

# **CIVIL ENGINEERING CURRICULUM AT THE UNIVERSITY OF FLORIDA AND THE MAHANAKORN UNIVERISTY OF TECHNOLOGY, THAILAND**

**Kitti Manokhoon<sup>1</sup>, Dr. Fazil T. Najafi<sup>2</sup>**

**Graduate student, Civil & Coastal Engineering, University of Florida<sup>1</sup>/  
Professor, Civil & Coastal Engineering, University of Florida<sup>2</sup>**

## Abstract

An overview of regular courses of study in undergraduate Civil Engineering at the University of Florida (UF) and the Mahanakorn University of Technology (MUT), Thailand, is compared. The curriculum systems are alike in terms of courses provided and credit hours requirements. These similarities are to provide necessary preparatory courses such as mathematics, chemistry, and physics, which serve as a foundation for the engineering degree. A number of basic engineering courses are taken to complete the core curriculum required of all engineering students. In upper division, students concentrate on their major field of study- civil engineering, which is composed of Structural, Construction Management, Transportation, Geo-technical, Water Resource, and General Civil Engineering. UF-Civil Engineering education mainly concentrates on technical excellence, communication skills, and a well-rounded general and multidisciplinary education. Whereas, the MUT focuses on balanced distribution of fundamental knowledge and practice to reach the society needs. The procedure to obtain license for working as a professional engineer is a major factor that indicates the difference between the two departments. Even though, the curriculum structure may appear dissimilar in minor but the main objectives are indisputably based on the same direction to incorporate many of different civil engineering aspects; in private practice, in academia, in public practice and in combination with other disciplines. Moreover, the action in the ideas of global perspective has been developing in both universities for the future of Civil Engineering.

## Introduction

The University of Florida (UF) is a major public university. The state's oldest university was established in 1853. Subsequently, the civil and coastal engineering department strives to build upon a leading program of exceptional teaching, innovative research and dedicated service by maintaining a strong curriculum, a highly qualified and committed faculty, outstanding facilities and essential funding. The department of civil engineering, which was established in 1905, has been a recognized leader in innovative educational programs and is widely considered to be among the top programs in the United States. The Department merged with the Department of Coastal Engineering in 1999 and currently has 44 faculty members in 10 technology areas. There

*“Proceedings of the 2003 American Society for Engineering Education Annual Conference & Exposition Copyright © 2003, American Society for Engineering Education”*

are 469 undergraduate students and 206 graduate students in the department. The 2001-02 research expenditures are \$13.5 Million<sup>1</sup>.

The Mahanakorn University of Technology (MUT) was found in 1990 as a new generation of private university in Thailand. The MUT is the first university in Thailand that constructs and owns a micro satellite (TMSat) in mid 1997 and the campus ground station permits physics laboratory exercises to be directly linked to current space technology. Mahanakorn successfully mixes computer-assisted activities with traditional "hands on" experiences in very large physics classes of up to 200 engineering students at a time. The laboratory exercises and reports, and their associated assessment system, have all been specially designed to encourage thinking, questioning and creativity<sup>2</sup>. The Department of Civil Engineering was among the first departments at the university. Currently, the department of Civil Engineering has more than 30 faculty members in 6-technology areas<sup>3</sup>.

In this paper, the civil engineering curriculum of both universities are described and compared between course administrations in terms of credit hours, program durations, number of exams, grade distribution for various activities and criteria on the procedure to obtain the professional engineering licenses.

## Course Administrations

### University of Florida

The undergraduate students of civil engineering department at the UF are educated in a wide-ranging of engineering services in structural, geotechnical, transportation, hydraulics, civil engineering materials, surveying sciences, construction engineering and general civil engineering, leading to a bachelor's degree in civil engineering. The department also offers a separate degree program in surveying and mapping, one of the few such programs in the country. Each of the specialty areas also can be developed in greater depth at the graduate level. The mission of the Department of Civil Engineering is to build upon a leading program of exceptional teaching, innovative research, and dedicated service by maintaining a strong curriculum; a highly qualified and committed faculty, outstanding facilities and essential funding required meeting program needs<sup>4</sup>.

The primary objective of the Department is to provide the student in the Basic Program with a curriculum designed to accomplish three primary purposes<sup>4</sup>.

- To provide a broad general education that enhances communication skills and encourages all-around development of students, both individually and as productive members of society,
- To ensure a thorough preparation in the fundamentals of science and engineering, and
- To provide a foundation to the planning, design, construction, and operation of civil engineering projects.

The program and curriculum to accomplish these objectives permit a graduate to enter practice and commence life-long learning through professional activities or graduate studies. The secondary objective is to enhance contributions to the State, Nation, and profession through strong programs in teaching, research and service<sup>4</sup>.

The necessary preparatory courses such as mathematics, chemistry, and physics, serve as a foundation for the civil engineering degree. The regular duration of the undergraduate level is about 4 years with total 131 credit hours. The grade distribution of the courses is classified to various activities such as midterm exam, final exam, test, homework, term project, presentation, and class participation<sup>4</sup>.

The current curriculum consists of 131 credits made up of 51 credits of math, science and general education course; 11 credits of engineering fundamentals (statics, dynamics, thermo, and strength); 63 credits of required Civil Engineering courses; and 6 credits of electives<sup>5</sup>.

The primary change in the new curriculum is a reduction in the number of required Civil Engineering credits from 63 to 54. This allows an increase in elective credits, from 6 to 15, while maintaining the overall degree requirements at 131 credits<sup>5</sup>.

In making this reduction, the curriculum committee believes it has maintained the body of core material necessary for all Civil Engineering graduates. The final program was based on the experiences of the committee members and on a study of material covered in the Civil Engineering Fundamentals examination, which was presumed to be the material deemed essential by the profession<sup>5</sup>.

The curriculum committee felt that specific “track” or “emphasis” areas should be developed giving students with an interest in a particular area of Civil Engineering an opportunity to study that specialty in greater depth, while avoiding the situation of students picking random, unrelated courses. For those students with no particular area of interest, a broad track, essentially equivalent to the current curriculum, would be available<sup>5</sup>.

The department of Civil and Coastal Engineering provides the students with a choice of curriculums on 6 areas of concentrations (areas of emphasis): Construction, Geotechnical, Structures, Transportation, Hydrology and Water Resources, and General C.E. emphasis<sup>5</sup>.

The UF-students have to pass the Engineering In Training (EIT) exam and hold the EIT license. The minimum of four years experience in USA is required for taking the Professional Engineering license (PE) exam. Besides, master degree gain from an accredited engineering school in the US can be considered as a year of experience and doctoral degree can be counted as two years of work experience. Normally engineering students at the UF take their EIT exam before they graduate. The PE in one state is not valid in another state. Apart from PE, two states (Illinois and California) also grant Structural Engineer license (SE), which the holders of PE license with enough experience in Structural Engineering must take another exam to get the SE license<sup>6</sup>.

## Mahanakorn University of Technology

The main reasons to established the department of civil engineering at the MUT were to develop the social needs of capable and knowledgeable professionals in science and technology (and especially civil engineering) that the public universities cannot provide and to be essential in modern society due to the students' understanding of basic science, their keeping up with modern technology and their skills in experimenting and solving real life problems<sup>3</sup>.

The MUT- undergraduate curriculums of civil engineering are followed the Thailand's Council of Engineers (COE) accredits criteria, which provides courses for the undergraduate in structural, construction, transportation and survey, soil mechanics, hydraulics and environmental engineering<sup>7</sup>.

There are two different programs in the undergraduate. One is a regular program, four years of study with 150 credit hours and the other one is a three-year program for technical students, who had studied in technical colleges for two years before getting in the university. The students in the second program have to earn 108 credit hours before getting a bachelor's degree in civil engineering. In the universities, lecture and laboratory classes are provided. Class duration is fifty minutes as one-hour credit period. Regularly, the students can take about 5-7 courses a term and 2 terms of the studying year in order to keep the regular duration of the program. The grade distribution of the courses is mainly classified to the midterm and final exams with the rigid time schedule<sup>3</sup>.

For the four-year program, the students have to take Humanities (12 credit hours), Languages (6), Mathematics (18), Sciences (12), General Engineering Courses (28), Required CE courses (62) and Elective Courses (9) to be 150 credit hours. Whereas, the three-year program contains Mathematics (18), General Engineering Courses (28), Required CE courses (62) and Elective Courses (9) to be totally 108 credit hours<sup>3</sup>.

The MUT students can graduate only with attending at least 30 professional training days. The training for every civil engineering student in industrial or governmental outfits before the last year of undergraduate studies is a part of an integrated educational system. Leading industries and companies are contacted to provide first hand professional experience to students before they graduate. MUT has a tradition of sharing and imparting explosive growth of knowledge and providing unique learning opportunities to its faculty and students. Seminars, workshops and short courses are regularly arranged at these civil engineering college campuses. Students are encouraged to take part in such extra activities<sup>3</sup>.

The Council of Engineering that accredits academic programs also regulates professional registration of engineers at four levels; Associate Engineer, Fellow Engineer, Charter Engineer, and Corporate Engineer. Registration as an Associate Engineer requires a degree in engineering with a minimum of a C grade in each of ten specified subjects as shown in Table 1 plus passing an intensive two day course in each of the following areas: Ethics, Environment, Safety, Law and Skills<sup>7</sup>.

The MUT- students who can not get the minimum of a C grade in each of the ten specified subjects, they can still graduate if the Grade Point Average is equal or more than 2.00 (from the range of 0.00 - 4.00) with no right to get the professional registration of engineers. Most of students try to concentrate on and pass the minimum requirement of the ten specified subjects during their studying. The MUT was the pioneer “private” engineering school, which could obtain this accredited curriculum of civil engineering program from the Council of Engineering<sup>3</sup>.

Table 1 The ten specified subjects required by the Council of Engineering

Group	Courses
1.	Theory of Structural and Structural Analysis
2.	Reinforced Concrete Design and Timber and Steel Design
3.	Soil Mechanics and Foundation Engineering or Applied Soil Mechanics
4.	Hydraulic Engineering and Highway Engineering and/or Transportation Engineering and/or Structural Dynamics and Earthquake Engineering and/or Construction Surveying Engineering and/or Water Supply and Sanitary Engineering
5.	Material Testing and/or Construction Technique and Construction Management
6.	Surveying and/or Photogrammetry
7.	Strength of Materials I and Strength of Materials II
8.	Hydraulics and/or Fluid Mechanics
9.	Other Approved Electives

Registration as a Fellow Engineer requires a minimum of three years as an Associate Engineer, the submission of a portfolio showing major responsibility on at least two projects, passing an exam and an interview. The Charter designation requires at least five years as a Fellow Engineer, responsibility for at least two major projects, and a satisfactory interview<sup>7</sup>.

## Conclusion

There are several observations to be made regarding the comparison. One obvious difference is the number of credits required. There are significantly fewer humanities and social science courses at the MUT curriculum. This is somewhat offset by higher numbers in English and communications courses. The math classes at both the UF and MUT curriculums extend through Advanced Engineering Math. A number of basic engineering courses are taken to complete the core curriculum required of all engineering students, which are virtually alike at the universities. Even though, the program duration in both universities is almost the same (4 years), it is interesting that the minimum 240 training hours under the supervision of a qualified senior engineer in practice at the MUT curriculum can be compared with the minimum 4 years of experience after passing the EIT exam to regulate the professional license at the UF. It shows the dissimilarity of experience required for working as a professional civil engineer in both countries. As part of the newly revised undergraduate civil engineering curriculum at the UF, the Civil Engineering education is mainly adjusted to be more flexible and focused on technical excellence, communication skills, and a well-rounded general, multidisciplinary education, while, the MUT focuses on balanced distribution of fundamental knowledge and practice to reach the high society needs of civil engineering. Besides, the action in the ideas of global perspective has been developing for the future of Civil Engineering.

## Reference

1. Jacques, Jeannette and Zelinsky, Sally, 2002, a report on "Engineering Day 2002," University of Florida, College of Engineering
2. [http://www.kfy.vslib.cz/pwg/recent/ptee97/abs\\_a.htm](http://www.kfy.vslib.cz/pwg/recent/ptee97/abs_a.htm), MUT-Teaching Strategy and Learning Process, access on January 2003
3. <http://www.civil.mut.ac.th>, MUT-Department of Civil Engineering, access on January, 2003
4. <http://www.ce.ufl.edu>, UF-Department of Civil and Coastal Engineering, access on January, 2003
5. Civil & Coastal Engineering News, The new and Improved Civil Engineering BSCE curriculum, Fall 2002
6. [http://www.thaiengineering.com/foreign\\_engineer/EIT\\_PE.html](http://www.thaiengineering.com/foreign_engineer/EIT_PE.html), UF-EIT and PE requirement, access on January 2003
7. <http://www.coe.or.th>, Council of Engineers, access on January, 2003

## Biographical Information

KITTI MANOKHOON is a doctoral student at the University of Florida majoring in Civil Engineering with an emphasis in Public Works. Mr. Manokhoon worked at the Mahanakorn University of Technology as a lecturer before he got the Royal Thai Government scholarship for pursuing his PhD at the University of Florida. His research focuses on geometric information system, highway pavement design and construction.

Dr. FAZIL T. NAJAFI is a professor at the CCE department at UF. He earned his BS, MS, and PhD degrees in Civil Engineering from Virginia Polytechnic Institute and State University. His research focuses on diverse areas, e.g. user cost data for Florida's bridge management, oil spill, cost optimization, including Maglev systems, rail, tort liability related to utility, public works planning and management, construction engineering and legal aspects.