

**AC 2009-245: CIVIL ENGINEERING EDUCATION AT THE RAJIV GANDHI
TECHNICAL UNIVERSITY, INDIA AND AT THE UNIVERSITY OF FLORIDA**

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Introduction

Civil engineering is treated as the first true engineering field. It is a field involved in planning, design, construction, operation, and maintenance of transportation, environmental, and construction systems. The world, which we see today, would have been very hard to imagine without the effective contribution of civil engineers. The road system, skyscrapers, harbors, transportation facilities, utilities would have been obsolete and cities like New York, Hong Kong, London, would not exist.

In this period of globalization, civil engineering is exploring new horizons. In some countries like Dubai and China, engineering is challenged to its limits to create innovative structures. However, in this harsh global economic climate, for civil engineers it is important to stay up to date with the latest technology so that they can realize their importance.

The curriculum of civil engineering at the University of Florida (UF) and the Rajiv Gandhi Technical University (RGTU) is comparable but there is a complete difference in the student grading system. The University of Florida offers several programs in seventeen different colleges that includes Business, Law, Engineering, Medicine and others. On the other hand, the Rajiv Gandhi Technical University is a multi-campus affiliating university in the state of Madhya Pradesh, India. However, the Rajiv Gandhi Technical University is modeled around the British system of engineering education and it includes two semesters of six. The university at present has more than seventy colleges of engineering in its fold enrolling 13,500 students each year in the state of Madhya Pradesh, India.

The Rajiv Gandhi Proudhyogiki Vishwavidyalaya (RGPV) was established in 1998. The university is a multi-campus affiliating university in Madhya Pradesh. It has campuses and affiliated colleges at various cities across the state. The university is well known for its extensive technical range of courses and claims to be one of top amongst India's best universities. This institution was established as a common university for all the technical institutes, mainly including Engineering and Science colleges in the state.^{1, 2, 3}

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 fifty-two undergraduate programs in a broad variety of instructional fields.⁴ 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 Engineering⁵. The civil engineering undergraduate program at UF is considered as one of the top programs in the United States of America.

In the UF curriculum, if students have completed no more than 60 credits they are allowed two drops⁶. If students have completed two summer semesters of co-op, internship or other engineering- related work, then they can petition to have the nine hour summer attendance requirement waived⁶. In UF, an honor is awarded to a student for their respective credits earned. The term Cum Laude is used for those students with undergrad grade point average (GPA) of 3.3, Magna Cum Laude for GPA 3.5 and Summa Cum Laude for grade 3.8.⁷

Admission Requirements for RGPV

Both educational programs have certain requirements that students are expected to meet if they wish to study Civil Engineering.

For admission at RGPV or its affiliated colleges, a student has to take one of the two entrance exams. One exam is conducted by the state and is called Madhya Pradesh Pre-Engineering Exam (MPPET). The other exam is conducted by the central government and is called All India Engineering Exam (AIEEE). MPPET is only given by the students who are state residents and AIEEE can be given by any student, despite of his/her nationality. Both of these exams have an option of choosing the language between English and Hindi, the Indian National Language³.

The minimum academic qualification for admission through AIEEE is to pass the final examination of 10+2 (Class XII) or its equivalent referred to as qualifying. Those appearing in 10+2 (Class XII) final or equivalent examination may also appear in AIEEE for consideration of provisional admission. There is also an age restriction on this examination. For example, for AIEEE 2009, only those candidates whose date of birth falls on or after October 01, 1984 are eligible. This date restriction is lowered in special conditions. In the case of Scheduled Caste (SC), Scheduled Tribe (ST) and Physically Handicapped (PH) candidates, upper age limit is relaxed by 5 years. This pattern is followed likewise for exams held in following years³.

In a process called counseling, the students are allowed to choose their department and college in which they want to study. Seats are counseled by their merit in a particular exam. For every college, there is a reserved quota of seats for students who passed a specific exam. For MPPET the reservation for seats is 85% and for AIEEE is 15%. After that process, there are sub-reservations in these categories that are based on special types of students which are less than 5% for each reserved category.^{3, 1}

Admission Requirements at UF

UF admissions are 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 either been educated in an English speaking country or provide results of the TOEFL test⁶.

The minimum requirements for qualification into the engineering program are⁸:

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 scores.⁸

RGPV Degree

The RGPV degree is a minimum four year course over 8 semesters. The first year which has 2 semesters has general courses and shared with students of all branches of engineering.

The civil engineering program is a four-year program based on two 24-week semesters per year. The student must take classes based on the predetermined course plans. Each semester students have to take minimum of five subjects, starting from first semester till seventh. In the last semester, students have to take a minimum of four subjects. The student has to pass every subject with minimum marks. If a student fails in an exam, then the student has to retake the exam of that specific subject in the next semester leaving 5 courses and 6 exams in the following semester.

The student has to pass all the first year classes to be able to start the third year classes and all the second year classes to start the final year classes. In the final year, each student has to take two electives in two respective semesters. Every semester starting from the third semester, students have a compulsory seminar of 30-60 points which they have to take and score well. Table 1 (a) – (h) shows the civil engineering undergraduate curriculum at RGPV.

Table 1 (a) first semester

Course Codes	Course Title	Distribution of Marks				Total
		Theory Exam	Practical Exam	Internal Assessment		
				Oral	TW	
I	II	III	IV	I+II+III+IV		
BE101	Engineering Chemistry	100	50	20	30	200
BE102	Engg. Mathematics-I	100	-	20	-	120
BE103	Communication Skills	100	20	20	20	140
BE104	Basic Elect. Engineering	100	50	20	30	200

BE105	Engineering Graphics	80	30	20	30	140
BE107	Basic Electronics	100	50	-	30	200
Total		580	200	80	140	1000

Table 1 (b) second semester

Course Codes	Course Title	Distribution of Marks				Total
		Theory Exam	Practical Exam	Internal Assessment		
				Oral	TW	
I	II	III	IV	I+II+III+IV		
BE201	Engineering Physics	100	50	20	30	200
BE102	Engg. Mathematics-I	100		20		120
BE203	Engg. Mechanics	100	20	-	20	140
BE204	Basic Mech. Engg.	100	50	20	30	200
BE205	Basic Civil Engg.	100	50	20	30	200
BE206	Basic Computer Programming	-	50	-	20	70
BE207	Workshop Practice	-	50	-	20	70
Total		500	270	80	150	1000

Table 1 (c) third semester

Course Title	Course Code	Credits			Theory Papers (ES)
Energy Ecology Environ. & Society	CE302	L	T	P	120
		3	1	0	
Strength of Materials	CE303	L	T	P	200
		3	1	2	
Building Design & Drawing	CE305	L	T	P	200
		3	1	2	
Computer Programming – III	CE306	L	T	P	100
		0	0	4	
Engineering Geology	CE304	L	T	P	200
		3	1	2	
Mathematics - III	CE301	L	T	P	120
		3	1	0	

Table 1(d) fourth semester

Course Title	Course Code	Credits			Theory Papers (ES)
Computer Programming – IV	CE406	L	T	P	100
		0	0	4	
Fluid Mechanics I	CE402	L	T	P	200
		3	1	2	
Material Construction	CE401	L	T	P	200
		3	1	2	

Qty. surveying & Costing	CE405	L	T	P	120
		3	1	0	
Transportation Engineering – I	CE404	L	T	P	120
		3	1	0	
Surveying	CE403	L	T	P	200
		3	1	2	

Table 1(e) fifth semester

Course Title	Course Code	Credits			Theory Papers (ES)
Transportation Engineering – II	CE501	L	T	P	200
		3	1	2	
Water Resources Engineering	CE502	L	T	P	120
		3	1	0	
Fluid Mech. – II	CE503	L	T	P	200
		3	1	2	
Structural Design & Drawing – I (RCC)	CE504	L	T	P	200
		3	1	2	
Theory of Structures –I	CE505	L	T	P	120
		3	1	0	
Surveying Practice	CE506	L	T	P	100
		0	0	4	

Table 1(f) sixth semester

Course Title	Course Code	Credits			Theory Papers (ES)
Engineering Economics & Management – I	CE604	L	T	P	120
		3	1	0	
Environmental Engineering – I	CE603	L	T	P	200
		3	1	2	
Irrigation Engineering	CE602	L	T	P	120
		3	1	0	
Minor Project – I	CE606	L	T	P	100
		0	0	4	
Structural Design & Drawing – II (Steel)	CE605	L	T	P	200
		3	1	2	
Theory of Structures – II	CE601	L	T	P	200
		3	1	2	

Table 1(g) seventh semester

Course Title	Course Code	Credits			Theory Papers (ES)
Construction Planning & Management	CE701	L	T	P	120
		3	1	0	
Advanced Structural Design – II (RCC)	CE702	L	T	P	200
		3	1	2	

Environmental Engineering – II	CE703	L	T	P	200
		3	1	2	
Geo-Technical Engineering – I	CE704	L	T	P	200
		3	1	2	
Minor Project	CE706	L	T	P	100
		0	0	4	
Elective - I		L	T	P	120
		3	1	0	

Table 1 (h) eighth semester

Course Title	Course Code	Credits			Theory Papers (ES)
		L	T	P	
Geo Tech. Engineering – II	CE801	L	T	P	200
		3	1	2	
Hydraulic Structures	CE802	L	T	P	120
		3	1	0	
Advanced Structural Design-II (Steel)	CE803	L	T	P	200
		3	1	2	
Major Project	CE805	L	T	P	310
		0	0	8	
Elective - II		L	T	P	120
		3	1	0	

For the final grading 10% of first year grand total, 20% of second year, 30% of third year and 100% of final year is taken. The marks are given from a total of 3,200. If a student scores more than 75% from 3,200 then he is awarded an honors degree. If a student scores above 65%, then he is awarded I division. If a student scores between 50-65%, he is awarded II division. Below 50%, it is III division.

UF 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. The current civil engineering curriculum at UF, leading to a bachelor of science degree in civil engineering 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 engineering.⁹

Curriculum comparison

There is a difference between the credit hour ratings at both universities. In both universities every course is assigned 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 RGPV. At RGPV the course includes weekly lecture course hours plus the designated weekly laboratory, practical, or studio course hours³. Laboratory classes at RGPV are always part of the activities of specific courses in either basic sciences or engineering sciences. At UF, in the pre-engineering courses, the curriculum offers courses completely dedicated to lab work.

Table 2 Courses comparison at UF and RGPV

Course No.	Course at UF	Credits	Courses at RGPV	Credits
Semester 1				
MAC 2311	Analytic Geom. & Calculus I	4	Engineering Mathematics I	4
CHM 2045	Chemistry & Lab. I	4	Engineering Mechanics	6
GEN. ED.	Humanities	3	Basic Mechanical Engg.	6
GEN. ED.	Social & Behavioral Science	3	Basic Civil Engineering	6
			Engineering Physics	6
			Computer Programming I	4
Semester 2				
MAC 2312	Analytic Geom. & Calculus II	4	Engineering Mathematics II	4
CHM 2046	Chemistry II	3	Engineering Chemistry	6
PHY 2048	Physics & Lab. I	4	Basic Electrical Engineering	6
ENC 2210	Technical Writing	3	Engineering Graphics	6
			Computer Programming II	4
			Communication Skills	3
Semester 3				
MAC 2313	Calculus III	4	Mathematics III	4
PHY 2049	Physics & Lab. II	4	Energy Ecology Environ. & Society	4
GEN.ED.	Humanities	3	Strength of Materials	6
GEN.ED.	Social Science	3	Engineering Geology	6
CGN 2002	Intro. to Civil Engineering	1	Building Design & Drawing	6
			Computer Programming III	4
Semester 4				
MAP 2302	Differential Equations	3	Material Construction	6
EGM 2511	Static	3	Fluid Mechanics I	6
EML 3100	Thermodynamics		Surveying	6
Or			Transportation Engineering I	4
EML 3007	Thermo and Heat Transfer	3	Qty. surveying & Costing	4
STA 3032	Engineering Statistics	3	Computer Programming IV	4
GEN.ED.	Humanities or Social Science	3		

Semester 5				
EGM 3400	Elements of Dynamics	2	Transportation Engineering II	6
EGM 3520	Strength of Material	3	Water Resources Engineering	4
CGN 3421	Computer Program for CE	4	Fluid Mech. II	6
CGN 3710	Experimentation	3	Structural Design & Drawing I (RCC)	6
CGN 4101	Civil Engineering Cost Analysis	3	Theory of Structures I	4
			Surveying practice	4
Semester 6				
CGN 3501	Civil Engineering Materials	4	Theory of Structures II	6
CEG 4011	Soil Mechanics	4	Irrigation Engineering	4
SUR 2322	Project Dev. And Visualization	3	Environmental Engineering I	6
CWR 3201	Hydrodynamics	4	Engineering Economics & Management I	4
			Structural Design & Drawing II (Steel)	6
			Minor project	4
Semester 7				
CES 3102	Intro. To Structural Analysis	4	Advanced Structural Design II (RCC)	6
CEG 4012	Geotechnical Engineering	3	Construction Planning & Management	4
CCE 4204	Construction Methods and Management	4	Environmental Engineering II	6
CWR 4202	Hydraulics	3	Elective I	6
			Geo-Technical Engineering I	4
			Minor Project	4
Semester 8				
CES 4702	Reinforced Concrete	3	Hydraulic Structures	4
TTE 4004	Transportation Engineering	3	Advanced Structural Design II (Steel)	6
SUR 4201	Route Geometrics	3	Elective II	4
ENV 4514	Water and Wastewater Treatment	1	Major Project	8
EGN 4034	Ethics	4	Geo Tech. Engineering II	6
Semester 9				
TOTAL	All track courses *	15		
		131		239

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

Conclusions

The major aspects taken into account in the comparison of civil engineering at two institutions were the admission requirements, number of credit hours, special courses or activities of each curriculum, the differences in the student academic load, and the curriculum flexibility.

The courses taken in both universities are fairly similar to the each other. At both universities, the civil engineering degree is obtained in a minimum of four years. At UF, the bachelors is obtained in nine semesters while at RGPV is in eight semesters. This is because of the higher work load at RGPV per semester.

Both undergrad civil engineering programs are similar in their goals to gradually introduce the basic engineering skills to students. Both systems allow students to choose specialty elective courses at their final semester before graduation.

RGPV is based on the British system of education. The other major difference is in grading. The final grade in RGPV is an aggregate from the first year to the final year. For the final grading, 10% of first years' grand total, 20% of second year, 30% of third year and 100% of final year is taken. The total marks are then assigned from a total of 3,200. However in UF, GPA is calculated from first year to the final year according to the grades achieved by each student. Each grade is awarded an equivalent number on the scale of 1-4, where "A" equals 4.0 and "D" equals 1.0. The total grade points received are then divided by the total number of credits to calculate the final GPA of a student.

While the numerous differences exist, the goal of providing students with a scope of civil engineering knowledge is the same.

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