

Engineering Education in Egypt: Survey and Assessment

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Abstract

This paper provides an overview of Engineering Education in Egypt. It surveys both governmental as well as private institutions. The paper discusses the challenges facing Engineering education institutions in the country as well as critiques the new private university experiment that began in 1996. The paper also discusses undergraduate curriculum issues through examination of samples of Electronic and Communication curriculum from some of the institutions. Comparison between the curriculum in the 60s, 70s, and 2000s show the changes with time and developing technology. Finally, the authors' assessment of engineering education in Egypt is given based on data available, as well as personal experiences and vision. Suggestions to improve the quality of engineering education in Egypt are given as well.

An Overview of Higher Education in Egypt

Egypt, as well as other Middle Eastern countries, realizes the need for top quality higher education as a means of bridging the widening technology and economic gaps that developed in the last three decades of the Twentieth Century. As the world enters the Twenty-First Century, a change in paradigm occurred that emphasizes Information Technology and economic globalization. Developing countries that were able to forecast and make use of this change were able to increase their Gross National Products at phenomenal rates. Concomitantly, their per capita incomes and the quality of life of their citizens leaped upwards.

Due to many political and socio-economic factors, Egypt did not start its effort to close this gap in earnest until the mid-seventies. Higher education was a cornerstone in this effort. As indicated by the figures given by the Egyptian Information and Decision Support Center of the Ministry of Higher Education (MoHE), a comparison between the academic years 1973/1974 and 1998/1999 yield the following statistics for the Egyptian governmental universities:

ITEM	1973/74	1998/99	% Increase
Number of state universities	7	12	71
Number of colleges	94	256	172
Number of faculty members	4,688	29,363	526
Number of teaching assistants	7,064	17,493	148
Number of freshman students	58,402	221,530	279
Number of undergraduate students	239,339	1,159,093	384
Number of graduates	32,030	216,226	575
Number of graduate students	32,258	131,228	307

Number of M. Sc. and Ph. D. graduates	4,848	24,483	405
Budgets (EGP Millions)	34	3,708	10,806
Budget per student (EGP)	142	4,171	2,837
Number of university hostels residents	22,000	102,000	364

It should be noted that these figures do not include those for institutions that do not belong to the Ministry of Higher Education.

The above figures, especially those related to the rate of growth of governmental universities may seem quite impressive. They, however, do not necessarily reflect a similar growth pattern in the quality of education. The fact is that different indicators on the quality of higher education in Egypt show marked decline. Some factors leading to this decline is external to the higher education system. They relate to the decline in the quality of High School Certificate graduates, which represent the raw material for the universities, and their low capabilities in foreign languages and almost complete lack of abilities of independent learning. The latter, of course, is caused by the prevalent practice of private tutoring. Another factor, also imposed on the governmental university system, is the policy of universal admittance of high school graduates to universities and institutes of higher learning. This policy floods the higher education system with enrollment numbers well beyond its endurance limits and dilutes all efforts to improve the quality of governmental higher education in Egypt.

[Survey of Egyptian Universities with Faculties of Engineering](#)

Appendix A gives a brief historical insight into modern engineering education in Egypt, which dates back to 1816 with The Engineering School “Madrasat El-Mohandes-khana.” The appendix shows the evolution resulting in the formation of The Royal School of Engineering in the early 1900s. In 1935, the school was renamed as the “Faculty of Engineering”, after being annexed to the “Egyptian (Cairo) University.”

Currently, there are twelve “governmental” universities in addition to Al-Azhar University, four “private” universities, a number of high institutes of technology, and two “special private” institutions, namely the American University in Cairo and the Arab Academy for Science and Technology. Two new universities started instruction in 2003 in collaboration with French and German universities. All these institutions have faculties of Engineering on their main campuses and some have additional faculties of Engineering on their branch campuses.

Appendices B and C survey the different institutions listed here with a brief history and summary of their engineering programs.

Location and Websites of Egyptian Universities

	Institution	Location	Web Site
1	Cairo University	Giza (Cairo)	http://www.cu.edu.eg/
2	Alexandria University	Alexandria	http://www.alex.edu.eg/
3	Ain Shams University	Cairo	http://www.asunet.eun.eg/
4	Assuit University	Assuit	http://www.aun.eun.eg/
5	Al-Azhar University	Cairo	http://www.alazhar.org/english/about/alazharuniv.htm

6	Tanta University	Tanta	http://www.tanta.edu.eg/
7	Mansoura University	Mansoura	http://www.mans.eun.eg/
8	Zagazig University	Zagazig	http://www.zu.edu.eg/
9	Helwan University	Helwan (Cairo)	http://www.helwan.edu.eg/
10	Minia University	Minia	http://www.minia.edu.eg/
11	Menofia University	Menofia	http://www.menofia.edu.eg/
12	Suez Canal U.	Suez/Port Said	http://www.suez.edu.eg/
13	South Valley U.	Qena/Aswan	http://svu.edu.eg/
14	Misr U. for Sc. & Tech	October (Cairo)	http://www.must.edu/english.htm
15	Misr International U.	October (Cairo)	http://www.miuegypt.com/index.htm
16	October Univ. for Modern Sc. & Arts	Giza (Cairo)	http://www.msa.eun.eg/main.jsp
17	6 October University	October (Cairo)	http://www.o6u.edu.eg/
18	American U. in Cairo	Cairo	http://www.aucegypt.edu/
19	Arab Acad. Sc. & Tech	Alexandria	http://www.aast.edu/

Location Map of Egyptian Universities



Egyptian Universities with Engineering: Year Established (Year Engineering Started)

Government Universities (Public)						
						
<u>Cairo U.</u> 1908 (1866)	<u>Alexandria U.</u> 1942 (1941)	<u>Ain Shams U.</u> 1950 (1950)	<u>Assuit U.</u> 1957 (1957)	<u>Tanta U.</u> 1962 (1977)	<u>Mansoura U.</u> 1972 (1972)	<u>Zagazig U.</u> 1974 (1974)
						
<u>Helwan U.</u> 1975 (1975)	<u>Minia U.</u> 1976 (1976)	<u>Menofia U.</u> 1976 (1976)	<u>Suez Canal U.</u> 1976 (1976)	<u>South Valley U.</u> 1994 (1994)	Military Tech. College	<u>Al-Azhar U.</u> 988 (1961)
Private Universities						
						
<u>Misr U. for Sc. & Tech.</u> 1996 (1996)	<u>Misr International U.</u> 1996 (1996)	<u>U. Of Modern Sc. & Arts</u> 1996 (1996)	<u>6 October U.</u> 1996 (1996)	<u>Higher Tech Institute</u> 1989 (1989)	<u>American U in Cairo*</u> 1919 (1993)	<u>Arab Acad. Sc. & Tech*</u> 1972 (1978)

Private Higher Education in Egypt

The Egyptian higher education system distinguishes between two types of private higher education institutions: Universities and Higher Institutes. A Presidential Decree is required to establish new Universities in Egypt. Higher institutes, owned by organizations or foundations can be established by a decree from the Minister of Higher Education. For years, establishing private universities was not allowed. In 1996, the ban was lifted and four private universities were given the permission to function. Soon afterwards, and because of the many doubts that surfaced about the quality of education provided by these new universities, a moratorium on establishing new private universities was instated. The American University in Cairo and the Arab Academy for Science and Technology were established through special legislations from the Egyptian parliament. A survey of established private universities in Egypt is given in Appendix C.

Four private universities were established simultaneously in 1996. They contain faculties of engineering, computer sciences, and management and, even, pharmacology and medicine, as well as other faculties. The Supreme Council of Egyptian Universities accredits only a small number of these faculties to date. They still depend to a large degree on faculty members that are delegated on part-time bases from corresponding faculties in governmental universities.

The claim of the new private universities in Egypt is that they can provide better quality education in many ways than that available through the government institutions such as:

- Small class sizes and hence better faculty-to-student ratio.
- Flexibility in designing the educational system to blend the best of the Egyptian and Western systems, thus creating an opportunity for the students to experience the best of both worlds.
- Make available better facilities for classrooms and laboratories.
- Create the missing campus environment by giving attention to recreational facilities and student activities.

The challenges to achieve these improvements are huge and require time, money, and sincere efforts. Unfortunately, the majority in Egypt is very skeptical about the chances the new private universities have in improving the quality of education. Accusations of being profit-oriented organizations are already tainting their reputation. It is evident that for most of the private institutes and universities material profit is a prime driving force. Unfortunately, for most of them, after their initial effort to obtain operating permits, turn into pale imitations of their governmental counterparts. They lack vision and initiative and suffer from negligence to their laboratories and other facilities. Quality education soon takes second seat to profit making. Trend within the Ministry of Higher Education is not to allow any more private institutions to be established. There are strong voices within the ministry and the Supreme Council of Universities that even call for closing some of the existing faculties. Perhaps for these reasons it was indicated by the MoHE that no new private universities would be established until full evaluation of the existing ones is conducted.

The first private higher technological institute was established in January 1989, in the Tenth of Ramadan City, the HTI. It is owned by an NGO, The Association for Development of New Urban Communities. Its main academic branches are engineering, with seven departments, and technology management. By 1999, there were forty 4-year private institutes. HTI is the only private engineering higher technology institute that has been fully accredited so far by the Supreme Council of Egyptian Universities. This implies that the quality of education in private institutes, with very few exceptions, is even lower than corresponding education in government universities.

[Academic Program and Student Admission](#)

Graduates of Egyptian secondary schools are admitted to undergraduate higher education programs on an equal opportunity basis. Their distribution among different universities and faculties is based strictly on High School Certificate's grades. Because Egyptian public university fees are heavily subsidized, the relatively limited number of places results in fierce competition among applicants. Non-Egyptian students pay reasonable tuition fees.

Engineering faculties in Egypt offer programs for the B.Sc. degrees in 5 academic years, a general "Preparatory" Year where typically all students would study the same core courses irrespective of their intended specializations (majors). Architecture-bound students in some universities have a different Preparatory Year core curriculum.

Preparatory Year Subjects (Lecture Hours + Exercise/Laboratory Hours) per week	
Engineering Mathematics (4+2)	Production Technology (0+2)
Engineering Physics (4+2)	Computer Programming (1+1)

Engineering Mechanics (2+2)	Descriptive Geometry (1+0)
Engineering Chemistry (1+1)	Engineering Drawing (1+3)
English Language (1+1)	History Of Engineering Sciences (1+1)

Students break up by departments starting with the “First” year (the second year in the program following the Preparatory Year). Typically, further fine specializations take place during the last two years (the “Third” and “Fourth” years) of the 5-year program.

Three types of graduate degrees are typically offered at the Egyptian Faculties of Engineering:

- Diploma: B.Sc. student do course work and research in a specific area of specialization. The diploma would specify the specialization in the degree name, e.g. Diploma in Hydraulic Systems and Control. The Diplomas are, in general, practically oriented.
- M. Sc.: B.Sc. student graduating with at least a rate of appreciation of Good (65% of the total grade) do course work and Thesis in a specific field leading to the degree, e.g. M.Sc. in Civil Engineering. These are in general academically oriented.
- Ph. D.: M.Sc. student do course work and dissertation in a specific field leading to the degree, e.g. Ph.D. in Computer Engineering. Due to the lack of adequate facilities in most Egyptian universities, typically, most students seek Ph.D. studies abroad or jointly between the Egyptian and an advanced foreign university.

Engineering Undergraduate Curriculum

This section presents samples of Electronic and Communication Engineering curriculum from some of the Egyptian engineering education institutions to help demonstrate the variations in styles, approaches, and emphasis of the different Egyptian institutions. Comparison between the curriculum in the 60s, 70s, and 2000s show the changes with time and developing technology.

As demonstrated in the tables in Appendix D, the government institutions classically had an educational system with mostly a fixed set of courses for students to take with no electives. The credit hour system is not typically used. The curriculum has very little humanities courses and a good number of broad based strong interdisciplinary courses are included. Examples of the 60s Cairo University’s curriculum included courses on Surveying, Construction Engineering, Heat Engines, Fluid Mechanics, and Theory and Design of Machines. Moving into the 2000s, Cairo University is moving into fewer interdisciplinary courses (14 hours vs. 50 hours in the 60s). Technical electives have a place now where students can choose 4 of their last two-year courses.

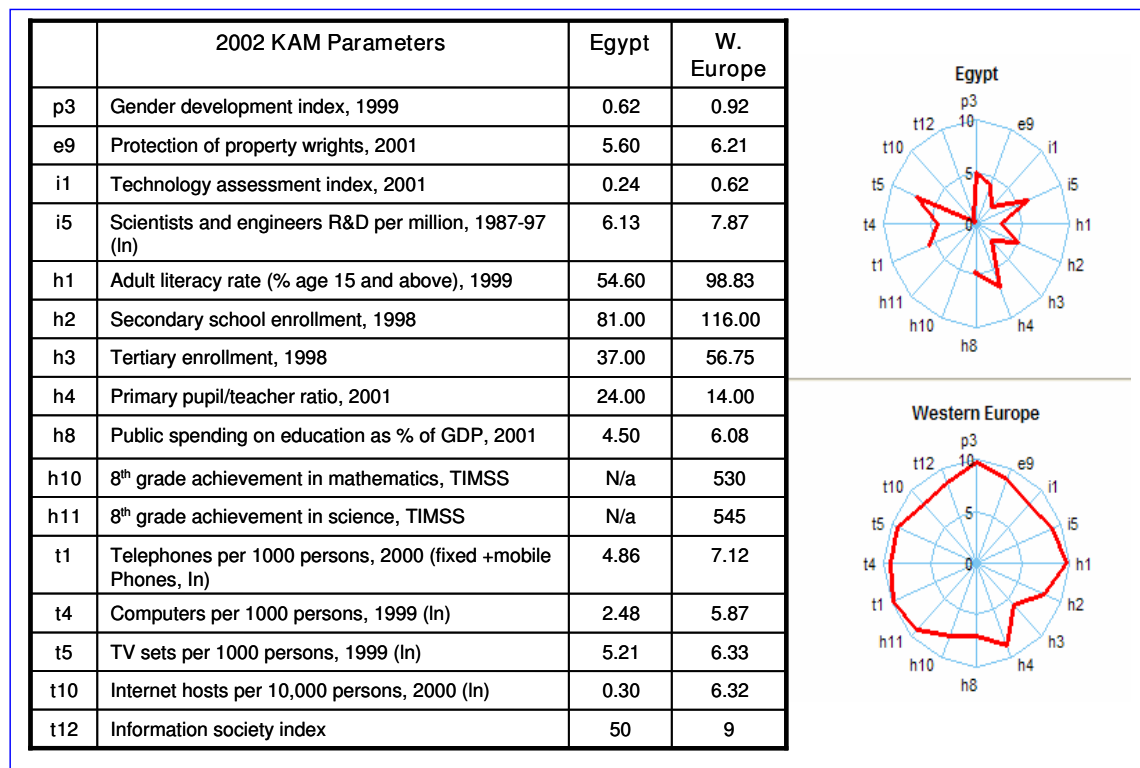
Comparing Cairo’s curriculum to that of the Arab Academy for Science and Technology (a well established private engineering program) and to that of Misr University for Science and Technology (one of the four new private universities) reveal some serious differences. First, most, if not all, the private institutions are following the credit hour system. Second, the private institutions pay more attention to Humanities and English Language education. Third, the private institutions’ curriculum requires fewer hours (10%-20% less) than that of the government university programs.

This comparison demonstrates the general appreciation that student and parents have for government universities in Egypt. The consensus is that the private institutions have compromised the quality of their programs at least in terms of the material covered. The limited English language coverage in the government curriculum is not seen as a serious issue and the lack of humanities is seen as a plus. The appreciation is that engineering student should spend their time learning engineering in college; those interested in humanities can learn it somewhere else.

Comparison to Europe

In view of the recent cooperation agreement between Egypt and the European Union, it may be of interest to compare a number of indicators between Egypt and Western Europe, among 96 such indicators, chosen by the World Bank to assess Knowledge Society Readiness as shown below:

World Bank Knowledge Society Assessment: Indices, 2002



Clearly, Knowledge Society readiness is proportional to how full the “pie” is. Of interest here are indicators h1 through h11. They demonstrate the wide quantitative gap that exists in education in general and Higher Education in particular. The only indicators that measure directly the quality of education are those measuring 8th grade student achievements in mathematics and science (h10 and h11). Egypt did not participate in these assessments.

In Higher Education, it is clear that the number of Egyptian graduates (h3) and the public spending on education as a percentage of the GDP (h8) have to be increased. Again, these indicators do not measure the quality of tertiary education graduates in Egypt and their compatibility with the current and future needs of both local and international job markets. Such quality is a function of a number of factors that include:

- Curricula modernization and flexibility as to be able to keep abreast with fast changing technologies.
- Lecture delivery and testing modes that encourage self-learning and practical problem solving, rather than memorizing notes and solving boilerplate problems.
- The existence of modern laboratories and workshops and their maintenance.
- Faculty members and assistants that are in touch with their peers in reputable universities abroad so as to learn about modern trends in curricula development, delivery technologies, student evaluation methodologies and needed supplementary material.
- Student per class densities that allow meaningful interaction between students and faculty members, as well as actually performing practical experiments rather than watching technicians perform experiments.
- The present outdated structure of courses, laboratories and workshops gives the erroneous impression that mechanical power engineering is a manual job for men who enjoy working with engines and power generation equipment. This image tends to drive women students away from joining the department, thus contributing to the gender gap expressed in index p3 above.

The six ingredients above are essential to undergraduate Higher Education in practical colleges, especially engineering. Their absence cause weaknesses in the quality of the produced graduates and in their ability to obtain private sector jobs in a highly competitive job market, as well as to develop their self-learning abilities to acquire new skills that would help their firm to become globally competitive.

Using the above courses in their present form to engineering graduates that are competitive in the local and international job markets is faced with the following limitations:

1. Courses are not up to date. They do not include modern concepts and applications.
2. Courses fall short of training students to use computers as a normal means of solving problems.
3. Courses train students to memorize lectures and even problems, rather than to concentrate on understanding concepts and using their deductive and research skills to apply these concepts to fresh applications.
4. The acute shortages in measuring instruments and other demonstration and hands-on laboratories cause students to graduate with academic knowledge that may prepare them to solve pencil-and-paper problems rather than being able to tackle real-world problems that they may meet on the job.
5. The traditional separation between mechanical engineering and electronics causes students to miss-out on the use of electronic and microprocessor control in mechanical systems.
6. The large number of students per class does not allow for interaction between students and faculty members and for proper follow-up of concept understanding, drilling, problem

solving and report writing activities in class and homework.

All these problems reduce the quality of education not only in departments of Engineering in the Egyptian tertiary education system, but in other departments and other colleges as well.

Conclusions: Assessment and Suggestions

Engineering education in Egypt has many strong aspects and some weaknesses. Two major strengths are:

- The availability of highly qualified faculty resource in this domain. There is an abundance of professorial staff that is not fully utilized. This can be easily recognized looking at the lengthy faculty lists on the websites of the surveyed institutions.
- The serious attitudes Egyptian have towards education. Egyptians spend hard-to-earn income to provide for quality education for their dependants. This attitude typically translates into determination and sincere effort on behalf of the students towards their education material and academic achievement.

The main weaknesses in the existing system are summarized in the following:

- Huge student numbers far exceeding the available educational capacity of the existing institutions.
- Inadequate facilities (including laboratories and equipment)
- Administration's rigidity that makes it difficult to introduce improvements

Resolving the issues with the engineering education in Egypt is not an easy task. However, some steps can be initiated in that direction as proposed in the following suggestions:

- Gradually end the subsidization of higher education. This will have two benefits: reduce the numbers of university bound students as well as generate the needed income to improve the conditions of the struggling institutions. The current Egyptian Constitution states that instruction in State education institutions is free. Hence a constitutional amendment would be needed for such approach to be implemented.
- Encourage the establishment of more foundation/organization owned/run institutions.
- Promote the introduction and use of latest instructional technologies, “blended” eLearning, and distance and distributed educational approaches. This may not apply to all engineering classes the same way or to the same degree. Innovative ways need to be researched to ensure proper engagement of these tools.

Despite the huge class sizes and the inadequate facilities and laboratories in the government institutions, they are still the favorite for the majority of parents and students alike. Despite all the issues one reads about or even experiences first hand with the government institutions in Egypt, the reputation of the government institutions, especially the lead ones, is still uncompromised.

From personal experience, professors working in US universities who worked with students from different backgrounds testify to the quality of the graduates of Egyptian government engineering universities who are doing their postgraduate studies under their supervision or just taking classes with them. Even the lack of experimental background and experience of those Egyptian students is easily overcome with reasonable exposure and training in the US institution laboratories.

APPENDIX A

History of Engineering Education in Egypt and Cairo University

The beginning of modern engineering education in Egypt dates back to 1816 when the famous Wali; Mohammed Ali Pasha established “Madrasat El-Mohandes-khana” (which means in Turkish Language the School of Engineering). The school was headed by Hassan Effendi known as “El-Darwish El-Mousely” and located in El-Kalaa (the Citadel) district. It remained there until 1834 when it was moved to Boulaq, a district of Cairo.



In September 1854, the school was closed; but four years later in December 1858, a school for irrigation works at the Barrage and a school for building in the Citadel (Cairo) were established.

The two schools were, however, closed in 1861. In 1866, a school of Irrigation and Architecture was re-established by the Khedive Ismail (son of Mohammed Ali Pasha), temporarily in Zaffran Palace, Abbassia (Cairo) and then in the Palace of Moustafa Fadel Pasha located at Darb El-Gamamiz (Cairo) in 1867. In 1866, two separate departments for Irrigation and Architecture were established. The study was extended to five years with the first as a preparatory year, and specialization took place in the final two years of study.

The Royal School of Engineering: In October 1902, the school was moved to a temporary location in the premises of the School of Agriculture at Giza. In 1905, the school was moved the new buildings of the “Royal School of Engineering” bordering Giza Zoo and facing Orman Park and remained there ever sense. In 1916, the school started to offer specialized studies in the final two years in five departments: Irrigation, Architecture, Municipal, Mechanical and Electrical Engineering. In 1925 and 1926, the school underwent major reorganization and expansions.

The Faculty of Engineering: In 1928, Mr. Charles Andrea, the former dean at the School of Engineering of Zurich, Switzerland was appointed as Headmaster of the Royal School of Engineering. Soon afterwards, the syllabi of the school were upgraded to the course of study was increased from four years to five years adding a preparatory year once more. In 1935, the “Royal School of Engineering” was renamed as the “Faculty of Engineering” after being annexed to the “Egyptian (Cairo) University.” The year 1942 marked the start of higher post-graduate studies.

More Departments at the Faculty of Engineering, Cairo University: The evolution of the newly established departments is given hereinafter in chronological order:

1942	Chemical Engineering	1960	Production Engineering and Design.
1944	Petroleum and Mining Engineering.	1976	Biomedical Engineering and Systems
1953	Aeronautics Engineering	1993	Computer Engineering
1959	Metallurgical Engineering		

APPENDIX B

Survey of Engineering Faculties at Egyptian Government Universities

Cairo University

Cairo university was officially inaugurated on December 21, 1908. It became a State University in 1917. School of Law and School of Medicine were the first to be annexed to the State University in 1923. In 1935, the “Royal School of Engineering” was renamed as the “Faculty of Engineering” after being annexed to the “Egyptian (Cairo) University.” The year 1942 marked the start of engineering post-graduate studies.



More Departments

The evolution of the newly established departments is given hereinafter in chronological order:

1942	Chemical Engineering	1960	Production Engineering and Design.
1944	Petroleum and Mining Engineering	1976	Biomedical Engineering and Systems
1953	Aeronautics Engineering	1993	Computer Engineering
1959	Metallurgical Engineering		

Current Status

The Faculty of Engineering comprises at present the following fourteen scientific departments:

Engineering Mathematics and Physics	Aeronautical & Aerospace Engineering
Architectural Engineering	Electrical Power and Machines
Structural Engineering	Electronics & Communications Engineering
Public Works	Chemical Engineering
Irrigation and Hydraulics	Mining, Petroleum and Metallurgy
Mechanical Power Engineering	Biomedical Engineering and Systems
Mechanical Design and Production	Computer Engineering

Engineering faculty members are about 1,000 and the number of under-graduate students is about 14,000, M.Sc. and Ph.D. degrees awarded during 1995/1996 reached nearly 240.

Currently, Cairo University includes 23 Faculties and Institutes serving about 155,000 students with 3,158 faculty members, 2,361 assistant lecturers & demonstrators and 12,233 employees in its main Campus in Giza. In addition, Cairo University has two branches in Beni Suef, Fayoum, and Khartoum, Sudan. The Fayoum branch has an Engineering Faculty which was established in 1983 and has 5 departments: Electrical, Architectural, Industrial, Civil, and Math and Physics.



Alexandria University

In 1938, the Faculties of Arts, Law and Engineering of Cairo University opened extension branches in Alexandria. In 1942, these faculties, together with the Faculties of Commerce, Science, Medicine and Agriculture formed the nucleus of the new university under the name Farouk University. Its name was changed to the University of Alexandria in 1952.



Since the Ptolemy, Alexandria has carried the torch of knowledge and science through its University which provided a haven for philosophers and scientists from diverse disciplines. In Alexandria, the idea about the steam engine had emerged, the first clear scientific idea about the nervous system had formed and the circumference of our planet had been estimated, and so many other things. All the knowledge of that time was collected in its renowned library which contained around 128 thousand books of arts and sciences.

Alexandria was also an economic and industrial center of fame in the ancient world. It provided the main port for exportation of manufactured glass goods, textiles, perfumes and jewelry in addition to wheat and papyrus. Alexandria today comprises an industrial and commercial center encompassing about 40% of the industrial capacity of Egypt.



College of Engineering was established in 1941 and has the following Faculties:

Architecture Engineering Department	Naval Architecture & Marine Eng. Department
Structural Engineering Department	Textile Engineering Department
Transportation Engineering Department	Electrical Eng. Dept (Power and Communications)
Irrigation and Hydraulic Eng. Department	Computer and Automatic Control Department
Sanitary Engineering Department	Nuclear Engineering Department
Mechanical Power Eng. Department	Chemical Engineering Department
Production Engineering Department	Basic Sc. Dept (Math., Physics, and Mechanics)

Ain Shams University

Ain Shams' Faculty of Engineering was established in 1839, which was later developed as the School of Arts and Crafts in 1932, and then it was changed into the school of Applied Engineering. In 1946, it was changed into the Higher Institute of Engineering which was further developed and annexed to Ain Shams University as the Faculty of Engineering in 1950.



The faculty has 753 teaching staff and 9,468 students. It has the following departments.

Automotive Eng.	Architectural Engineering	Computer and Systems Eng.
Structural Eng.	Urban Planning	Design and Production Eng.
Irrigation & Hydraulics	Power and Electrical Machines	Eng. Mathematics & Physics
Public Works	Mechanical Powers	Electronics & Electrical Communications Eng.

Assuit University

Founded in October 1957. One of the top Universities in Egypt located 375 Km south of Cairo in Assuit, Upper Egypt. The Faculty of Engineering enrolls about five thousands of students annually in five departments.

Departments	• Civil Engineering department
• Electrical Engineering department	• Mechanical Engineering department
• Architectural Engineering department	• Mining & Metallurgical Eng. Department

Al Azhar University

Al-Azhar Mosque dates back to 973 AD. In 988, it became a university in which different sciences and religious and mental arts are taught. For over 1000 years, Al-Azhar has remained the impregnable stronghold and mainspring for the sciences of Muslim Jurisprudence and Arabic Language, ever end favoring to propagate them in the various Islamic countries. As a result of Mughul attacks on central Asia and the shrinkage of Muslim rule in Andalusia, Al-Azhar became the only shelter for the scholars who were forced out of their homeland. Those scholars helped Al-Azhar to reach the apex of its glory during the 14th and 15th centuries AD. It should be mentioned here that Al-Azhar played an important role in the development of natural sciences. Some of Al-Azhar scholars studied Medicine, Mathematics, Astronomy, Geography and History. They put much effort to advance these sciences even in times of political and intellectual deterioration and stagnation.



Al-Azhar Faculties B = Boys G= Girls	Cairo, B	Cairo, G	Assuit	Zagazig	Tanta	Mansoura	Menoufia	Damanur	Alexandria	Damietta	Girga	Suhag	Qina	Aswan
Islamic Theology and Da'wa	B		B	B	B	B	B							
Islamic Jurisprudence and Law	B		B		B		B	B						
Arabic Language	B		B	B		B	B	B			B			
Arabic & Islamic Studies	B	G	G			G			G	B		G	B	B
Quranic Studies					B									
Agriculture	B		B											
Commerce	B	G												
Dentistry	B		B											
Education	B													
Engineering	B													
Humanities		G												
Language and Translation	B													
Medicine	B	G	B											
Pharmacy	B		B											
Science	B	G	B											

In 1872 the first law organizing the award of degrees from Al-Azhar was passed. The law also defined the requirements of every degree. In 1930 a second law organizing studies in three different faculties: Islamic Theology, Jurisprudence, and Arabic. In 1961 more faculties were added. Current faculties are tabulated below. The newly introduced faculties are not duplicates of their counter- parts in other universities since they combine both the empirical as well as the religious sciences.

Tanta University

Tanta University started with the faculty of Medicine in 1962 as a branch of Alexandria University It became independent as "The University of Middle Delta" in 1972. In 1973 it was renamed "Tanta University". Engineering was introduced in 1977 in two campuses: Tanta and Kafr El-Shiekh where undergraduate classes began in 1990 and 1991, respectively.

Tanta Engineering Departments		Kafr El-Shiekh Eng. Depts.
Electric Power and Machines Eng.	Mechanical Power Eng.	Electrical Eng. Dept.
Communication and Electronics Eng.	Architectural Eng. Dept.	Civil Eng. Dept.
Computer Eng. and Automatic Control	Structural Eng. Dept.	Architecture Eng. Dept.
Mechanical Production & Design Eng.	Water Eng. Dept.	Mechanical Eng. Dept.
Physics and Engineering Mathematics	Transportation Eng.	

Mansoura University (1973)

Mansoura University was established in 1973. The Faculty of Engineering has the following departments:

Departments	<ul style="list-style-type: none"> • Structure Engineering
• Architectural Engineering	• Electronics and Communications
• Irrigation and Hydraulic Engineering	• Mathematical & Physical Science
• Public Works Engineering	• Textile Engineering
• Control and Computer Engineering	• Industrial Production Engineering
• Mechanical Engineering	• Power and Electric Machines

Zagazig University

Zagzig University started in 1969 as a branch of Ain-Shams University then became independent in 1974. Now, it includes 21 faculties and Higher Institutes; seven Faculties at Benha, One Faculty at Moshtohor, and the rest of Faculties and Institutes are at the main campus in Zagazig. Zagazig’s Engineering, was started in 1978, while Benha’s was founded in Shoubra in 1976.

Helwan University

Helwan University was established in 1975. It has two Engineering Faculties in both Helwan and Mataria which started as high institutes in 1960 and 1965, respectively.

Departments at Helwan’s Engineering	Departments at Mataria’s Engineering
Production Engineering	Mechanical and Power Engineering
Electronics & Communications Eng.	Automotive and Tractor Engineering
Electrical Machines & Power Engineering	Architecture Engineering
Biomedical Engineering	Civil Engineering
	Mechanical design

Minia University

Faculty of Engineering & Technology started as High Industrial Institute in 1957 then joined Minia University in 1976.

- | | |
|-----------------------------|---|
| Departments | • Electrical Engineering |
| • Architectural Engineering | • Automotive and Tractors Engineering |
| • Chemical Engineering | • Production Engineering and Design |
| • Civil Engineering | • Mechanical Power and Energy Engineering |

Degree	BS	Dip	MS	PhD
# of Students	3443	5	125	25

Faculty	Total	Males	Females	% Females
University wide	33282	17979	15303	49%
Engineering	3635	2865	770	21%

148 full-time staff members, and 61 teaching assistants

Menoufia University

Menoufia University was established in 1976. It has three Engineering Faculties in Shebin Elkom, Menouf, and Sadat City. Shebin Elkom's faculty is the largest of the three and has now 3745 undergraduate students and 282 staff member and Assistants.

Faculty of Engineering, Shebin Elkom	Faculty of Electronic Engineering, Menouf	Faculty of Engineering Bio-Technology, Sadat City
High institute in 1958	High institute in 1965	Established in 1990
Architectural Engineering Electrical Engineering Mechanical Power Engineering Design and Production Engineering Civil Engineering Basic Sciences Engineering (Math and Physics)	Electronic and Electrical Communications Industrial Electronic and Control Computer Science and Engineering Physics and Eng. Mathematic	Molecular Biology Biotechnology of Microorganisms Plant Biotechnology Animal Biotechnology Industrial Biotechnology Environmental Biotechnology Social Biotechnology Molecular Diagnostics Bioinformatics

Suez Canal University

The Suez Canal University was established in 1976 to help develop the Suez and Sinai areas in Egypt. It has two faculties of engineering:

- *Faculty of Petroleum & Metallurgical Engineering (Suez)*

The faculty was first established in 1961 as the "Industrial Higher Institute of Petroleum and Mining." in Suez. In 1976 it joined the Suez Canal University as "Faculty of Petroleum and Mining Engineering" in Suez. Currently, the faculty has seven departments:

Academic Departments	Mining Engineering
Petroleum Engineering	Geological Engineering
Oil Refinery Engineering	Science & Mathematics
Metallurgy Engineering	Engineering Sciences

- *Faculty of Engineering & Technology (Port Said)*

The Faculty was established in 1961 as a higher institute (Shipbuilding, Production Engineering, Mechanical Engineering and Electrical Engineering). In 1976 it joined the Suez Canal

University as “Faculty of Engineering and Technology” in Port-Said. Currently, the faculty has seven departments:

Academic Departments	Electrical Engineering
Physics and Engineering Mathematics	Maritime Engineering & Ship Architecture
Architecture and Architectural Planning	Mechanical Engineering
Civil Engineering	Production Eng. and Mechanical Design

South Valley University

South Valley University began in October 1970 as branch of Assuit University. The University was separated in 1995. Its headquarters is located in Qena, a city which is 600 km South of Cairo. The University is comprised of five campuses which are Quena, Sohag, Luxor, Aswan, and Hurgada campuses. The university’s Faculty of Engineering is located in Aswan.

The Military Technical College, Cairo, Egypt

The Military Technical College was established in 1958 in cooperation with the Czechoslovak Military Academy, Brno, Czechoslovakia. The scientific foundation and the teaching plans were laid down by a group of Czech experts and Egyptian university professors. Since 1977 the term of the Czech experts ended and the college started to depend totally on its own staff. In 1978 the college was assigned the mission to start postgraduate studies for military engineers. MTC serves cadets from different Arab and African countries as well.

APPENDIX C

[Survey of Engineering Faculties at Egyptian Private Universities](#)

Organization/Foundation Private Institutions

American University of Cairo

The American University in Cairo was founded in 1919 by Americans devoted to education and service in the Middle East. For its first 27 years the university was shaped by its founding president, Dr. Charles A. Watson. He wanted to create an English-language university based on high standards of conduct and scholarship and to contribute to intellectual growth, discipline, and character of the future leaders of Egypt and the region. He also believed that such a university would greatly improve America's understanding of the area.

In 1993 the AUC academic programs were organized into three schools: Humanities and Social Sciences; Sciences and Engineering; and Business, Economics and Communication. AUC has an Interdisciplinary Engineering Programs (IEP) which administers the admission of students into the engineering program and the student's affairs before declaration of one of the three engineering majors: Construction, Electronics, and Mechanical. Upon completion of certain required credit hours students declare one of these majors.

Arab Academy for Science and Technology

AAST is the educational institution of the Arab League engaged in teaching, training, research work, community service, and projects. AAST's main campus is located in Alexandria with service programs in Saudi Arabia and Kuwait, and branches in United Arab Emirates, Bahrain, Qatar, in addition to the new branch in Cairo.

In 1972, the Academy was established to include the Marine Engineering Department which offered a two year program of basic studies for engineering cadets as well as upgrading courses for marine engineers. In October 1975, the radio and electronics department was established to offer a two-year program leading to the competency certificate of second class program radio officer. The year of 1978 witnessed the beginning of the Bachelor of Engineering (B. Eng.) program plans in two major areas of conduction: marine engineering and electronic engineering. The formal decree to establish the College of Engineering and Technology was issued in November 1990. Currently, the college has eight departments in addition to the Marine Engineering Department in the College of Maritime Transport.

College of Engineering & Technology	
Computer Engineering	Construction and Building Engineering
Mechanical and Marine Engineering	Industrial and Management Engineering
Electronics and Communications Engineering	Architectural Engineering and Environmental Design
Electrical and Control Engineering	Basic and Applied Sciences
College of Maritime Transport	
The Marine Engineering Department	

In the postgraduate domain, the college offers a master of engineering (M. Eng.) degree in Seven Programs:

M. Eng. Programs	Mechanical Engineering
Electronics and Communication Engineering	Electrical and Control Engineering
Computer Engineering	Engineering Management
Marine Engineering	Construction and Building Engineering

Higher Technological Institute

The institute was established in 1988 by the Foundation for New Urban Communities as the first "private" school of higher engineering education in Egypt and soon became the model for the private university level education in the country. HTI has two branches at the 10th of Ramadan City and the 6th of October City. HTI has about 4000 students in seven engineering departments.

Academic Departments	Chemical Engineering
Mechanical Engineering	Textile Engineering
Electrical and computer Engineering	Architecture Engineering
Civil Engineering	Biomedical Engineering

The Four “New” Private Universities

Misr International University

Misr International University was established in 1996 and has three engineering departments: Engineering Architecture Dept., Engineering Electronics & Communication Dept., and Computer Engineering Dept.

October University for Modern Sciences and Arts

October University for Modern Sciences & Arts was established in 1996 and has a Faculty of Engineering which offers three B.Sc. degrees in Electrical Engineering: Computer Engineering – Electronics - Communication, Architectural Engineering, and Industrial & Systems Engineering.

Misr University for Science and Technology

Misr University for Science & Technology was established in 1996 and has a College of Engineering. The college offers courses of study leading to bachelor's degrees in Construction Engineering, Architectural Engineering, Industrial and Systems Engineering, Computer and Software Engineering, Electronics and Communications Engineering, Biomedical Engineering.

October Sixth University

October Sixth University was established in 1996 and has a Faculty of Engineering which offers programs of study leading to bachelor's degrees in Architectural Engineering, Building & Construction Engineering, Computer Engineering, Electrical Engineering, and Industrial Engineering Mechatronic Engineering.

APPENDIX D

ELECTRONICS AND COMMUNICATIONS ENGINEERING CURRICULUM (Page 1 of 3)

Cairo U, 1960		Cairo U, 1970		Cairo U, 2000		AAST		MUST	
Subject	Cr Hrs	Subject	Cr Hrs	Subject	Cr Hrs	Course Title	Cr Hrs	Course Title	Cr Hrs
First Year									
Engineering Mathematics	9	Engineering Mathematics	9	Engineering Mathematics	10	English (1)	2	English I	3
Engineering Physics	9	Engineering Physics	9	Engineering Physics	10	Mathematics(1)	3	Calculus I	3
Engineering Mechanics	5	Engineering Mechanics	5	Engineering Mechanics	6	Physics (1)	3	Physics I	3
Engineering Chemistry	5	Engineering Chemistry	5	Engineering Chemistry	2	Intro to Computers	3	Intro to Computers	3
Engineering Drawing	4	Engineering Drawing	4	Engineering Drawing	4	Eng Drw - Descriptive G	2	Engineering Graphics I	2
English Language	2	English Language	2	English Language	2	Engineering Mechanics	3	Engineering Mechanics I	3
Production Engineering	3	Production Engineering	3	Production Technology	2	History of sc & Tech	2	Intro to Engineering	2
Descriptive Geometry	6	Descriptive Geometry	6	Descriptive Geometry	2	English (2)	2	English II	3
Intro to Engineering	2	Intro to Engineering	2	History Of Eng Sciences	2	Mathematics (2)	3	Calculus II	3
Humanities	2	Arab Society	2	Computer Programming	2	Physics (2)	3	Physics II	3
						Manufacturing Tech	2	Manufacturing Tech	2
						Engineering Mechanics	3	Eng Mechanics II	3
						Chemistry	2	Chemistry	3
						Structured Programming	3	Engineering Graphics II	2
Total Hours	48	Total Hours	48	Total Hours	42	Total Hours	36	Total Hours	38
Second Year									
Mathematics	9	Mathematics	9	Mathematics (2)	12	Technical Report Writing	3	English III	3
Physics	11	Physics	5	Physics (2)	8	Mathematics (3)	3	Vector Algebra Calc III	3
Surveying	3	Electromagnetism	5	Electric & Magnetic field	4	Solid State Electronics	3	Electronics I	3
Theory of Structures	5	Structural Analysis	5	Meas and Lab.(1)	4	Electrical Circuits (1)	3	Circuits I	3
Building Construction	3	Civil Engineering	5	Civil Engineering	2	Programming Appl	3	Logic Design	3
Production Engineering	5	Production Engineering	5	Mechanical Eng (1)	6	Aesthetic Edu Art Appr	3	Physics III	3
Mechanics	5	Mechanics	5	Circuits (1)	4	Mathematics (4)	3	Lin Algebra and Diff Eq	3
Materials Testing	3	Prop & Strength of Mat	5	Microprocessor	4	Electronic Devices (1)	3	Electronics II	3
Machine Drawing	5	Engineering Drawing	3	Humanities (2)	2	Electrical Circuits (2)	3	Circuits II	3
		Egyptian Revolution	2			Measurements & Instrum	3	Electromagnetic I	3
						Digital Logic Design	3	Basic Mechanical Eng	3
						Scientific Thinking	3	Fluid Mechanics	3
								Arabic I	3
Total Hours	48	Total Hours	49	Total Hours	46	Total Hours	36	Total Hours	39

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ELECTRONICS AND COMMUNICATIONS ENGINEERING CURRICULUM (Page 2 of 3)

Cairo U, 1960		Cairo U, 1970		Cairo U, 2000		AAST		MUST	
Subject	Cr Hrs	Subject	Cr Hrs	Subject	Cr Hrs	Course Title	Cr Hrs	Course Title	Cr Hrs
Third Year									
Mathematics	7	Mathematics	9	Mathematics (3)	4	Electronic Devices (2)	3	Electronics III	3
Metallurgy	3	Electronics	5	Electronics (1)	4	Electr Cir Synth / Anal	3	Circuits III	3
Materials Testing	3	Electrical materials	5	Electronics (2)	4	Computer Organization	3	Microprocessors	3
Circuits	5	Circuits	5	Circuits (2)	4	Mathematics (5)	3	Eng Prob and Statistics	3
Electrical Technology	11	Electr Energy Conv	5	Electrical Power Eng	4	Electrical Power & Mach	3	Electromagnetic II	3
Heat Engines	7	Thermo & Heat Transfer	5	Meas and Lab.(2)	4	Communication Theory	3	Exp Methods for Engrs	3
Fluid Mechanics	3	Fluid Mechanics	5	Logic design	4	Mathematics (6)	3	Signal Analysis I	3
Th. & Design Machines	9	Theory of Machines	5	Mechanical Eng (1)	4	Electronic Circuits (1)	3	Electrical Power Eng	3
Mechanics	5	Mechanics	5	Electr Signal Analysis	4	Electromagnetics (1)	3	Measurements I	3
		Dev of Egyptian Society	2	Applied Statistics	2	Comm Systems (1)	3	Communications I	3
				Computer Engineering(1)	2	Numerical Analysis	3	Prog and Algorithms	3
						Electronic Materials	3	Heat Transfer	3
								Scientific Thinking	3
Total Hours	51	Total Hours	51	Total Hours	40	Total Hours	36	Total Hours	39
Fourth Year									
Mathematics	7	Applied Mathematics	5	Mathematics (4)	4	Electronic Circuits (2)	3	Electronics IV	3
Electronics	5	Electronics	7	Electronics (3)	4	Communications Sys (2)	3	Communications II	3
Electrical Testing	3	Electrical Testing	3	Measurements & Lab.(3)	4	Electromagnetics (2)	3	Electromagnetic III	3
Radio Engineering	5	Radio Engineering	7	Electromagnetic Waves 1	4	Intro to Microprocessors	3	Comp Interfacing Preph	3
Telephony & Telegraphy	5	Wire Communications	7	Communications (1)	4	Operation Research	3	Systems Engineering	3
Electr Meas & Instrum	7	Electr Meas & Instrum	7	Automatic Control (1).	4	Automatic Control Sys	3	Measurements II	3
Electrical Machines	7	Electr Energy Conv	7	Electrical Machines.	4			Numerical Analysis	3
Electrical Power Eng	7	Electrical Power Eng	5	Computer Engineering(1)	4	Electronic Circuit (3)	3	Electronics V	3
Heat Engines	5	Thermal Power Eng	5	Elective (1)	4	Communication Sys (3)	3	Communications III	3
		Industr Econo Legistl	2	Systems Analysis	2	Modern Control Eng	3	Control I	3
				Eng economics and Laws	2	Wave Prop & Antennas 1	3	Digital Signal Proc I	3
						Elective Course	3	Active Circuits	3
						Engineering Economy	3	Basic Civil Engineering	3
								Humanities	3
Total Hours	51	Total Hours	52	Total Hours	40	Total Hours	36	Total Hours	42

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ELECTRONICS AND COMMUNICATIONS ENGINEERING CURRICULUM (Page 3 of 3)

Cairo U, 1960		Cairo U, 1970		Cairo U, 2000		AAST		MUST	
Subject	Cr Hrs	Subject	Cr Hrs	Subject	Cr Hrs	Course Title	Cr Hrs	Course Title	Cr Hrs
Fifth Year									
Electronics	9	Electronic Engineering	9	Electronics (4)	6	Communication Sys (4)	3	Communications IV	3
Wave Prop & Antennas	7	Wave Prop & Antennas	7	Electromagnetic Waves(2)	6	Electronic Measurements	3	Advanced Electronics	3
Telephony & Telegraphy	8	Wire Communications	7	Communications (2)	6	Project (1)	3	Senior ECE Project	3
Electronic Measurements	8	Electronic Meas & Testing	8	Measurements & Lab.(4)	2	Wave Prop & Antennas(2)	3	Satellite Communications	3
Graduation Project.	3	Graduation Project.	3	Graduation Project.	6	Elective Course	3	Real Time Comp systems	3
Industrial Economics	2	Computers	2	Microprocessor	4	Elective Course	3	Adaptive Filters	3
Radio Engineering	9	Radio Engineering	9	Elective (2)	4			Elective Course	3
Acoustics	5	Acoustics Engineering	5	Elective (3)	4	Project (2)	3	Senior ECE Project	3
		Automatic Control	3	Elective (4)	4	Int'l Business & Mgmt	3	Engineering Economy	3
		Industrial Electronics	3	Active Circuits	4	Digital Signal Processing	3	Comm Networks I	3
						Microwave Technology	3	Computer Networks I	3
						Elective Course	6	Elective Course	9
Total Hours	51	Total Hours	55	Total Hours	46	Total Hours	36	Total Hours	42
Total Program Hours	249	Total Program Hours	255	Total Program Hours	214	Total Program Hours	180	Total Program Hours	200
Cairo University does not use the Credit Hour System									
Notes									
English	2	English	2	English	2	English	7	English	9
Humanities	2	Humanities	6	Humanities	2	Humanities	8	Humanities	5
Interdisciplinary	50	Interdisciplinary	42	Interdisciplinary	14	Interdisciplinary	2	Interdisciplinary	14
No Electives		No Electives		Technical Electives	12	Technical Electives	12	Technical Electives	12
Technical Electives at AAST					Technical Electives at MUST				
Selected Topics in Electronics		Optical Communications			Selected Topics in Electronics Eng			Optical Fiber Communications	
Satellite Communications		Applied Telecommunication Systems			Selected Topics in Comm Engineering			Statistical Communications	
Communication Systems (5)		Digital VLSI Design			Information Theory and Coding			Radar Communications	
Mobile Communications		OptoElectronics			Mobile Communications			Speech and Image Processing	
Biomedical Electronics		VLSI Fabrication & Testing			Power Electronics I			Pattern Recognition	
Acoustics		Media & Entertainment Eng.			Expert Systems			Neural Networks	

Bibliographical Information:

Government Institution		Web Site
1	Cairo University	http://www.cu.edu.eg/
2	Alexandria University	http://www.alex.edu.eg/
3	Ain Shams University	http://www.asunet.eun.eg/
4	Assuit University	http://www.aun.eun.eg/
5	Tanta University	http://www.tanta.edu.eg/
6	Mansoura University	http://www.mans.eun.eg/
7	Zagazig University	http://www.zu.edu.eg/
8	Helwan University	http://www.helwan.edu.eg/
9	Minia University	http://www.minia.edu.eg/
10	Menofia University	http://www.menofia.edu.eg/
11	Suez Canal University	http://www.suez.edu.eg/
12	South Valley University	http://svu.edu.eg/
Special "Private" Universities		
13	Al-Azhar University	http://www.alazhar.org/english/about/alazharuniv.htm
14	American University in Cairo	http://www.aucegypt.edu/
	Arab Acad. Sc. & Tech*	http://www.aast.edu/
Private Institutions		
15	Misr University for Sc. & Tech.	http://www.must.edu/english.htm
16	Misr International University	http://www.miuegypt.com/index.htm
17	October Univ. for Modern Sc. & Arts	http://www.msa.eun.eg/main.jsp
18	6 October University	http://www.o6u.edu.eg/
19	Higher Technical Institute	http://www.stormloader.com/htisb/hti/
Other Links		
	Supreme Council of Universities	http://www.scu.eun.eg/eng/scu-eng.htm
	Engineering Directory in Egypt	http://www.egypteng.com/

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