

The importance of french education for engineers

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French education for engineers is significantly different from that of the United States. This fact will be the topic of this paper as well as the sequencing of French education. There are four schools in France that provide for the bulk of the engineering education after high school. These are called National Instituts For Applied Sciences or INSA. These institutions are very comprehensive and high level.

The National Instituts For Applied Sciences or INSA take students who have completed their secondary school studies and select them on the basis of their examination results and their academic records. The recruitment is highly selective. In 1991, 11, 000 candidates with a science baccalaureat applied for about 1, 200 places.[1] It is therefore obvious, that the INSAs attract students with a high level of scientific education in mathematics, physics and chemistry.

The studies begin with a two-year basic study program in the Premier Cycle, which is comprised of general science courses in mathematics, physics, chemistry, mechanics and computer science. These courses are also complimented with courses in the Liberal Arts. The students who pass the first and second year exams are admitted to the Engineering Departments where they continue their studies for three additional years. This enables the students to specialize in nearly all the different engineering sciences: computer studies, mechanics, physics, chemistry and biochemistry. One original aspect of the INSAs is that, the number of students in a department can vary depending on the state of employment prospects. All the INSAs train their students according to the same principles and curricula as the other four institutions.

The First cycle is a two-year program of common core classes that welcomes secondary school graduates. Its goal is to prepare students for entry into one of the Institute's specialized departments. The initial qualifications of those who apply for admission to INSA guarantee the high quality of the students: 80% of them graduate in 5 years and 5% in 6 years. [1] Engineering studies start concurrently with the first year of their training. After a two-year preparatory phase, the first cycle begins putting an ambitious regiment into place.

The goal of this regiment is, first of all, to give students the common scientific, technical, and liberal arts training necessary for all departments. In order to achieve this goal, course work is divided into modules that are independent of each other. The second goal of the regiment is to encourage students to make the transition from high school student to a responsible higher level student with clearly defined professional goals. As a result of the quality of these different goals, the first cycle plays an important role in both engineering sciences as well as the liberal arts through both years.

EURINSA is another two-year European first cycle in engineering studies that has, since 1991, been training European students (including French students) to be part of an international team. The scientific training, conducted in French but adapted to engineering students from different backgrounds (language abilities), allows the students to enroll in any one of the four INSAs in France or even in one of their European counter parts. The program is open to approximately 100 students (at each institution) of whom 1/3 are French, 1/3 are from other European countries, and 1/3 from Central and Eastern Europe.[3]

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The INSAs produce highly qualified engineers. There are some main differences between studying at an INSA and in the universities of the other European countries. One difference is that French students specialize only at the end of the first two years (the "Premier Cycle"). This form of training provides them with a vast scientific background, which guarantees a good overall training in the engineering sciences. This method also allows them to change their area of concentration, if necessary during the course of their career.

As the INSAs and the "Grandes Ecoles" are highly selective, very few students drop out during the Premier Cycle whereas, in the traditional university system, there is a high dropout rate or at least a decision to change their course of study. Unlike the University system, the students at an INSA have many general courses. Although all European countries announce a training scheme which lasts approximately 5 years, the fact that attendance is not 100% and that students are permitted to repeat years, means that becoming a qualified engineer could take two or three years longer.[3]

Engineering training fields and engineer status differ widely among countries. In other European Countries as well as the United States for example, the seemingly simple problem of correspondence among degrees, not to mention equivalence, is far from being solved, and the notion of harmonizing the numerous systems does not seem realistic. Educational system's specifications are deeply rooted in the country's culture, industry and economy.

Large discrepancies appear in Europe between: kinds of high-school studies and their length before college entrance, means of student recruitment, length of training (in terms of number of years of study), degree awarding, academic recognition, professional recognition, etc. In many countries, two engineer profiles coexist: a design engineer with a broad background training, and a production and application engineer. For each profile, there are nevertheless important national particulars.

With such diversity, one may understand why a foreign candidate admission in a French engineering college does not assume automatic level equivalence rules. Instead results from various factors: number of study years, major and minor fields of studies, major projects, etc. Therefore, there is only one European general objective in this area, dealing with recognizing degrees obtained after at least three higher education years. These are valued for entrance in professions having regulated access. Because of this definite lack of equivalence standards, Europeans have decided to develop student and professional mobility by recognizing and validating studies engaged in at colleges in other countries .

This process has strongly developed in some cases, through the development of programs leading to double degrees, or through the E. C. T. S. project (European Credit Transfer System), based on academic credits which are transferable within higher education institutions of the European Union.[3] Institutions wishing to participate in E. C. T. S., particularly those following non-university framework, must make great efforts to adapt. They have to reorganize their training programs or curriculum with credit hours and they have to use a universal grading scale.

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The University of Technology of Compiègne (UTC) was the first French engineering school to engage in ECTS in the field of mechanical engineering. Other schools, like INSA of Lyon have more recently done the same. Apart from this very structured system, recognition of study periods among institutions from several countries appears more and more to be an essential component of an international open policy.

Partnership agreements exist also with American universities, for instance between the Institut National Polytechnique de Lorraine and Kansas State University and University of Wisconsin at Madison. Developing this practice and expanding the student exchanges depends on firm relationships between foreign schools. A new attitude has developed, where one takes notice of differences between systems, without making value judgements. Thus, these new relations are creating more awareness of the equivalence problem and providing better methods for rectification.

The École Polytechnique constitutes the "graduate schools." It takes 2 to 3 years of study and, in 1993, there were 46,000 students enrolled in the second cycle.[3] Each year, the École Polytechnique admits slightly more than 400 students into the Second Cycle, via traditional competitive examinations.[4] These students are of both sexes, may be either French or foreign, and are approximately 21 years old. The instructional program for the Second Cycle consists of two years of advanced courses in the fundamental sciences. The program is evenly divided between a core curriculum, and an elective curriculum that includes individual research projects.

All students follow the core curriculum, which includes courses in pure and applied mathematics, computer science, mechanics, physics, chemistry, biology and economics. The core curriculum also includes courses in the humanities and social sciences, as well as in several modern languages.

Upon successful completion of these two years, students are awarded the diploma of Ingenieur de l'École Polytechnique. Relatively few of them begin their careers upon graduation. The vast majority of graduates choose to follow their studies with specialized training in engineering or business administration, or with the preparation of a doctoral degree.

The French nationals, in view of the obligations of their status as polytechniciens, may choose to pursue technical training in France, at one of its engineering schools (such as the École des Mines, the École des Ponts et Chaussées, or the École des Télécommunications) They complete their last two years of education, and receive the corresponding Diplôme d'Ingenieur.

Since 1996, French nationals have undertaken such training at foreign institutions, in Europe, America or Asia: they have a choice among 100 different instructional programs, at 29 foreign institutions, leading to an Engineering degree or a Masters of Applied Science or Engineering, depending on the institution selected.[3] These programs generally require between two and two and a half years. Special arrangements with the École facilitate admission to some of these institutions.

After research training in France or at a foreign university, engineering school, or public or private research center, approximately four years, they obtain a doctoral degree, a Ph. D. or a similar degree in a basic or applied

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science. For business studies abroad, after several years of practical experience, they earn an MBA degree at one of seven institutions. Foreign students may undertake specialized training or prepare dissertations at institutions of their choice, including, of course, their home institutions. The past shows, however, that they tend to favor the programs offered to their French classmates. In any case, the École attempts to arrange that the two years of study at Palaiseau be properly validated in the programs of the students' home universities. Foreign students are entitled to the same agreements as those offered to French nationals.

The École Polytechnique's Second Cycle in the fundamental sciences together with a specialization acquired at another first class institution, represents a training that is proving to be in particular demand in today's economic market place. Indeed, each year large corporations come forward with expressions of their needs and suggestions as to where they believe the necessary applied training may best be obtained.