

**Proposed Syllabus of Geomatics Course Towards Civil Engineering Degree
- Some Guiding Thoughts**

By
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1. Introduction & Scope

Senior faculty of IITs and other Engineering Universities and colleges have already started paying attention to this rather ignored and postponed topic. This is a happy augury. New subjects are being incorporated in the four year syllabus of the Civil Engineering Course. Geomatics (old surveying) is, therefore, in competition with some modern civil engineering subjects. The correct thought should, therefore, be to 'mould' the subject of Geomatics in such a thoughtful manner that the freshly passing civil engineer should not miss the 'essentials' of the subject. Consequently, he should be exposed to some ideas / practical concepts which will help him in furthering his professional objectives in whatever discipline (sub-branch of civil engineering) he is called upon to work.

What is mentioned further is for the consideration of the concerned faculty and professionals to evolve on effective, understandable, accessible and acceptable syllabus for Geomatics subject.

2. Geomatics Vs Geoinformatics

The traditional name of surveying and mapping although very much in vogue in practice even today is being gradually replaced by Geomatics / Geoinformatics. Most of the surveying professionals are rather not choosy on the nomenclature but the academic world and the international literature have already embraced these words.

It is, therefore, requested that Indian academia and the concerned decision managers will arrive at some consensus on one 'word' so that more and more professionals make use of the word. For the sake of this paper, a simple word of 'Geomatics' is being used – without prejudicing the selection of the finally chosen word.

Indeed, the chosen word should also have the formal support of All India Council of Technical Education. Further the chosen word will eventually be embraced by the organizations like Survey of India, National Remote Sensing Agency, other allied organizations and authors.

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3. Passing Out Civil Engineer Professionally what is Generally Expected of A Fresh Civil Engineer?

This is a cardinal question, the answer to which is going to lead to the direction of a solution. Consequently, some of the thoughts which are part of the answer are discussed further.

Nobody expects from a CE graduate that he will behave and act as an 'all knowing' specialist or professional in the field of Geomatics and who will handle surveying instruments to deliver the results. The stress, therefore, will be more on the understanding supported by the requisite practical knowledge of the Geomatics profession.

It follows that a CE graduate, at the minimum level, should be able to appreciate the 'potential' and the 'limitations' of the current technological practices. He should be able to do the desired comprehension of the technology on the basis of the exposure, desired syllabus. The syllabus should, therefore, help the student to know what can be done and what cannot be done by a particular technology within Geomatics.

In simple terms a CE graduate should have a practical / project oriented comprehension of the profession of Geomatics.

This is what should also be the expectation of the person who employs the fresh graduate --- nothing more nothing less. If a CE graduate has to be put on a production / project task, he has to be additionally trained by the employing organization.

4. Interaction with Geomatics Professionals / Experts

He should be able to hold intelligent dialogue with the specialists in this field, pertaining to the salient features, specifications and milestones of his own project. These specialists will, perhaps, be many depending on the type of the task. This is made clear in the Box 1.

CE graduate should also be able to appreciate the vocabulary and purport of the dialogue with the concerned persons

BOX-1

Specializations within Geomatics

The discipline of Surveying Mapping has transformed into a large number of specializations or sub-disciplines. These can be grouped under the title of Land-Information Technologies. The profession of Geomatics will naturally embrace all these technologies.

- ◆ Ground Surveys, Field Control
- ◆ Global Positioning System (GPS)
- ◆ Satellite Imagery and Remote Sensing
- ◆ Aerial Photography, Photogrammetry and Digital Terrain Model (DTM)
- ◆ Geographic Information System (GIS)

Other technological frontiers:

- ◆ Air Borne Laser Terrain Mapping Systems
- ◆ Radar Interferrometry for Heights

It is quite natural that a combination of these subjects may be required for a given project.

This appears to be a 'tall order' for the fresh graduate but it is not difficult to follow provided the syllabus contains the requisite rightly balanced and well designed exposure to the above mentioned technologies.

5. Knowledge About Geomatics – Resources

The fresh graduate should also be able to access the desired information regarding 'Geomatics – resources', namely the Institutions, Consultants and other sources connected with the delivery of Geomatics – services / products (example – satellite imagery) in India and to some extent from abroad. This knowledge is necessary because his Geomatics related project will need these inputs at the early stages of the main project.

6. Idea About The Accuracy And Cost of Geomatics Operations

No geometric project will succeed unless a clear idea of the 'accuracy' is established. The accuracy will be crucial to the cost. He should, therefore, have an adequate idea of accuracy and its associated cost pertaining to any major activity falling within the realm of Geomatics (refer to Box 1).

Sufficient reference material, real project details about the cost and accuracy should be provided to the student so that he can make a good beginning.

7. Capability Towards Undertaking Feasibility Report of a Project

A fresh graduate should fully understand the implications of Geomatics for the preparation of Feasibility Report which is required for almost all civil engineering projects. He should also, partially, help his employing organization towards preparation of the Detailed Project Report, if needed. It should be clearly understood that work on Geomatics is like an 'infrastructure' to all the other infrastructure projects.

8. Books and References

It is highly desirable that CE graduate should be generally aware of the Geomatics related books, journals, magazines and web-sites etc. This will help him in knowing the state-of-art of the technology, its status in India (and also abroad !) and broaden his technical comprehension. It will be a good practical idea that this information could be compiled by the faculty as a reference material for the student.

9. Designing The Course

The above mentioned guide lines help to formulate the major features of the course and how to go about deciding the contents. It is suggested that basic features of the Course should be completed in three phases. These are:

- ◆ Exposure
- ◆ Analysis
- ◆ Consolidation of concepts developed in first two phases.
- ◆ The concepts of these phases are briefly described further.

9.1 Phase – One
Exposure of Geomatics Concepts

In this phase, the student will learn, in-depth, about the professional practices in different land information technologies mentioned in Box-1. These practices will be those which are generally adopted in tackling projects in (Geomatics) surveying and mapping in India and abroad.

Student should be exposed to the essential theoretical underpinning of Geomatics.

The contents of this phase should follow the traditional teaching methodology through:

- ◆ Lectures-requisite edited theoretical base is taught at this stage
- ◆ Demonstrations e.g. GPS, Photogrammetry etc
- ◆ Special lectures by theme professionals-by invited faculty / or organization.
- ◆ Seminars and workshops based on specific topic organized by in-house or invited faculty.

9.2 Literature Search And Practicals

- ◆ Literature search by the student on specific topic. This will pertain to the professional topics and tutorials. A good source for gathering this information is Internet. Almost all sites connected with Geomatics have tutorials. A convenient site, which can be recommended, is gisdevelopment.net of India.
- ◆ Practical Exercises involving handling of equipment e.g. GPS, Photogrammetry and Total Station are highly desirable. Alternatively, the students could be taken to the organizations where such equipment is in use. Further, special videos / film available on these subjects can be shown to the students.

Box-2: Availability of Survey Equipment

It is rather unrealistic to assume that most of the universities / colleges will have all the equipment specially GPS, Photogrammetry etc. In such a situation it will be economical and convenient to enter into agreement with practising Govt and Private parties to run the practicals and lecture module at the premises of the university / college.

Such facilities are already available and are poised to be commissioned for such training courses.

10. Phase – Two Analysis and Decision Making

The student having been exposed to the basics of theory should be given well prepared case studies based on the practical problems. He should be able to generate various options after properly studying and understanding of the problem. It may be mentioned here that such case studies are not readily available and have to be prepared with zeal by some invited professionals / faculty.

After generating the options – may be in discussion with experts – the student should arrive at

‘Some optimal OR even satisfying solutions’.

Needless to say that these case studies have to be presented before the class which will discuss the options and the constraints. This is a standard method of teaching problem-solving.

Two to three case studies depicting different technologies should be enough for meeting educational objectives,

It is assumed that Phase II will be carried out with almost 70 to 80% collaboration of instructional staff (in-house or outside)

11. Phase – Three

Consolidation of Geomatics Concepts

It has become difficult to take the students for a field oriented project to gather real time data. Therefore, this data should either be given or simulated for carrying out the exercise which should (hopefully) consolidate the Geomatics concepts picked up during phase-one and phase-two.

In case time resources are available, a real field project could be undertaken as consultancy for some agency which is already busy with some project of its own in the Geomatics area

Alternatively, student could have in-depth tour of a working organization in Geomatics field. These organizations could be from Govt or Private Sectors. In all the above cases student (may be group of 3-4) should make a small Report (without the assistance of teaching staff) on some aspect of the technology.

Universities / colleges can think of other ideas through which the Geomatics concepts can be consolidated, in the mind of a student.

12 Recommendations and Conclusion

Efforts have been made to create a new type of syllabus for the ‘Geomatics’ as a part of full Civil Engineering Degree Course. The proposed syllabus lays emphasis on comprehension, understanding the constraints of the new technology and solving real problems in Geomatics. It is hoped that by following the proposed syllabus, the fresh civil engineer will be able to take advantage of the whole gamut of the Land Information Technologies in theory and practice. If he cannot find the solution immediately, he will definitely know the way to find it with the help of his exposure to the various sources of

Geomatics solutions. A fresh Civil Engineer is required to work through men, machines, materials and methodology connected with Geomatics.