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# **Commentary on EUR-ACE Framework Standards for the Accreditation of Engineering Programmes**

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## Introduction

Let us recall that, in response to the “Call for proposals for Europe-wide Participation Projects Contributing to the Realisation of the European Higher Education Area (Bologna process)”<sup>1</sup>, a consortium made up of 14 partners proposed the EUR-ACE (EURopean ACcredited Engineer) Project for the “Accreditation of European Engineering Programmes and Graduates”. The consortium includes major well recognised professional organisations and educational institutions relevant to the engineering sector throughout Europe. More specifically, six of the 14 partners are European organizations and networks, namely FEANI, SEFI, CESAER, EUROCADRES, EHQHEEI, TREE (through the contracting partner, University of Florence), and eight are national bodies operating in engineering programme accreditation: ASIIN (Germany), CTI (France), IEI (Ireland), CoPI (Italy), OE (Portugal), UAICR (Romania), RAEE (Russian Federation), EC<sup>UK</sup> (UK). Several Higher Education Institutions (mostly members of SEFI) and national members of FEANI and EUROCADRES, plus the CLAIU network and the Italian University Rectors’ Conference (CRUI) also participate in the project. The EUR-ACE Project was approved by the European Commission (DG Education and Culture), and with their support was launched in September 2004.

The accreditation of engineering study programmes is a key function for the practice of engineering in the economic regions that are represented in the EUR-ACE project. The declared main aim of the EUR-ACE Project is “to propose a framework for setting up a European system for accreditation of engineering education at the First Cycle and Second Cycle level (as defined within the Bologna process)”, i.e., in more general terms, to contribute to “...establish[ing] the European Higher Education Area by 2010, in which citizens can choose from a wide and transparent offer of high quality courses and benefit from smooth recognition procedures.”<sup>2</sup>

Within the context of the Bologna follow-up activities, and fully aware of the previous results and exchanges of knowledge and experiences achieved through

- EC-supported European wide projects; amongst others, more specifically, Thematic Networks (TN) run under the SOCRATES programme, such as H3E<sup>3</sup>, E4<sup>4</sup> and EUCEET<sup>5</sup>,
- ESOEPE<sup>6</sup>, an informal consortium set up in 2000 in order “to build confidence in systems of accreditation of engineering degree programmes within Europe” and “... to assist national agencies and other bodies in planning and developing such systems”,

the EUR-ACE Project aims at taking a decisive step forward, towards the setting-up of a European Accreditation system/procedure for the entire engineering sector. This is mainly intended as a major tool to improve and assess quality in engineering education (EE), to support mutual transnational recognition of engineering qualifications, and to facilitate the mobility of engineers across Europe.

The proposed European accreditation system should be based on a set of common European Framework Standards for the accreditation of engineering study programmes that should fulfil two aims:

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<sup>1</sup> Call for proposals for Europe-wide Participation Projects contributing to the Realisation of the European Higher Education Area (Bologna Process) (5 March 2004), EC DG Education and Culture.

<sup>2</sup> Cf. Introduction of the above quoted “Call”.

<sup>3</sup> H3E: “Higher Engineering Education in Europe”, EEIG Consortium set-up by BEST, CESAER and SEFI (1996-99) running a TN project called: “Developing European Dimension within Higher Engineering Education”.

<sup>4</sup> E4: “Enhancing Engineering Education in Europe”, TN run by the University of Florence with 110 European partners (1999-2004).

<sup>5</sup> EUCEET: “European Civil Engineering Education and Training”, TN run by Ecole Nationale des Ponts et Chaussées France and Technical University of Civil Engineering of Bucharest Romania, with 132 partners from 29 European countries (1998 - 2005).

<sup>6</sup> ESOEPE: European Standing Observatory for Engineering Profession and Education, established in Paris (Sept. 2000), by 7 partners (later increased to 12).

- provide a common reference framework which will add a European dimension to existing national accreditation procedures;
- provide guidelines to implement accreditation procedures in countries where none is yet in force, in order to guarantee the quality and relevance of EE and so facilitate national and trans-national recognition.

In this context, the EUR-ACE Project elaborated and published in December 2004 a first version of tentative EUR-ACE *Standards and Procedures for the Accreditation of Engineering Programmes*: a wide discussion on them was then promoted within the project partners and among stakeholders of engineering education in Europe.

Having taken their comments into account, the EUR-ACE Steering Committee published in May 2005 a second version of the EUR-ACE *Standards and Procedures* that was again submitted to the European engineering community and other stakeholders.

The final version of the EUR-ACE *Standards and Procedures* (now called *EUR-ACE Framework Standards*) has been elaborated taking into account all comments received, and also the results of trial accreditations run in several European countries under the supervision of the EUR-ACE Coordinator and Steering Committee: it has been approved by the Steering Committee on 16 November 2005 and by the Project Board on 17 November (apart from some editorial revisions delegated to the SC) and is now presented to the European Commission (D.G. Education and Culture) together with this Commentary.

It is to be noted that the EUR-ACE proposals for the organization and management of the EUR-ACE accreditation system are not included in these Standards, but in two separate documents (A2 and C2).

## 1. Terminology

In the *EUR-ACE Framework Standards*, terminology and nomenclature adheres strictly to a Bologna-compatible scheme of HE studies. Some specific terms are used in this document in the meaning defined in the following; for other technical terms and/or definitions, reference is made to the *Glossary* produced by the E4 Thematic Network<sup>7</sup> and now under revision in the context of the TREE Thematic Network.

### Accreditation

Accreditation of an engineering educational programme is the primary result of a process used to ensure the suitability of that programme as the entry route to the engineering profession. Accreditation involves a periodic assessment against accepted standards of engineering education. It is essentially based on a peer review process, undertaken by appropriately trained and independent teams comprising peers from both academia and engineering practice. The process normally involves both scrutiny of data and a structured visit to the Higher Education Institution (HEI) running the programme.

The accreditation process should be carried out by properly constituted national accreditation agencies or institutions or consortia thereof.

In the context of the whole EUR-ACE Project and proposals, each accreditation is referred to a specific engineering programme and not to Departments or HEIs. Accreditation will ensure that the relevant programme has attained the standards required for its graduates to acquire the necessary educational qualifications to enter the engineering profession.

### First and Second Cycle Degree

In accordance with the EHEA framework, the accreditation process will distinguish between programmes of the First and Second Study Cycles, defined in accord with the *“Dublin” Descriptors* developed by the Joint Quality Initiative and the Report *“A Framework for Qualification of the European Higher Education Area”*, both documents endorsed by the Bergen Ministerial meeting of May 2005.<sup>8</sup>

The terms *“First Cycle Degree”* and *“Second Cycle Degree”* (and their acronyms FCD and SCD), are used to avoid any possible misinterpretation associated with the use of specific terms such as Bachelor, Master, etc., that are used with different meanings in different countries of the EHEA.

In this context, the term *“Cycle”* is used to describe a study programme leading to an academic degree while the term *“Degree”* describes a qualification awarded to an individual by a recognised HEI after successful completion of a study programme. In a credit accumulation system the programme is completed through the accumulation of a specified number of credits awarded for the achievement of a specific set of learning outcomes.

### Integrated programme

In the present document, *“Integrated Programme”* is by definition an educational programme leading directly to a Second Cycle Degree (SCD).

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<sup>7</sup> The Glossary is published within the Collection of E4 Outputs: *“E4 Thematic Network: Enhancing Engineering Education in Europe”*, vol. B., C. Borri & F. Maffioli Eds, Firenze University Press (2003).

<sup>8</sup> Joint Quality Initiative: *“Shared ‘Dublin’ descriptors for Short Cycle, First Cycle, Second Cycle and Third Cycle Awards”*, 18 October 2004. These descriptors have been included in a report prepared by the Bologna Working Group on Qualifications Frameworks: *“Report on: A Framework for Qualifications of the European Higher Education Area”*, December 2004, pp. 30ff. For more information on the Joint Quality Initiative cf. <http://www.jointquality.org>.

## **Admission (entry) into accredited programmes**

Conditions for entry into each accredited programmes are not prescribed in the EUR-ACE Framework Standards: they are left to each HEI (or to national legislation).

In particular, entry into an accredited Second Cycle programme is possible in principle from a non-accredited First Cycle programme. In this case, it would be expected that the HEI demonstrates how it ensures that graduates from the respective Second Cycle programme fulfil the programme outcomes defined for both First and Second Cycle degrees.

## **ECTS**

The present document also refers to ECTS (acronym for European Credit Transfer System, developed by the European Commission in order to increase the transparency of educational systems and facilitate the mobility of students across Europe through credit transfer) as the unique Europe-wide “measuring unit” of workload within an educational programme; this also avoids contradictory interpretations due to the multiplicity of “credit systems” already introduced in many European countries.

The ECTS is based on the general assumption that the global workload of an academic year of study is equal to 60 credits; one ECTS credit is equal to a student work load of 25 to 30 hours.<sup>9</sup>

## **Programme Outcomes**

The present *EUR-ACE Framework Standards* are based on programme outcomes that outline the specific knowledge, skills and abilities<sup>10</sup> gained by the successful completion of an engineering study programme. They are developed on the basis of those qualifications required by graduates of these programmes to enter a career in the engineering profession.

The programme outcomes defined in the present *EUR-ACE Framework Standards* are designed to be compatible with the general framework outlined in the “Framework for Qualifications of the European Higher Education Area” prepared by the Bologna Follow-up Group on the basis of the “*Dublin*” *Descriptors*. However, the descriptors for programme outcomes in the *EUR-ACE Framework Standards* are more specific with respect to the competences required for the engineering profession.

## **Engineering Profession**

Engineering is a profession directed towards the skilled application of a distinctive body of knowledge, based on science and technology and integrated with efficient management, business and interpersonal skills, which are acquired through formal education and professional development.

It can be performed at different levels of qualification (cf. Art. 11 of European Directive 2005/36/EC; see also Section 4).

## **Engineering Branches and Disciplines**

In this document, in accord with the quoted “Glossary”, “engineering” is identified as a “field of study”, subdivided into “branches” (alternatively called “disciplines”).

## **Accreditation criteria**

Accreditation criteria as outlined in Section 2 of the *EUR-ACE Framework Standards* denote the criteria for assessment and accreditation of engineering study programmes.

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<sup>9</sup> For further information on ECTS, cf. [http://europa.eu.int/comm/education/programmes/socrates/ects\\_en.html](http://europa.eu.int/comm/education/programmes/socrates/ects_en.html).

<sup>10</sup> For definitions, see the Glossary quoted in Note <sup>7</sup>.

These criteria – as well as the accompanying requirements for each criterion – have been developed on the basis of the programme outcomes defined in Section 1 of the *EUR-ACE Framework Standards* in order to verify the achievement of these programme outcomes. Generally, this achievement will be considered verified, if the learning outcomes of the study programme applying for accreditation are consistent with the indicated programme outcomes and if the programme has:

- a curriculum and related processes which ensure achievement of the programme outcomes;
- academic and support staff, facilities, financial resources and cooperation agreements with industry, research institutions and other Higher Education Institutions adequate to accomplish the programme outcomes;
- appropriate forms of assessment which attest the achievement of the programme outcomes;
- a management system able to ensure the systematic achievement of the programme outcomes.

## 2. Aims of the EUR-ACE Framework Standards

The main aims of these *Framework Standards* and of the proposed European system for accreditation of engineering education are to

- ensure that study programmes in engineering maintain defined educational standards;
- provide an appropriate “European label” to the graduates of the accredited educational programmes to complement the labels awarded by national accreditation agencies;
- facilitate trans-national recognition thanks to the common European label;
- facilitate mutual recognition agreements; and
- facilitate recognition by the competent authorities, in accord with EU Directive 2005/36/EC.

The development of the *EUR-ACE Framework Standards* is a first step towards the achievement of these goals as it defines suitable standards – in the form of programme outcomes, criteria and procedures – for the accreditation of engineering study programmes in accord with the various European national accreditation standards and criteria.

The objective of these Framework Standards is two-fold:

- a) In countries where a national system for accreditation of engineering programmes already exists, agreements to recognise national accreditation certificates can be immediate if the existing rules and procedures are consistent with these Framework Standards.
- b) Alternatively, in countries where a national engineering accreditation system does not exist, the Framework Standards can be directly applied, or used as a draft for the Standards and Procedures of newly created Accreditation Agencies.

Hopefully, this double use of the *EUR-ACE Framework Standards* will allow to build up gradually a Pan-European Accord to establish a system of mutual recognition of engineering study programmes.

However, it is again underlined that the EUR-ACE proposals for the organization and running of the European accreditation of engineering programmes are not included herein, but is the object of a specific document (A2).

### **3. Application of the EUR-ACE Framework Standards**

#### **Quality Assurance**

It is also assumed that all programmes to be accredited fulfil the criteria set out in the ENQA 'Standards and Guidelines for Quality Assurance in the European Higher Education Area'. These Standards are concerned with ensuring the quality of the educational process, whereas EUR-ACE Framework Standards regard the content and standard of engineering education for professional qualification. Thus, the two overlap and have some common concerns but they are not the same.

It has been checked that there is no inconsistency between the *EUR-ACE Framework Standards*, the ENQA Standards, or any other relevant document.

#### **Engineering Programmes as Entry Route to the Engineering Profession**

The framework of programme outcomes and accreditation criteria and procedures outlined in the *EUR-ACE Framework Standards* has been developed and is intended to be applied to deciding if an engineering study programme provides its graduates with the academic qualifications necessary for a career in the engineering profession, i.e. it applies to engineering study programmes as the entry route to the engineering profession.

#### **Consecutive FCD and SCD Programmes and Integrated Programmes**

The programme outcomes and accreditation criteria outlined in the *EUR-ACE Framework Standards* have been designed to be applied to the accreditation of the two main cycles defined in the Bologna Declaration and subsequent documents (see Note <sup>8</sup>), i.e. to First Cycle and Second Cycle engineering programmes in series.

However, the use of programme outcomes makes the *Standards* applicable also to the accreditation of programmes leading directly to a degree equivalent to a Second Cycle Degree (conventionally termed 'Integrated Programmes'), that are still a very significant part of the European engineering education system.

#### **Scope of these Standards**

The *EUR-ACE Framework Standards* define programme outcomes and accreditation criteria only for engineering study programmes leading to a First or to a Second Cycle Degree (FCD or SCD) or an equivalent degree obtained via an "Integrated Programme". Therefore, while including the "short cycle" programmes of the "old" (pre-1999) terminology (now called "First Cycle" programmes), they do not include programmes of the type "short cycle within the first cycle" defined in the quoted EQF report (which do not provide graduates with the academic qualifications necessary for a career in the engineering profession) nor Third Cycle Degree programmes (which provide graduates with important additional engineering qualifications but are not relevant as an entry route to engineering profession).

Indeed, it is not excluded that, in addition to EUR-ACE, other systems may be created to provide special standards and "labels" for programmes addressed to meet specific and particular requirements, like for example education for advanced research.

It is also to be underlined that the *EUR-ACE Framework Standards* do not distinguish between engineering branches (disciplines): therefore in actual accreditations they must be complemented by branch-specific requirements.

Also, these Standards do not explicitly refer to, but on the other hand do not exclude, e-learning (distance learning), lifelong learning or other types of programmes: for the accreditation of such programmes, the course providers would have to demonstrate how the outcomes and requirements outlined in the *EUR-ACE Framework Standards* are fulfilled.

In particular, a common European label will facilitate accreditation of trans-national joint- and double-degree programmes.

The *EUR-ACE Framework Standards* will thus apply indiscriminately to all different types or profiles of engineering study programmes, and these programmes will be judged based on whether they provide graduates with the academic qualifications necessary to enter the engineering profession.

#### **4. Professional Recognition of Engineering Degrees**

The use of the term “engineer” has been avoided in these Framework Standards, which define outcomes of educational programmes and not professional requirements (see also Section 4). Although the “official” definitions of “engineer” and “engineering profession” vary from country to country, and moreover some European countries (but not all) have professional systems that are in substantial agreement with the First-Second Cycle educational model, it can be stated that any professional in the engineering field should possess an approved engineering qualification accredited by an officially recognised accreditation agency or institution or an engineering qualification which is recognised through an international agreement as satisfying the educational standard for the qualification.

The ultimate goal of the EUR-ACE Project is to facilitate professional recognition of the engineering degrees awarded by study programmes accredited on the basis of the programme outcomes and accreditation criteria defined in the *EUR-ACE Framework Standards*.

However, given different national legislative frameworks for professional recognition of engineers, these degrees cannot be considered automatically equivalent to professional recognition: to practise the engineering profession, further qualifications (e.g. State exams) and/or training may be required within some countries or by some professional organizations.

It can be expected that engineering degrees accredited as FCD and SCD, possibly with additional requirements, will usually lead to the levels (d) or (e) of professional qualifications, defined in Art. 11 of Directive 2005/36/EC.

It may be worth to underline again that the EUR-ACE Project is concerned only with the accreditation of the educational part of the engineering formation.