

A Comparison of Civil Engineering Education at the University of Hail, Saudi Arabia and the University of Florida

Abdulmajjid S. Alrashidy and Fazil T. Najafi

*University of Florida, Engineering School of Sustainable Infrastructure & Environment,
Department of Civil and Coastal Engineering*

Abstract

Civil engineering is one of the most important disciplines, which contribute to a sustainable planning, design, operation, and maintenance of world's infrastructure. Recently, civil engineering education has improved significantly to keep up with the-state-of-art due to rapid technological advancement and market demand. The curriculum of civil engineering education is different from university to university depending on countries' needs and market demand. The primary objective of this paper is to compare civil engineering curriculum at the University of Florida and the University of Hail, Saudi Arabia. The curriculum includes a type of courses, credit hours, grading systems and graduation requirements. The purpose of the comparison is to learn from each other's curriculum and perhaps modify their curriculum for future improvements, which is significant to the field. At both institutions, student's admission to the university depends on a student's specific test scores. Selection process is different at both institutions. Although there are some differences in Civil Engineering education, there are some similarities as well. Both institutions strive to enhance civil engineering education and to cultivate the knowledge and the skills required for their graduating students.

Keywords

Civil Engineering Education, type of courses, test scores, selection process, cultivate knowledge, skills

INTRODUCTION

The paper compares civil engineering education at the University of Hail (UOH), Saudi Arabia and civil and coastal engineering departments at the University of Florida (UF).

Alrashidy, one of the author of this paper graduated from the civil engineering department of UOH. He is now a graduate student in the Department of Civil & Coastal Engineering at UF. Alrashidy wanted to improve UOH's civil engineering curriculum and wanted to compare to UF's program to determine if there are some courses that can be incorporated to improve his former civil engineering curriculum.

The University of Hail accepts students from many countries and from different regions of Saudi Arabia, and it admits about 8000 students every year; most of them are from the Hail region. The Hail region is about 40,000 square miles located in the north of Saudi Arabia. UOH was established a decade ago, and it exceeded many of the Saudi Universities, which were founded two decades earlier. Furthermore, Ranking Web of Universities ranked UOH 16 out of 55 public

and private universities in Saudi Arabia [1]. UOH consists of 15 colleges, and the civil engineering department consists of three tracks: a) structures, materials and constructions, b) transportation and geotechnical engineering, c) water resources and environmental engineering [2,3].

The University of Florida is located in Gainesville, Florida and was founded in 1853, one of the oldest universities in the state. The department of civil and coastal engineering at UF was established in 1910 and later merged with the department of coastal engineering in 1999, and the civil engineering undergraduate program at UF is considered as one of the top programs in the United States of America. The civil engineering department is under the umbrella of the Engineering School of Sustainable Infrastructure and Environment (ESSIE), which also includes the department of environmental engineering sciences [4]. ESSIE offers B.S., M.S., M.E., and Ph.D. with no undergraduate program in the department of Coastal and Oceanographic Engineering. ESSIE hosts the eighth largest undergraduate program in the nation and the third largest graduate program. In addition, it is driving science searches in physical infrastructure protection, hurricane and tornado engineering, coastal engineering, urban water, transportation, and coastal ecology.

There are some similarities such as required courses and differences such as student admission, and type of courses between both departments at UOH and UF.

Undergraduate Admission at UOH

Following are the minimum requirements needed for admission at UOH [5]:

- Student must have secondary school certificate, or equivalent from inside or outside of Saudi Arabia.
- Student should have obtained the secondary school certificate less than 5 years prior to the date of application.
- Student must have a record of good conduct.
- Student must successfully pass required test such as General Aptitude Test (GAT).
- Student must obtain an approval of the employer, if student is an employee of any government or private organization.
- Student who applies to the University of Hail's science colleges, such as college of engineering, must take an achievement test (science courses: mathematics, chemistry, physics, biology, and English). The maximum score for all of these tests is 100, and there is no minimum score for admission to the Colleges of Engineering. However, there is an equivalent ratio depending on those tests indicated earlier and secondary school GPA. Student with ratio of 65% and more could apply for admission to the college of engineering.

Undergraduate Admission at UF

Following are the minimum requirements needed for admission at UF [6]:

2017 ASEE Zone II Conference

- Graduation from a regionally accredited secondary school or equivalent
- 18 academic units, 16 distributed as follows: 4 years of English and Math, (3 years) Social Science, (3 years) Natural Sciences two with Lab, (2 years) Foreign Language sequential,
- An accumulative C average in the academic core, as calculated by the university, at all institutions attended high school and college.
- Student taking dual enrollment courses must obtain a minimum 2.0 Grade Point Average (GPA) at every institution attended.
- A record of good conduct
- At least the minimum amount in each section of Scholastic Aptitude Test (SAT): Critical Verbal= 500, Mathematics=500, or American College Testing (ACT): with a minimum score of 19 on the Reading section, Mathematics=19 [7].

The significant differences in admission between UOH and UF are:

- UOH requires aptitude and achievement tests, and students can take them twice a year. However, US students can take the SAT several times in a year.
- Admission at the UOH uses a combined ratio of high school GPA, aptitude, and achievement scores. However, UF reviews the GPA, SAT, and ACT scores, and it determines a minimum score for each requirement.

Civil Engineering Curriculum Offered at UOH and UF

Duration of the semester at both institutions are four months, but the course load at these institutions are different. As shown in table 1, the total number of credit hours for general education and engineering fundamentals are 71 credits and the total credit hours for lower division and engineering fundamentals at UF is 60 credits. Furthermore, the number of credit hours per semester is higher at UOH as compared to UF (see Table 1). In addition, UF has 5 semesters versus UOH of 4 semesters for engineering fundamental courses. Students at both civil engineering departments must take certain courses such as religion, social science and humanities as required by the university.

TABLE 1. Civil Engineering Curriculum at UOH and UF

General Education and Engineering Fundamental Courses at UOH (71 credits)	Lower division and Engineering Fundamentals at UF (60 credits)
Semester 1 (18 credits)	Semester 1 (14 credits)
Calculus I (4 credits) General Physics I (3) Physics I Lab (1) General Chemistry I (3) Chemistry Lab (1) Introduction to Academic Discourse (English) (3) Belief and its Consequences (2) Physical Education I (1)	Calculus I (4 credits) General Chemistry I (3) Chemistry Lab (1) What is the Good Life (3) Argumentative Writing (3)
Semester 2 (19 credits)	Semester 2 (12 credits)
Calculus II (4) General Physics II (3) Physics II Lab (1) Basic for Environment Chemistry (2) English Composition II (3) Computer Programming in C (2) Computer Programming in C Lab (1) Practical Grammar (2) Physical Education II (1)	Calculus II (4) Physics with Calculus I (3) Physics I Lab (1) Prof. Communication for Engineers (3) Introduction to Civil Engineering (1)
Semester 3 (17 credits)	Semester 3 (14 credits)
Calculus III (3) Statics (3) Computer Graphics (2) Computer Graphics Lab (1) Surveying (1) Surveying Lab (1) Academic & Prof. Communication (English) (3) Science Elective (2) Science Elective Lab (1)	Calculus III (4) Physics with Calc II (3) Physics II Lab (1) Humanities (3) Social Science (3)
Semester 4 (17 credits)	Semester 4 (15 credits)
Structural Mechanics I (3) Engineering Fluid Mechanics (3) Elements to Different Equations (Math) (3) Dynamics (3) Professional Ethics (2) Fundamental of Electrical Circuits (2) Fundamental of Electrical Circuits Lab (1)	Elementary Differential Equations (3) Statics (3) Introduction to Sustainable Engineering (3) Engineering Statistics (3) Science Elective (3)
	Semester 5 (5 credits)
	Dynamics (2) Mechanics of Materials (3)

Table 2 shows the required civil engineering courses at UOH and UF. The total number of credit hours for the required civil engineering courses at UOH are 62 credits and the total credit hours for the required civil engineering courses at UF is 53 credits. At UF, there are several divisions within the civil engineering department such as general, construction, geotechnical, hydraulics and water resource, structures, and transportation (see Table 2). Also, it can be seen from Table 2 that, at UOH, they have not separated courses under various divisions. Moreover, there are five courses that are required at UF and are not required at UOH including Experimentation, Soil Mechanics, Hydrodynamics, Geographic Information System (GIS), and GIS in Soil and Water Resource (see Table 2).

TABLE 2. Required Civil Engineering Courses at UOH and UF.

Required Civil Engineering Courses at UOH (62 credits)	Required Civil Engineering Courses at UF (53 credits)
Structural Materials (3 credits) Structural Materials Lab (1) Structural Analysis I (3) Numerical & Stat. Methods in CE (2) Numerical & Stat. Methods in CE Lab (1) Writing for Professional Needs (2) Environmental Eng. Principles (3) Engineering Economics (3) Introduction to CE Design (1) CE Elective I (3) Transportation Engineering (3) Transportation Engineering Lab (1) Geotechnical Engineering I (3) Geotechnical Engineering I Lab (1) Oral Communication Skills (2) General Study Elective (3) Co-op Field Work (9) Applied Design Project (3) Construction Methods & Management (3) CE Elective II (3) CE Option Elective (3) Human Rights in Islam (2) CE Seminar (1) Principles of Management (3)	General
	Computer Methods in CE (4 credits) Experimentation (3) Technical Drawing and Visualization (3) CE Materials (4) Professional Ethics (1)
	Construction
	Choose one of CE Cost Analysis (3) Civil Engineering Practice (4) or Engineering Economy
	Geotechnical
	Soil Mechanics (4) Geotechnical Engineering (3)
	Hydraulics and Water Resource
	Hydrodynamics (4) Hydraulics (3) Water and Wastewater Treatment (3)
	Structures
	Structural Analysis (4) Reinforced Concrete (3)
	Transportation
	Choose one of Geometrics (3) Survey of Planning Info. (3) Geographic Information Systems (GIS) (3) GIS in Soil & Water Science (3) or Transportation Engineering (4)

Elective Courses:

Table 3 presents the list of elective courses offered by civil engineering departments at UOH [8] and UF [9]. Most of UOH and all of UF elective courses are 3 credit hours each. As shown in Table 3, UOH civil engineering department requires 15 credits of elective courses from three different categories including civil engineering, science, and general studies. In addition, at UF, students have one elective course to choose from out-of-department including Environmental Engineering, Geology, Urban and Regional Planning, Building Construction, Architecture, Soil and Water Science, Mechanical Engineering, or Geography [9]. At UF, students have more elective choices within and outside the department as compared to elective courses at UOH.

TABLE 3. Elective Courses at UOH and UF.

Elective Courses at UOH (15 credits)	Advanced Elective Courses at UF (15 credits)
Civil Engineering Electives	Construction Estimating
Reinforced Concrete I	Construction Methods and Management
Structural Analysis II	Construction Engineering Design
Steel Design	Retaining Wall/ Embankment Design
Foundation and Earth Structures Design	Foundation Engineering Design
Geotechnical Eng. II	Analysis of Structural Systems
Reinforced Concrete II	Analysis and Design in Steel
Pavement Design	Advanced Reinforced Concrete Design
Traffic Eng. & Roadway Safety	Advanced Steel Design
Highways & Airport Materials	Pavement Design
Eng. Hydrology and Hydraulic	Public Works Engineering
Hydraulics Systems Design	Environmental Hydrology
Design and Operation of Water and	Urban Storm-water Design
Wastewater Treatment Plants	
Hazardous & Solid Wastes	Water Resources Engineering
Science Electives	Urban Transportation Planning
Physical Geology	Traffic Engineering
Applied Geosciences for Scientists and	Transportation Systems Analysis
Engineers	
General Studies Electives	Route Geometrics and Design
Principles of Human Behavior	Subdivision Design
International Relations	
Planning and Social Development	
Man and Environment	

Comparison of total credits required to graduate at UOH and UF:

Table 4 shows the total credits for graduation from UOH and UF. It can be seen from Table 4, total credit required to graduate at UOH is 133 versus UF at 131. Required courses at UOH

totals 62 credits versus 53 credits at UF. Elective courses and practical courses are the same in both departments.

TABLE 4 Credit Requirements

Name	University of Hail	University of Florida
Total credits	133	131
Elective courses	15	15
Required courses	62	53
Practical courses	9 Credits Summer + 1 st senior	9 hours summer attendance

Grading Policy at UOH and UF

Table 5 presents grading policy at UOH and UF [10] [11].

TABLE 5 UOH and UF Grading Policy

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Grade points	4.00	3.67	3.33	3.00	2.67	2.33	2.00	1.67	1.33	1.00	0.67	0.00
Percent	90.0-100	87.0-89.9	84.0-86.9	81.0-83.9	78.0-80.9	75.0-79.9	72.0-74.9	69.0-71.9	66.0-68.9	63.0-65.9	60.0-62.9	0-59.9

Graduation requirements at UOH

The graduation requirements are [11]:

- Students must complete 133 credits before graduation.
- Students must obtain a minimum cumulative GPA and major GPA of 2.00 out of 4.
- Transfer students must complete 36 credits hours of course work (minimum of 18 credits in their field) at UOH before graduation.

Graduation requirements at UF

The graduation requirements are [12]:

2017 ASEE Zone II Conference

- The Herbert Wertheim College of Engineering confers a BS degree upon all students who have successfully completed a program of study and have fulfilled all requirements for a specific major in the college.
- Students must obtain a minimum cumulative GPA and major GPA of 2.00
- Students must obtain a GPA of 2.5 in critical-tracking courses
- Before graduating, all BSCE students must take the Fundamentals of Engineering exam.

Comparison of graduation requirement between two universities

- The total graduation credits at UF, department of civil and coastal engineering are 131 credit hours, and Students must take FE to graduate.
- The total graduation credits at UOH, department of civil engineering are 133 credit hours, and FE is not required to graduate.
- Both universities require a minimum cumulative GPA of 2.0.

CONCLUSION

This paper compared the differences in admissions, grading systems, credit hours, type of courses, and graduation requirements between UOH and UF. Although there are some differences in Civil Engineering instructions, there are some similarities as well. Both institutions strive to improve civil engineering education and to develop the knowledge and the skills required for the future endeavors of their graduating students. The curriculum differences and similarities should provide both universities the ability to learn from one another. For example, at the Civil Engineering Department at UF, students are required to take the Fundamentals of Engineering (FE) exam. However, FE is not required at UOH. Thus, UOH can reduce the total number of credit hours and focus more on exams such as FE similar to UF. Also, the Civil Engineering Department at UF offers courses which are divided into several divisions including general, construction, geotechnical, hydraulics and water resource, structures, and transportation. This prepares students for those specific fields and jobs. Furthermore, UF students have more electives to choose from which can allow them to pick out the classes that they are truly interested in or applies to their specific future job or career.

REFERENCES

1. Ranking Web of Universities, July 2016, <http://www.webometrics.info/en/Asia/Saudi%20Arbia%20>, Accessed October 28, 2016.
2. The University of Hail, Colleges, 2016, <http://www.uoh.edu.sa/en/Pages/default.aspx>, Accessed Oct. 28, 2016.
3. The University of Hail, Program structure, <http://www.uoh.edu.sa/en/Subgates/Faculties/CM/Departments/Civil/PublishingImages/Pages/Program/CE%20Prog-Structure.pdf>, Accessed Oct. 28, 2016.
4. The University of Florida, Engineering School of Sustainable Infrastructure & Environment, August 26, 2016, <https://www.eng.ufl.edu/academics/schools-departments/essie/>, Accessed Oct. 28, 2016.
5. The University of Hail, Requirements & Calculation, 2016, <http://www.uoh.edu.sa/en/Subgates/Admission/Pages/default.aspx>, Accessed Oct. 28, 2016.
6. University of Florida, Undergraduate Catalog 2016-17, <https://catalog.ufl.edu/ugrad/current/admission/info/information-for-freshmen.aspx>, Accessed Oct. 28, 2016.
7. The University of Florida, Civil Engineering Requirements, <http://www.admissions.ufl.edu/apply/freshman/freshmanapp>, Accessed Oct. 28, 2016
8. The University of Hail, Academic Program, 2016, http://www.uoh.edu.sa/en/Subgates/Faculties/CM/Departments/Civil/PublishingImages/Pages/Program/CE_Curriculum-electives.pdf, Accessed Oct. 28, 2016.
9. University of Florida, Civil and Coastal Engineering, 2016, <https://catalog.ufl.edu/ugrad/current/engineering/majors/civil-engineering.aspx>, Accessed Oct. 28, 2016.
10. The University of Florida, Grades and Grading Policies, 2016, <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>, Accessed Oct. 28, 2016
11. The University of Hail, Rules and Regulations, 2016, <http://www.uoh.edu.sa/Subgates/Admission/Documents/hai%271%20university%20ENGLISH.pdf>, Accessed Oct. 28, 2016.
12. The University of Florida, Degree Requirements, 2016, https://catalog.ufl.edu/ugrad/current/engineering/school_pages/degrees.aspx, Accessed Oct. 28, 2016.

Abdulmajjid S. Alrashidy

Graduate student at the University of Florida, Department of Civil and Coastal Engineering ,365 Weil Hall, PO Box 116580 Gainesville, Florida 32611, Mjeed.sanat@hotmail.com

Dr. Fazil T. Najafi

Professor at the University of Florida, Department of Civil and Coastal Engineering, 365 Weil Hall, PO Box 116580 Gainesville, Florida 32611, fnaja@ce.ufl.edu , For more information please refer to Dr. Najafi' s University of Florida site: <http://fnaja.essie.ufl.edu>