Geotechnical Education and Professional Practices

Dubey, Satyendra Sharma, Bhruti
Senior Lecturer Lecturer
satujain@gmail.com sbhruti@gmail.com
Ujjain Polytechnic College, Ujjain

ABSTRACT

Soil Mechanics is just not a science; it is more about engineering and judgment. Science could be taught and thought about in classrooms but engineering has to be taught in laboratories and fields. This unique nature of geotechnical engineering practice leads to the incorporation of professional issues in the curriculum. It is a very common practice in teaching geotechnical engineering to lay very high emphasis on certain topics and that it is often noticed that students are left out with a handful of formulae in the end. Hence, authors after thoroughly examining the curriculum and syllabus of universities of central India pointed out their deficiencies and shortcomings and suggested how these can be eliminated to make students familiar with professional practices. The authors also propose a new optional course at the undergraduate level titled ‘Geotechnical Works’ where students are challenged to think and solve real world problems by faculty members with professional experience.

1. INTRODUCTION

It has been found that in most of universities and college of Central India running graduation courses in Civil Engineering has following topics in subject soil mechanics in common (1) Phase relationship (2) Index properties and their use (3) Seepage and Permeability (4) consolidation and compaction (5) Shear strength (6) Slope stability (7) Earth Pressure (8) Foundation (9) Soil stabilization and (10) Site investigation. Authors after thoroughly examining the curriculum and syllabus of Central India Universities, pointed out deficiencies and shortcomings and suggested (proposed) a new course at the undergraduate level titled ‘Geotechnical Works. Course integration in Civil Engineering Degree, its purpose and format and the procedure used to teach it are discussed.

Critical Analysis and Shortcomings in Graduate Level Geotechnical Course

(i) Traditionally, soil mechanics has focused on the behavior of two distinct types of geomaterials: Clean sand and pure clays. Under the application of internal loads, these two types of geomaterial represent and are conveniently associated with two extreme types of soil responses, drained and un-drained behavior. The drained behavior of clean sands and un-drained behavior of pure clays have been covered extensively in existing course. There is an absence of content to provide some insight into the mechanical response of additional material like sittysand, clay sand, silty clay, sandy clay, sandy silts and cemented soils.

(ii) Consulting Civil Engineer are involved primarily with the design of foundation for warehouses, schools, medium rise buildings and residential houses with such projects, the complete answers to soil engineering problem cannot be resolved solely with textbook information.

(iii) At present, state of the art teaching it has an urgent need to introduce originality because teaching geotechnical courses has become
presentation of testing procedure and solving idealized problems and students are left out with a handful of formulae in the end.

(iv) Geotechnical engineer should be proficient not only in subsurface investigation methods and laboratory testing technique but should have thorough knowledge of construction methods, monitoring / inspection procedures and specification and contracting practices.

(v) Although each topic in basic geotechnical engineering carry equal weightage but the current trend in graduate level teaching is to highlight certain topics. One such example could be of bearing capacity determination which is usually considered as the only exercise relevant to a soil engineer where as other properties such as consolidation, swelling, chemical reaction etc. are also of engineering importance but are often ignored.

In order to address these pedagogical shortcomings, authors proposed an subject titled ‘Geotechnical Works’ which can be added to list of elective (optional) subject chosen by students at last semester (VIII Sem) of their graduate course. There have been a number of calls and reforms reports from different commission [e.g. Boyer Commission (1998)] regarding articulating need for new approach to undergraduate education. A key element in many of these proposed reforms is to move from educational models centered primarily on the transmission of knowledge to those that incorporate experiential and hands-on learning.

2. SUBJECT OUTLINE

Purpose of the course –

(i) Reinforce the concept learned in basic geology and geotechnical engineering by providing hands on experience with real projects.

(ii) Strengthen the students understanding of the geotechnical site characterization process (i.e. reading boring schemes including field test results, defining the geotechnical scenario in which the work is to be constructed and attributing design parameters to the soil investigated and interfering with the work to be designed.

(iii) Alert and train students to the organization of project, namely the presentation of the written parts and the design plans.

(iv) Training students to think about construction methods, construction phases and implementation of solution.

(v) Provide experience working with other in a team environment and presenting the results of technical work in the form of a comprehensive written report and oral presentation.

Course Integration

Course format

This course ‘Geotechnical works’ is proposed to be introduced at VIII Sem. level i.e. it will last for one learning semester (usually for 13 weeks) and is organized in theoretical and practical lessons.

Theory Session

- Review of principles of soil mechanics and design of foundation, discussions on field and laboratory tests commonly used in practice, methods available for field investigation, selection of an appropriate method for a particular project, development of subsurface profiles based on the field data.
Main characteristics of geotechnical projects.

Sites construction organization. Equipments and tools and construction methods used in geotechnical works.

Professional liability, risk management and loss prevention issues on geotechnical engineering projects, types of contracts, understanding contacts and avoiding excessive and / or inappropriate professional liability.

Practical Session
During these practical sessions, teachers can be seen as senior designer engineer who is guiding junior engineer in achieving their first design.

List of Geotechnical problems-

- Designing a group of piles that can support vertical and horizontal loads (example can be taken from successful field projects or under process projects.
- Designing an anchored concrete retaining wall using user-friendly geotechnical software.
- Case studies for failure structure and treatment of such failure projects and successful projects of the region.

This list can be expanded relevantly. Each group is asked to choose one problem. Development of the solution, their design and the plans are accomplished during the practical sessions. The total credit of the subject is to be divided by 40% to theory paper and 60% to report writing and oral presentation.

In practical defense, at least two faculty members and one from consulting field will ask questions about the project presented, the justification of the decisions that will be made to achieve the solutions and construction methods necessary to execute them.

Strength & Weaknesses
This paper presents ‘Geotechnical works’ as an optional (elective) subject in last semester of Civil Engg. Graduation Course. Author’s feel that without any formal assessment, we have met the original objective of strengthening students understanding of basic geotechnical concepts with design processes and site characterization. This format will also help students develop their ability to draw conclusions and to develop design inspite of having incomplete and sometimes contradictory data. This skill is essential in the practice of geotechnical engineering, as well as most other branches of Civil Engg. The project oriented format provides all important introduction to his essential still. It will also provide much better experience in preparing written and oral reports and is a closer simulation of kinds of reports generated in professional practice regarding weakness. This course format has no provision for industry involvement and primary responsibilities of advising mentoring is entrusted to faculty members with sufficient profession experience.

3. CONCLUSION
Authors feel that with the introduction of this course format, resulting educational benefits will be very consistent with the technical mission and educational philosophy. It will also inspire students and motivate in the same that they will feel that teacher is actually competent in the practice of his profession. Due to a unique nature of geotechnical engineering practice, the need of such a course in conventional geotechnical engineering curriculum cannot be overemphasized.

REFERENCES


