

**AC 2009-238: CIVIL ENGINEERING EDUCATION AT JUBA UNIVERSITY,
SOUTH SUDAN AND UNIVERSITY OF FLORIDA**

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Abstract

Civil engineering is a professional engineering discipline that encompasses design, construction and maintenance of infrastructure. It is the oldest engineering disciplines after military engineering. Unlike the other disciplines, it is both an art and science that could be traced back to the early civilization (4000 to 2000 BC) in Ancient Egypt and Mesopotamia. And it is a science that makes man and nature live in harmony. It has moved through a number of technological interfaces to reach its current stage. To maintain its integrity, it is imperative that the curricula be regularly revised to meet the ever-demanding economical, social and environmental needs of the society.

In most universities, civil engineering under graduate program is four years. University of Juba has five years undergraduate program. The College of Engineering at the University of Florida has 11 academic departments while the College of Engineering at the University of Juba has 5 different departments.

These two institutions have different undergraduate requirements both in terms of credit hours and number of semesters. The curriculum leading to the Bachelor of Science in Civil Engineering degree at the University of Florida consists of 131 credit hours, while University of Juba consists of 211 credit hours. The University of Florida allows 52 general education credits while University of Juba provides 133. In terms of core civil engineering credits, the University of Florida requires 79 engineering-based credits, while University of Juba requires a minimum of 78 engineering-based credits.

The objective of this paper is to compare the current undergraduate civil engineering curriculum in these two institutions. The results of this study present that the civil engineering curriculum meets the educational requirements of both institutions, however, admission requirements, student grading systems and types of courses are different for both.

Introduction

The University of Florida (UF) is located in Gainesville, Florida and was founded in 1853, making it the oldest university in the state. UF currently offers more than 52 undergraduate programs in a broad variety of instructional fields¹. The Department of Civil Engineering at UF was established in 1910 and later merged with the Department of Coastal and Oceanographic Engineering in 1999 to become the Department of Civil and Coastal Engineering². The civil engineering undergraduate program at UF is considered as one of the top programs in the United States of America.

Drops

Two drops are allowed if you have completed less than 60 credits at UF. Free drop if your number of credits does not drop below 12 and if filed by the seventh week of the semester³.

Summer Attendance

If students complete two summer semesters of co-op, internship or other engineering-related work they can petition to have the nine hour summer attendance requirement waived³.

Honors

The term Cum Laude is used for the students with under graduate grade point average (GPA) of 3.3. The term Magna Cum Laude is used for those with GPA of 3.5. The term Summa Cum Laude is designated for those students with GPA of 3.8³.

Admission Requirements

Admission at UF is based on the student's high school GPA, Scholastic Aptitude Test 1 (SAT 1) and the American Collegiate Test (ACT). International students are required to have a high school degree in an English speaking country or provide TOEFL results⁴.

The minimum requirements for qualification into the program are⁵:

1. Graduation from a regionally accredited or state-approved secondary school or the equivalent General Education Degree (G.E.D.).
2. Fifteen academic units, including 4 years of English, 3 years of math, 3 years of natural sciences (two with laboratories), 3 years of social sciences, and 2 sequential years of a foreign language.
3. A cumulative C average in the academic core, as computed by the university, at all institutions attended high school and college.
4. A total score of at least 1330 on the SAT (minimum 440 on either verbal or quantitative), or a composite ACT score of 19 with a minimum of 17 on the English subsection, 19 on the math, and 18 on the reading.

Where a student is coming from a Non-Accredited school or Home Schooling, they must provide in addition to a transcript and the new SAT or ACT with writing results required of other applicants, results from the SAT II examinations in mathematics (Level II-C), foreign language, science and social science. For admission decision purposes, the university will use the result of the new SAT writing sub score if the applicant has no dual-enrollment or virtual school English composition coursework, since the SAT II in writing is no longer offered. Applicants who present G.E.D. scores must also present secondary school records and standardized test scores⁵.

Admission at UJ is based on the student's high school certificate. The main requirements are passing grades in English, Arabic, Religious studies and Elementary Mathematics. Furthermore, College of Engineering requires a passing grade on Physics, Chemistry and any other Science subject. The medium of instruction at UJ in English, however, students who completed their Sudan certificate in Arabic are also admitted to the college⁶.

Undergraduate Civil Engineering Programs at both Institutions

The civil engineering program at UJ is a five-year program based on two 19-week semesters with the interval of eight weeks per year. The student must take classes based on predetermined course plans. In the final year of the program, students must select one

technical elective course per semester. The program consists of ten semesters, with an average of seven courses per semester⁶.

The department decides the number of courses that each student must take during each semester. A student’s normal course load in each semester is between 16 and 26 credit hours. The minimum requirement to pass academic year is grade C (GPA of 2.00) without any F.

Most of the courses in the first four semesters are common and shared with the students from other departments in the college such as basic calculus, general physics and general chemistry. In the third year of the program the students will follow their respective fields of engineering disciplines.

UF Undergraduate Degree

The UF undergraduate program degree is a four-year course spanned over nine semesters. In the majority of the first couple of semesters, courses are more general and shared with students from other colleges and include analytical geometry and calculus, technical writing, and physics. It is from the third semester that engineering students are taught engineering-based courses such as “Introduction to Civil Engineering” which allows students to see the entire curriculum including specialty. Like UJ, Internships are not required for UF students, but it is recommended. Overall, the current civil engineering curriculum at UF leading to a bachelor of science degree consists of 131 credits made up of 53 credits of required civil engineering course work, and 15 credits of engineering electives specific to a desired track (Construction Engineering track, Geotechnical Engineering track, Hydrology & Water Resources Engineering track, General Civil Engineering track, Structural Engineering track and Transportation Engineering track). All students are required to pass the Fundamentals of Engineering (FE) Exam to complete their degree in civil engineering¹.

Curriculum Comparison

There is difference between the credit hour ratings at both institutions. At UF every course is designated a specific number of credit hours. The number of credit hours for a class reflects the total hours a student spends per week in class at both UF and UJ. At UJ the course includes weekly lecture course hours plus the designated weekly laboratory, practical, or studio course hours⁶.

Laboratory classes at UJ are always part of the activities of specific courses in either basic sciences or engineering sciences. At UF, the curriculum offers courses completely dedicated to lab work in the pre-engineering courses. Table 1 presents a list of the courses offered at UF and UJ^{1,6}.

Table 1 *Course Comparison between UF and UJ*

Course Code	Course at UF	Credits	Equivalent Course at UJ	Credits
Semester 1				
MAC 2311	Analytical Geom. & Calculus I	4	Calculus I	3
CHM 2045	Chemistry & Lab. I	4	Linear Algebra I	2

GEN. ED.	Humanities	3	General Physics I	4
GEN. ED.	Social & Behavioral Sc	3	General Chemistry I	3
			Intro to Computer Sc	3
			Statistics	3
			Arabic Language I	3
			English Language I	3
Semester 2				
MAC 2312	Analytic Geom. & Calculus II	4	Calculus II	3
CHM 2046	Chemistry II	3	Analytical Geometry	2
PHY 2048	Physics & Lab. I	4	General Physics II	4
ENC 2210	Technical Writing	3	General Chemistry II	3
			Dynamics	3
			Introduction to Engg	3
			Arabic Language II	3
			English Language II	3
Semester 3				
MAC 2313	Calculus III	4	Linear Algebra II	2
PHY 2049	Physics & Lab. II	4	Complex Variables	2
GEN.ED.	Humanities	3	Engineering Drawing I	3
GEN.ED.	Social Science	3	Mechanics of Materials	4
CGN 2002	Intro. to Civil Engg	1	Computer Applications	2
			Sudanese Culture	3
			Electrical Technology	2
			Arabic Language III	3
			English Language III	3
Semester 4				
MAP 2302	Differential Equations	3	Differential Equations	4
EGM 2511	Static	3	Engineering Drawing II	3
EML 3100	Thermodynamics		Material Science	3
Or	Or		Environmental Studies	2
EML 3007	Thermo and Heat Transfer	3	Mechanics of Fluids I	3
STA 3032	Engineering Statistics	3	Intro to Mechanical Engg	2
GEN.ED.	Humanities or Social Science	3	Surveying I	3
			Arabic Language IV	3
			English Language IV	3

Semester 5				
EGM 3400	Elements of Dynamics	2	Islamic/Christian Culture I	2
EGM 3520	Strength of Material	3	Numerical Methods	2
CGN 3421	Computer Program for CE	4	Surveying II	2
CGN 3710	Experimentation	3	Mechanics of Fluids II	2
CGN 4101	Civil Engg Cost Analysis	3	Building Materials	2
			Structural Analysis I	2
			Engineering Geology	2
			Environmental Engg I	2
Semester 6				
CGN 3501	Civil Engg Materials	4	Islamic/Christian CultureII	2
CEG 4011	Soil Mechanics	4	Probability & Statistics	3
SUR 2322	Proj. Dev. & Visualization	3	Soil Mechanics I	3
CWR 3201	Hydrodynamics	4	Hydraulics I	3
			Structural Analysis II	3
			R.C. Design I	3
			Steel Design I	3
			Adv Mechanics of Materials	3
Semester 7				
CES 3102	Into. To Structural Analysis	4	Islamic/Christian Culture III	2
CEG 4012	Geotechnical Engg	3	Engineering Economics	2
CCE 4204	Construction Methods & Mgmt	4	Hydraulics II	3
CWR 4202	Hydraulics	3	Surveying III	3
			Structural Analysis III	3
			Soil Mechanics II	3
			Environmental Engineering II	3
			Traffic & Transportation Engg	3
Semester 8				
CES 4702	Reinforced Concrete	4	Islamic/Christian Culture IV	2
TTE 4004	Transportation Engg	3	Engineering Management	3
SUR 4201	Route Geometrics	3	Seminar	3
ENV 4514	Water and Wastewater Treatment	3	Hydrology	3

EGN 4034	Ethics	1	R.C. Design II	3
			Soil Mechanics III	3
			Comp App of Civil Engg	1
Semester 9				
	General CE Elective*: All Track Courses	15	Project	
			Construction Engineering	3
			Irrigation & Drainage	3
			Design of Structures	4
			Foundation Engineering	3
			Elective Course I	3
Semester 10				
			Project	6
			Steel Design II	3
			Hydraulic Structures	3
			Highway & Airport Design	3
			Elective Course II	3
Total Credits		131		211

* All track courses are 3 credits and all tracks consist of 15 credits. Electives can be chosen from approved lists or with the consent of track advisor. Many track courses will only be offered once a year.

Conclusions

The major aspect taken into account in the comparison was the duration of the programs, special courses or activities of each curriculum, the differences in the student academic load, the grading systems, the curriculum flexibility and the admission requirements.

Civil engineering degree is obtained in four years at UF and five years at UJ. Both courses are similar in introducing the basic engineering knowledge to students. Both departments allow students to choose electives towards the end of their degrees to help students concentrate on their specialty.

UJ utilizes a required internship during the latter semester of the course to allow students to appreciate the application of their theoretical knowledge in the real world. At UF, the Civil Engineering department will accept students to complete two summer semesters of co-op, internship or other engineering-related work.

References

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