

Geomatics Engineering Education in Nepal

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Introduction

The training in engineering profession was started in Nepal about five decades back. Even though formal education in engineering profession started with BE in Civil Engineering in Tribhuvan University in 1978, the growth of engineering education has been since 1994 in both government and outside the government system. Kathmandu University started undergraduate program in Electrical & Electronics, Computer and Mechanical Engineering in 1994. It has been pioneer in starting these courses in Nepal and always providing students new career opportunities in the fields, which needs huge investment, physical resources and expert faculties. There are 28 institutions approved by Nepal Engineering Council (NEC) offering undergraduate level courses in 13 engineering disciplines in Nepal with annual intake capacity of 4297. Nepalese engineers are educated from more than 20 countries and 430 universities around the world. More than 9000 engineers in 42 different disciplines have registered to practice in Nepal and there are quite a many who are practicing without registration. But even this number is not enough for development of the country. The acceleration of economic growth cannot be achieved without engineering.

Government of Nepal is mainly responsible for surveying and mapping. The 50 years of periodic planning process in Nepal has witnessed the growth of Survey Department as a Cadastral Survey office to National Mapping Agency (NMA) to the hub of National Geographic Information Infrastructure (NGII) in Nepal (Chhatkuli, 2007). There could be the gap between the qualities of human resource needed to cope with the future challenges with existing human resource development mechanism. On the other hand, there may not be any more monopoly of government in mapping and geo-information sector. The previous influence of government at both strategic and operational levels has diminished, although

there is still strong case for a strategic national government role in Spatial Data Infrastructure through coordination (Rajabifrad et al 2006). Realizing such future challenge, Kathmandu University and Land Management Training Center (LMTC) has collaboratively initiated and started new program Bachelor in Geomatics Engineering since August 2007 to produce internationally competent human resource.

Engineering Education at Kathmandu University

Kathmandu University (KU) was established in November 1991 as an autonomous, non-profit, non-government, public institution through private initiative. KU is committed to develop leaders in professional areas through quality education with the vision "To become a world-class university devoted to bringing knowledge and technology to the service of mankind". It is running more than 50 different academic programs from certificate level to PhD through six different schools. KU has produced 4906 undergraduate and 1017 graduate level specialized manpower until 2007.

School of Engineering at KU was established in 1994. It is offering BE in Mechanical Engineering program, Electrical & Electronics Engineering program and Computer Engineering program with 48 intake in each discipline annually. The graduate program in engineering was started in 2001. Until 2007, KU has produced 33 graduate and 833 undergraduate level engineers in these three engineering profession.

The universities in Nepal are offering undergraduate and graduate programs in engineering. Council for Technical Education and Vocational Training (CTEVT) offers most of the skill oriented training programs. Technical Education is always expensive, but the quality of

the program cannot be compromised and diluted, because engineering profession is responsible for health and safety of society. Hence the curriculum of the program should be formulated in such a way that the program should be able to prepare engineers to meet the present requirement, ready to face challenges that may appear in future and should be of internationally acceptable standard. For this reason KU has adopted following procedure for finalizing its curriculum:

- Meta analysis of courses of same or similar program offered by universities and institutions around the world
- Organizing Curriculum Development Workshop by involving experts in the field of education, industry, business and other related area.
- By incorporating topics demanded by employer and market.

The engineering program of Kathmandu University is always focusing to produce engineers with one or more of the following qualities:

- Engineers who can make use of ultra modern technologies to become highly skilled manpower
- Engineer who can make use of natural resources efficiently and economically, especially in the rural communities of Nepal to become excellent social servant
- Engineers who can best manage human and material resource in production and service industry to become highly successful manager
- Engineers who can be creative in the profession and business and become entrepreneur to provide employment to many others
- Engineers who can develop new technology and system for the service of mankind and become leader in the society

Each of the above mentioned activities are equally important especially in case of Nepal. The country has developed confidence in producing such human resource in technical area and reduced dependence with other country. To achieve this, all the engineering program of Kathmandu University incorporates knowledge of basic sciences, engineering sciences, social sciences, management, practical technical skill, creativity, language proficiency and professional practice.

Geomatics Engineering

The technologies in the engineering discipline are developing rapidly. Even though traditional engineering disciplines are very essential for infrastructure development,

the specialized area of engineering is also equally important for comfort, safety, accuracy and reliability. When population density was low, the importance of land was not that high because land was basically used for agriculture. Similarly prior to development of modern communication and transport facility, the knowledge of every part of the globe was not of much interest because of accessibility problem. But in today's modern life every human activity is associated with geo information and measurement science.

Geomatics Engineering is rapidly developing discipline. This is a term which is not found even in modern dictionaries. Geomatics is new term which incorporates the traditional "Surveying" along with other aspects of spatial data management. The spatial information, which is information that is referred based on location, is the primary factor for viewing and analyzing wide range of data. The development of information technology, digital data processing techniques and mapping technology has revolutionized the land surveying profession. The spatial information produced by this profession is vital for planning and decision making not only for government level, but also in community level and business society. Hence the profession of land surveying is converted and expanded to the profession of Geomatics Engineers.

Geomatics Engineers apply engineering principles to create spatial information and use relational data involving measurement science. Geomatics Engineers are special information engineers who manage local, regional, national and global spatial data. Even in Nepal, prior to seventies, land measurement was carried out by chain survey. It has been already changed now and Department of Survey has already established the National Geo Information Institute (NGII) and created huge digital resources in the country. Nepalese surveying professionals have to design, develop and operate system for collecting and analyzing spatial information about the mountains, land, natural resources and manmade infrastructures.

Both traditional and new disciplines of science and technology such as geodesy, cartography, digital mapping, remote sensing, photogrammetry, image visualization, geographic information system (GIS), global positioning system (GPS), computer aided design and drafting (CADD), land information system (LIS), land information management and so on fall under this discipline of Geomatics Engineering. KU was providing education in GIS to computer engineers since 1994 on technological perspective, but now with this new education program, the things will be looked in to application perspective. With

the launching of Geomatics Engineering, there will be synergic effect in geomatics and informatics program of Kathmandu University.

The overall course structure of Geomatics Engineering is shown in figure 1. More than 40% of the courses are on Geomatics Engineering and among 16% practical oriented courses, it is mostly related to Geomatics Engineering. The foundation of geomatics engineers are prepared strong with 15% courses in basic science and 18% courses are interdisciplinary engineering courses, which prepares them to cope with all other engineering challenges and make them comfortable to work with other engineering team. Geomatics Engineers in no way should be inferior to the existing Senior Surveyor. Hence there is strong field survey training of total 18 weeks (which is equivalent to full 1 semester load) in five parts in the program.

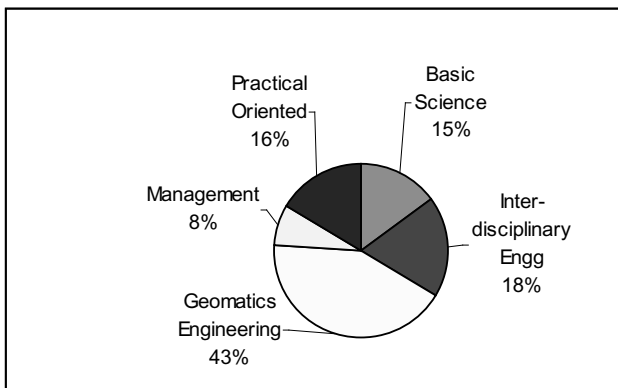


Figure: 1

Challenges and Opportunities

There are only 4 survey engineers who have registered in Nepal Engineering Council. Land Management Training Center (former Survey Training Center) under Ministry of Land Reforms and Management has so far produced about 5000 survey professionals of different levels since its establishment in 1968. School of Geomatics and Himalayan College of Geomatic Engineering and Land Resource Management has also initiated programs in related field in private sector. Mainly survey professionals of Nepal are getting higher degree from abroad. In such situation, Land Management Training Center and Kathmandu University has joined hand to initiate quality education in undergraduate and graduate level in this field in Nepal itself.

Several universities around the world have Geomatics Engineering Departments and offering courses in Geomatics. Conventionally this curriculum is administered by Civil Engineering in most of the universities and also considered as specialized area of Civil Engineering. The Ministry of Land Reforms and Management realized the need of professional with better skill and knowledge in the survey field and requested Kathmandu University to support them to change Senior Surveyor Training (16 months course after BSc) to academic engineering degree. Kathmandu University and Land Management Training Center in Dhulikhel are neighboring institutions. These two institutes have now lunched joint program in BE in Geomatics Engineering since August 2007. Government of Nepal is providing financial and human resource support for this program through Ministry of Land Reforms and Management for 7 years (at least 4 batches). The physical and laboratory resource of the center will be used for teaching this course while resources of Kathmandu University will be used for basic science and engineering courses. The experts from government, private consulting companies, INGOs and other institutes have contributed to design the courses. This course will have common engineering pattern of Kathmandu University, which includes courses of basic science, engineering knowledge & skills, managerial competency and specialized knowledge in the subject area. This is a joint effort in the country of two pioneer institutes KU and LMTC to produce highly skilled professionals. The engineers produced from this program can get job in government, infrastructure development projects (such as roads, irrigation, hydropower and housing), NGO/INGOs, development agencies and consulting firms. There is also growing demand of this profession in international job market. Moreover it is believed that these engineers will create opportunity for them by themselves.

This program is one of the unique programs in South Asian region. Kathmandu University has started bringing international students in Nepal for higher education. This could be one area where we can bring the international students for higher education because we have a nature that gives all the challenges for survey and mapping starting from Terai to Himalayas.

If information technology industry cannot develop in faster pace in the country, that could be hurdle for speedy growth of Geomatics Engineering. Since it is first ever program in the country, it takes time to prepare Survey and Mapping professional for changing need of Geomatics Engineering.

Student attraction

There is a great response from the student community for this newly offered engineering program. Out of the 10 undergraduate programs offered by Kathmandu University in science and engineering, Geomatics Engineering was second highest demanded program and it was a first priority among engineering program (Figure 2). Out of the 917 applicants, 372 candidates have shown interest in Geomatics Engineering for the total 24 seats available. The distribution of interest of priority for this program is shown in figure 3. Students admitted in this program have got good academic records. This is an opportunity for survey professionals in the country to nurture this young talented group and prepare them for upcoming challenges.

Overall female to male student ratio in Kathmandu University is 40:60, but this trend is not encouraging for gender balance in engineering program. There is a same reflection in total applicant of the geomatics program as 10:90, but there is only 1 girl student who got admission in a group of 24 students. Hence there should be effort for promoting this program in under privileged sections of the society.

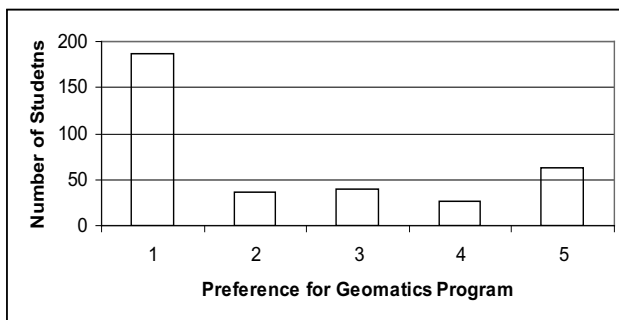


Figure: 2

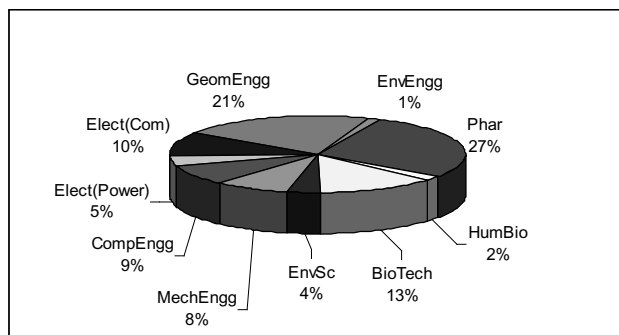


Figure: 3

Conclusion

This new innovative joint academic program of Kathmandu University and Land Management Training Center is leapfrog step of public private partnership in higher education. This program will create many new opportunities for Nepalese in the future and contributes for scientific geo-information system in the country. There is a great appreciation of all sectors of society for this novel endeavor, but it is a responsibility of the professional working in the field to make it world class and make it successful. There will not be any compromise in quality in any corner of the program. Hence it needs incubation care for some time. There is a great interest of Nepalese youth in the program. This is not only due to financial subsidy in the program, but Nepalese student, nowadays is taking more risk for new, challenging and creative things rather than conventional activities. It could be great opportunity for Nepalese youth to establish themselves in the field of geo-information and geo-science.

Reference

Chhatkuli, R. R., *Status of SDI Implementation in Nepal: National Geographic Information Infrastructure, the National Initiative for Inter-Agency Networking and Data Sharing in Nepal, Symposium of Senior policy Executive and Decision-makers on Spatial Data Infrastructure, 29 June 2007, Kathmandu*

Rajabifard, A., Binns, A., Masser, I. and Williamson, I., *The role of sub-national government and the private sector in future spatial data infrastructures, Int. Journal of Geographical Information Science, Vol 20, No 7, Aug 2006*

Nepal Engineering Council, Annual Report, 2007