Surveying Education in ITU (Istanbul Technical University) and Comparison with USA Universities

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SUMMARY

Geodesy and Photogrammetry Engineering is a science related with depicting and expressing via plans or maps by measuring the world or a part of the world and processing these measurements and is more open for technological developments. One of the oldest occupation, Geodesy and Photogrammetry Engineering, is changing rapidly with the needs of mankind and technology. Geodetic education courses, contens of the courses, lecture hours of courses and even its name have been changed for years from the time surveying education started. This paper discusses these issues in the context of geodetic education from 1834 up to now and its comparison with education in USA on account of surveying education vista and vistas.

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1. INTRODUCTION

Geodesy and Photogrammetry engineering, in its simplest definition, is responsible for the drawing and calculation necessary to produce maps representing the Earth or a portion of the Earth. It shows the shape of the Earth, natural or man-made features, their locations and relations with each other graphically, based on mathematical models and surveying methods

The discipline is continuing to be a dynamically changing and improving one that the people interested in mathematics, computer applications and like to serve by producing the map as a base for almost all engineering applications can work comfortably [URL 1, 2007].

One should also have knowledge on some specific application areas (e.g. agriculture, forestry, geology, etc.) although the methodologies about thematic or topographic mapping, spatial data management and land administration can be integrated under one curriculum. It is not possible to gather all applications in one license curriculum. Because of this, geomatics should focus on covering some highlighted methodologies and understanding the theories thoroughly while cooperating with other disciplines in the general understanding of multi disciplined special applications. This concept for geomatics is not new and is based on about 40 years before when the geodesy and photogrammetry engineering had started to broaden its concept [Mekik, 2005].

It is estimated that more than approximately 9000 surveying engineering are on duty in Turkey. 45 percent of them are working in puplic institutions and associations and the rest 55 percent are working in either their componies or big civil engineering or project companies. It is well known that today's need is more and more ever this number of engineers [URL 2, 2007].

2. SURVEYING EDUCATION IN TURKEY WITH NUMBERS

In Turkey, there are eight universities with 4-year degree programs as of 2000 offering geodetic engineering education. These universities are the key units for educating professionals in sur veying and mapping with BSc, MSc, and PhD degrees. An additional three universities intend to begin offering geodetic engineering education. Within the technical schools, there are 20 universities offering 2-year programs for mapping technicians within approximately 40 departments in different regions of Turkey. Furthermore, surveying engineering education has been offered to officers in the military college in the General Command of Mapping since 1969. The master's degree programs are designed to be completed in 1.5 or 2 years and consist of both compulsory and elective courses, some offered in English [Kızılsu, 2005].

Members of the educational staff have official authority to conduct a course, and disturibution of staff in the universities is given in Table 1 and educational staff's distribution in all Turkish universities according to the main science divisions is

- Surveying technique= 30%,
- Geodesy =25%,
- Photogrammetry =16%,
- Cadastre =11%,
- Remote sensing= 10%, and
- Cartography =8%.

Table 1. Distribution of Education Staff in Surveying Engineering Departments at Turkish Universities.

University	Professor	Associate Professor	Assistant Associate Professor	Research Assistant	Lecturer
Istanbul Technical University (ITU)	14	10	5	24	1
Yildiz Technical University (YTU)	13	4	9	24	1
Karadeniz Technical University (KTU)	7	4	4	23	1
Selcuk University (SU)	2	2	7	10	2
Zonguldak Karaelmas University (ZKU)	2	—	3	2	9
Afyon Kocatepe University (AKU)	—	—	1	4	—
19 Mayis University (19MU)[a]	1	—	—	5	1
Erciyes University (EU)[b]	—	—	1	5	—
Total	39	20	30	97	15

[a] MSc and PhD program only, [b] MSc program only.

3. SURVEYING EDUCATION IN ITU

Geodesy And Photogrammetry Engineering Department, functioning in the Istanbul Technical University Faculty of Civil Engineering, is established with the aim of execution of the technical, social and economical services of Mapping, Title Deed and Cadastre sector, contributing to the prevention of the technical staff shortage causing a bottleneck on the development efforts of the country, for supplying the usage of technological and scientific developments suitable to the country needs, and for doing the duties of our country efficiently [URL 3, 2007].

It is accepted that ITU had started in 1727 under the name of "Humbarahane". And in 1773, the foundations of ITU are set by the opening of the Faculty of Naval Architecture by the name of "Mühendishane". İn 1944, the Faculty of Civil Engineering was founded and the Geodesy & Photogrammetry Engineering department started to serve with the name of "Topography And Geodesy Chair" in 1973 as a graduate program. Within the 1969-1970 academic year, students are accepted to the Geodesy & Photogrammetry as a seperate department. In 11.12.1989, five divisions are established within the department named

Geodesy Division, Cartography Division, Surveying Techniques Division, Photogrammetry Division and Remote Sensing Division [URL 3, 2007]. ITU has started to give education in 30% English in the year 2000.

3.1 Some Data About Surveying Engineering in ITU

The Geodesy And Photogrammetry Department of ITU has started education eith 8 students and 7 academic staff in the 1969-1970 academic year aiming to raise professionals on license, masters and doctorate levels to provide digital and thematic information to many other related engineering branches performing engineering surveys for technical projects and to prepare all kinds of maps and plans having different aims and scales [URL 3, 2007].

The department, having graduated 1045 engineers, 72 M.Sc engineers and 35 doctor engineers since today, has a total number of 427 students with 307 undergraduate, 63 M.Sc and 57 doctorate students in 2007.

The subjects covered in the Turkish Geodesy and Photogrammetry engineering departments and their weight assessments are made internally and given in Table 2 (URL 1, 2, 3, 4, 5, 6, 7, 8).

Table. 2: Emphasis of Repuplic of Turkey Surveying and Mapping Programs.

University	Photogrammetry &Remote Sensing	Plane Survey& Computations	Geodesy & GPS	Cadastre	Cartography	GIS & LIS
Istanbul Technical U.	G	G	G			P
Yildiz Technical Univ.		G	G			G
Karadeniz Technical U.						
Selcuk University	P	G	G		G	P
Zonguldak Karaelmas		G		P		
Afyon Kocatepe Univ.		G	G			
19 Mayis Univ..		G		G		P
Erciyes University						

G good coverage / P poor coverage / empty space = adequate coverage

4. SURVEYING EDUCATION IN USA

The oldest American University, the one of Mexico City, is still very cognizant of these traditions. The early North American Universities, such as Harvard (and its offspring New Brunswick after US independence) were originally modelled after British University traditions. In the United States of America the military agencies supported the establishment of a Mapping and Charting Laboratory at Ohio State University in 1953. Out of it grew a graduate program with the emphasis to take B.Sc. graduates in applied science (engineering, geography, mathematics, and physics) and to transform them within two to three years into a surveying and mapping career oriented individual. This was possible as most graduate students were already working in the field and were sponsored by their employers to take part

in the course.
The philosophy of Ohio State University was very much like that of the ITC of The Netherlands with the advantage that OSU had a recognized University program at the start and ITC had to obtain gradual University recognition by the Dutch government. The approach in Canada in 1959/60 was different. (Konency, 2002). As well known, in America, the name of Geomatics Engineering is used instead of Surveying Engineering or Geodesy and Photogrametry Engineering.

4.1 Some Data About Surveying Engineering in Anmerica

Table. 2: Emphasis of U.S. Surveying and Mapping Programs.

University	Photogrammetry &Remote Sensing	Plane Survey& Computations	Geodesy & GPS	Cadastre	Cartography	GIS & LIS
Ohio State		P	G	P	G	G
Oregon Instite of		G			G	G
CA State Univ-Fresno	G		G	G		
University of Maine		P				
Mishigan Technical Univ.	P					
Ferris State Univ.						
Texas A & M						
Perdue University		P		P		
Penn State Univ.						
New Mexico State Univ.						P
University of Alaska					G	
East Tennessee State Univ.				G		
MIT	Geomatics program is no longer offered.					
Univ. Of Florida	Geomatics program is no longer offered, now it is a part of Forest Resour.					

G good coverage / P poor coverage / empty space = adequate coverage

In the USA, where prerequisites to be a surveyor are also very low, there are now 14 accredited surveying and mapping programs. While in Europe, Canada, Australia, South Africa, and Nigeria the course content covers the entire geomatics field, the coverage of certain aspects of the discipline differs from University to University as shown in Table 2 (Frank, 2002; Konency, 2002).

In Table 3. The contrubution of casified hours of courses is given between ITU and some Universities in United States (URL 3, 9, 10, 11)).

Table. 3: The contrubution of casified hours of Courses

University	Basic Sciences	Human and Community	Basic Engineering	Others	TOTAL
Istanbul Technical University	*38*	*32*	*51*	*33*	*154*
California State University-Fresno	26	58	18	24	126
The State University of NY	38	67	9	18	132
Pennsylvania College of Tech.	25	32	42	29	128

5. REQUIREMENTS OF ACQUIRING ENGINEERING.

After the Marmara Earthquake disaster in our country, an arrangement especially in structure projects, applications and inspections had arisen. In engineering and architecture applications, the thought of necessity of switching to "professional engineer/architect" titles arose and afterwards, in 2000 "Professional Engineer or Architect Certificate Regulation" was put into effect by the government in order to adopt professional engineer certificate (URL 12, 2007).

In United States of America, titles of Professional Engineer or Professional Surveyor are offered by National Council of Examiners for Engineers and Surveying. A candidate, graduated from engineering or a surveying program accreditated by ABET, must initially succeed in Fundamentals of Engineering (FE) and Fundamentals of Land Surveying (FLS) exams. Successful students are designated to be interns. An intern must gain experience under the inspection of another licensed engineer/surveyor and this experience is usually gained in at least 4 years. This technical experience should aim to help the intern gain a continuously increasing level of competence. After gaining the required experience, the intern engineer attends Principles and Practice of Engineering (PE) or Principles of Land Surveying (PLS) exam, which is the second step of taking license. This exam is held twice a year in different engineering disciplines and surveying (Mekik, 2004).

6. CONCLUSIONS.

One of the most noteworthy aspect regarding the engineering education is the continuity of the learning process even after graduation. In USA, in order to work as a profesisonal engineer, one has to pass the prescribed examinations. In Turkey, this application is not yet put into practice so graduated students directly are able to start work as engineers.
In Turkish universities, subjects like plane survey, survey computations, geodesy and GPS are generally given in sufficient teaching commitments. Whereas subjects like GIS and land information are less weighted in the curriculum than the orher subjects.
Even though ITU is the oldest university in Republic of Turkey, surveying education started in 1973 in it.
Acreditation studies first started in 2003 and acreditaion of Geodesy and Photogrammetry Engineering department of ITU was first approved for 6 years in 2006.
Although the number of undergraduate and graduate students in ITU are higher than the Geodesy and Photogrammetry departments in USA, the student / lecturer ratio of ITU is much more higher than these universities.
For the 8 universities in Turkey giving Geodesy and Photogrammetry engineering education, there are 12 universities in the USA giving this education. If the populations are taken into consideration, it can be seen that there are not much departments giving geodesy and photogrammetry education.
While the student / lecturer ratio in ITU is 10.5, it is 15.0 in Fresno and 6.67 in Florida (before 2007).

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BIOGRAPHICAL NOTES

He is graduated from ITU-Geodesy and Photogrammetry Engineering Department, then took his MsC degree in 1992, and took PhD degree in 1998. He has been an assistant professor in Surveying Techniques Division since 2000. He is interested in GPS, GIS, Mobile GIS, Emergency Planning, and software development. He has international experience in California State University-Fresno as a visitor scientist in 2001-2002.

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