry.

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