

## **QUALITY ASSURANCE IN ENGINEERING EDUCATION : STATE OF THE ART IN FRANCE AND EUROPE**

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Accreditation agencies must play a key role to educate new generations of engineers better prepared to face the new global development challenges. Nowadays, they must fulfil their missions in awareness of societal and professional challenges and in permanent exchange with the different stakeholders.

By establishing appropriate standards and guidelines, accreditation agencies can act as catalysts for the implementation by higher education institutions of strategies for addressing these challenges. Furthermore in a worldwide context, they have to provide employers, students and the general public with clear information on the engineering program outcomes to facilitate the international mobility of students and professionals.

These challenges must be addressed taking into account the diversity of the national education systems and regulations for the engineering profession. The agencies have to elaborate common standards and procedures, while preserving the national cultural and economic specificities.

The European situation is very illustrative in this respect; at the turn of this century, the so-called "Bologna process" was launched. Its aim was "to strengthen the competitiveness and attractiveness of the European higher education area and to foster student mobility and employability through the introduction of a system based on undergraduate and postgraduate studies with easily readable programs and degrees".

Ten years later, almost 50 countries have joined the European Higher Education Area (EHEA) and have adopted the Standards and guidelines for Quality assurance, shaped by the ENQA association.

The engineering education evolution illustrates the ambition of the process and the efforts needed in each country in order to comply with common standards. In some countries the engineering profession is regulated (e.g. in Spain or Italy), in others it is not (e.g. in France or Germany). In some countries, the engineering degree is a bachelor, in others it is a master (e.g. in France), in some cases, the two levels coexist (e.g. in Germany). The accreditation systems themselves differ widely: program accreditation by professional societies or agencies, academic institutional accreditation, or mere external quality evaluation.

At last, one may observe a wide range of the expected programs outcomes; in some countries, an engineer is rather an expert in a specific technical domain; in others, he(she) is more a project or team manager with a scientific background.

### Engineering education in France

CTI (*Commission des Titres d'Ingénieur*) is the French body in charge of accrediting engineering degrees in France and abroad; it establishes the standards for the higher education institutions (HEIs) which wish to deliver engineering diplomas and defines the general competence profile of engineering degrees.

Created in 1934, it is a non-profit institution with 32 members: 16 from academia and 16 from employer organisations and engineer associations. About 160 HEIs are accredited to deliver the "titre d'ingénieur diplômé" (MSc in engineering), more than 30 000 engineers graduate each year. CTI also performs accreditation outside France (China, Viet Nam,

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## Engineering Education and Accreditation, Abstract Template

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Belgium, Bulgaria, Switzerland, Morocco, etc.). There are more than 500 000 active “ingénieurs diplômés” in France and abroad.

The CTI standards shape a “generalist” engineering professional with a strong and broad basis in fundamental sciences, but also with a vast business culture and a awareness of social, human, environmental and ethical issues. For example, curricula must include at least 20 % dedicated to humanities, social sciences and economics (including the compulsory fluency in English), compulsory internships in industrial companies and in research laboratories, international mobility, etc.

Thereby, CTI considers that all accredited engineering programs must comply with a list of ten essential components, including for example: “Knowledge and understanding of a broad range of basic sciences” or “Understanding of engineering methods and tools”, but also, “Aptitude to work in an international context”, “Aptitude to put sustainable development principles into practice” or “Capacity to join an organisation, to lead it and drive it forward”.

### The EUR ACE project

The EUR-ACE project aims to develop a framework for the accreditation of engineering degree programs in the European Higher Education Area, with the following objectives:

- to respect the great diversity of engineering education within the European Higher Education Area,
- to create a system of accredited engineering programs that share common objectives and outlooks,
- to facilitate transnational recognition of academic and professional qualifications.

This project supported by the European Community, is driven by the ENAEE association (European Network for Accreditation of Engineering Education), which has defined the EUR-ACE outcome-based Framework Standards, i.e. the capacities or abilities that must be acquired by engineers in Europe and the criteria for the accrediting agencies.

The EUR-ACE<sup>®</sup> labels are awarded to engineering programs by authorised agencies; they distinguish between First-Cycle (Bachelor) and Second-Cycle (Master) Degrees, in accord with the definitions given in the European Qualification Frameworks. In 2011, there are 7 European authorised agencies, which have awarded EUR-ACE labels to more than 700 engineering programs ; the two main contributors being CTI (France) and ASIN (Germany) which have each delivered about 250 labels.

**KEYWORDS** : program accreditation, engineering education, European higher education area

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