

# 스위스의 공학교육

## 외국 공학교육제도 (5)

### Engineering Education System in Switzerland

#### 1. Introduction

Switzerland may be a small country, but it is still remarkably difficult for foreigners to understand. History and geography are the main culprits here. Situated in the heart of Europe, Switzerland is the meeting point of three great European linguistic and cultural traditions (French, German and Italian). Its historical development has also been unique, producing a state that is organized internally into 26 cantons and half cantons (provincial states), each still enjoying great autonomy.

The strong federal tradition of Switzerland is reflected in its educational system. Primary and secondary education are essentially the responsibility of each canton, while responsibility for higher education is shared between the cantons and the Confederation. This has resulted in an pronounced diversity of the higher education system. It consists of 12 Universities, plus about 120 Advanced Vocational Colleges that offer a professional rather than an academic education in a wide range of subjects. Switzerland today has the following Universities:

- ◆ 2 Federal Institutes of Technology (EPF Lausanne and ETH Zurich) with four associated research institutes
- ◆ 7 fully fledged Cantonal Universities (Basel, Berne, Fribourg, Geneva, Lausanne, Neuchâtel tel, and Zurich) and the specialized University of St. Gallen
- ◆ 2 small cantonal university-level institutions: the University College of Lucerne, and the Università della Svizzera italiana (University of Lugano) founded in Ticino in 1996.

In German-speaking Switzerland there are the Universities of Basel, Berne, Lucerne, St.

Gallen and Zurich as well as the ETH Zurich. The French-speaking region has the Universities of Geneva, Lausanne and Neuchâtel, plus the EPF Lausanne. The University of Fribourg is bilingual (French and German). The University of Lugano lies in the Italian-speaking region.

## 2. Manageable units despite strong growth

At present, around 90,000 students are enrolled. After a long period of rapid growth, the number of students has leveled off somewhat in recent years. The variations between Swiss universities have not had a negative effect on the quality of the higher education system. In contrast to other West European countries, Switzerland has not seen the growth of almost unmanageable monster universities. Thanks to the federal structure of this country, students are distributed across small-to medium-sized-and sometimes specialized-universities, which have remained easy to comprehend and to administer-though the largest Swiss university, Zurich, has reached a significant size with some 20,000 students. The special features of Switzerland university system are:



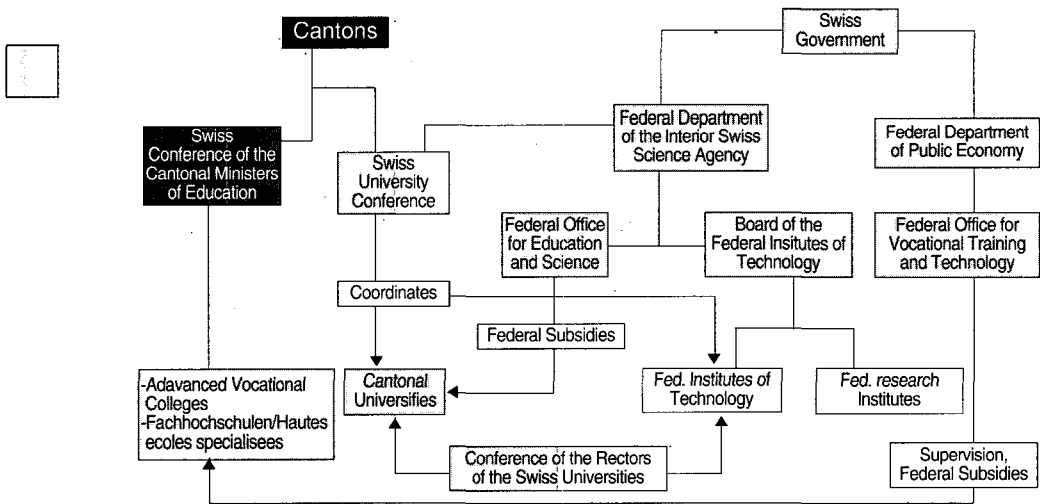
- (1) No Numerus Clausus so far
- (2) More autonomy and efficiency
- (3) “Silent partner” of the EU
- (4) Improve coordination
- (5) Federal Institute of Technology : Besides the traditional universities and the Federal Institutes of Technology there are a few institutions, modest in size, that offer a limited curriculum in the field of higher education and award academic diplomas.
- (6) High-quality teaching and research : The advantage of moderate size can be seen in the fact that the internationally recognized high quality of teaching and research has been maintained. Numerous indicators such as the Science Citation Index, as well as evaluations carried out in recent years by international experts, have confirmed this achievement. Publicly financed research is given emphasis in Switzerland - more than in most other countries - in its universities and Federal Institutes of Technology, through the classic academic trio of teaching, research and service. The traditional Swiss universities thus have the potential to expand their role as “research universities”.
- (7) Competitive, thanks to international networks : Swiss universities have always been international in their outlook. A large percentage of teaching staff has traditionally consisted of non-Swiss; at the two Federal Institutes of Technology the proportion is about one third. In the amount of non-Swiss students, too,



Switzerland stands at the peak on an international scale. On average, they account for some 20% of the students body. Among the post-docs it is even higher. How strong the Swiss university system has developed its international relationships is indicated by over 500 formal cooperation agreements that have been concluded with partner institutions in many countries.

### 3. Swiss Education System

The federal structure of Switzerland developed over centuries has resulted in each canton building up its own educational system. In addition, the federal authorities also play a role in education. As a result, one cannot talk of a single Swiss educational system, but rather of a network of cantonal, federal and mixed bodies, which are responsible for the management and coordination of this system. Most of the administrative bodies for higher education are also responsible for research.



Organization of higher education in Switzerland

Education in Switzerland is primarily the responsibility of the cantons, and some of them - Basel, Berne, Fribourg, Geneva, Lucerne, Neuchâtel, St. Gallen, Ticino, Vaud and Zurich - run their own cantonal university or university college. All the cantons have one organization in common. The federal government plays a twofold role in the administration of Education. The federal Constitution authorizes the Confederation on the hand to subsidize the cantonal universities, and on the other to set up its own institutions of higher education, in

particular the two Federal Institutes of Technology. In addition, the Confederation promotes scientific research.

Representing all the cantons, the Confederation safeguards higher education and research on a national scale: it encourages coordination among the universities and their study programs according to the country's needs and capacities as viewed from a general standpoint.

The Confederation's responsibilities in the field of education and research are exercised through two federal ministers: the Federal Department of the Interior and the Federal Department of Public Economy.

#### 4. Important Engineering Education Institutes in Switzerland

##### (1) Ecole Polytechnique Fédérale de Lausanne (EPF Lausanne)

- Languages of instructions : French, English
- Number of Students : 4,500
- Proportion of women : 17%
- Proportion of non-Swiss : 24%
- Graduates per year : 500
- Doctorates per year : 130
- Expenditure per year (incl. research) : CHF 410 million
- Source of funds : Confederation: 78.0%, Swiss National Science Foundation: 4.5%, Commission for Technology and Innovation: 2.5%, Other (Industry, etc.): 15.0%
- Teaching and Research Areas (Faculties): Civil Engineering, Rural Engineering, Mechanical Engineering, Micro-Engineering, Electrical Engineering, Communication Systems, Physics, Chemistry and Chemical Engineering, Mathematics, Computer Science, Materials Science and Engineering, Architecture
- Cooperation agreements with universities outside Switzerland: 110 bilateral agreements, 40 international student exchange programs, participation in 180 European research and development programs



##### (2) Eidgenössische Technische Hochschule Zürich (ETH Zürich)

- Language of Instructions : German and English, partly French
- Number of students : 11,700
- Proportion of women : 24%
- Proportion of non-Swiss : 10%
- Graduates per year : 1,400
- Doctorates per year : 450



- Expenditure per year (incl. research) : CHF 960 million
- Source of funds(1996): Confederation: 86.7%, Cantons: 0.1%, Swiss National Science Foundation: 3.7%, Others (Industry, etc.): 9.5%
- 19 Academic department : Architecture, Civil Engineering, Rural Engineering and Geodetic Sciences, Mechanical and Process Engineering, Electrical Engineering, Computer Science, Materials Science, Industrial Management and Manufacturing, Mathematics and Physics, Chemistry, Biology, Earth Science, Environmental Science, Pharmacy, Agriculture and Food Science, Forest Sciences, Human and Social Sciences (no degrees), Military Science (no doctorate), Physical Education (no doctorate)
- Cooperation agreements with university outside Switzerland : Joint Research: 14, Bilateral student exchange schemes: 175

(3) Paul Scherrer Institut (PSI)

- Number of staff : 1100
- Number of doctoral candidates : 230
- External users : approx. 650
- Annual budget : CHF 182 million
- Source of funds : Confederation: 85.7%, Third parties: 14.3%



(4) Eidgenössische Forschungsanstalt für Wald, Schnee und Landschaft (WSL)

- Number of staff: 350
- Annual budget : CHF 50 million
- Source of funds : Confederation: 58%, Other federal agencies: 34%, Third parties: 8%

(5) Eidgenössische Materialprüfungs - und Forschungsanstalt (EMPA)

- Number of staff : 775
- Annual budget : CHF 114 million
- Source of funds : Confederation: 60%, Federal and industrial orders, third parties: 40%

(6) Eidgenössische Anstalt für Wasserversorgung, Abwasserreinigung und Gewässerschutz (EAWAG)

- Number of staff : 400
- Number of doctoral candidates : 80
- Consulting mandates apart from the Confederation : 40
- Annual budget : CHF 38 million
- Source of funds : Confederation: 89.5%, Other parties: 10.5%

