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QUACING Approach to EUR-ACE Accreditation

QUACING (Italian Agency for Quality Assurance and EUR-ACE accreditation of engineering programmes), Italy
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The paper presents the QUACING approach to the EUR-ACE accreditation of Engineering programmes with reference to both accreditation conditions: the consistency of the programme outcomes established by the programmes with the EUR-ACE programme outcomes and a positive assessment of the programme quality.

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Introduction

QUACING, the Italian Agency for the EUR-ACE accreditation of Engineering programmes[1], was established at the end of 2010 on the initiative of the Conference of the Deans of Italian Engineering Faculties (CoPI), the Foundation of the Conference of the Rectors of the Italian Universities (CRUI Foundation), the National Engineers' Council (CNI), the official representative body of the Italian engineers, member of FEANI, Finmeccanica, Italy's leading manufacturer in the high technology sector and ranks among the top ten global players in aerospace, defense and security, the FIAT Research Centre (C.R.F.) and the National Association of Building Contractors (ANCE).

The goals of the Agency are established in the Statute. They are:

- the quality certification and EUR-ACE accreditation of Engineering programmes;
- the promotion of the quality of Engineering programmes and the development of quality culture among the staff working for Engineering programmes;
- the promotion of correct information on the quality of Engineering programmes at both national and international levels;
- the promotion of the recognition of Engineering titles in Europe.

The Agency is new, but it has inherited all the experience acquired by CRUI before and by CRUI Foundation after in more than 15 years of activity in the field of quality assessment of University programmes. It is a fact that CRUI and CRUI Foundation have been and are the organisations most committed to promoting the quality of the educational services offered by Universities in our country, even if, in particular in the first years of activity, the quality assessment was mainly centred in the assessment of the management system than of the results of programmes.

From the activity of programme quality assessment we have learnt that the most difficult thing in an assess-

[1] *QUACING refers always to "EUR-ACE accreditation" to avoid conflicts of competence with ANVUR, the recently established official Italian Agency which by law will have competence on programme accreditation.*

ment process is to obtain the same assessment from different assessors. Consequently, in order to make the assessments as objective as possible, we have established some assessment criteria and necessary requirements, with reference to both conditions for the EUR-ACE accreditation, i.e.:

- the consistency of the established programme outcomes with a set of reference programme outcomes that are defined in the QUACING By-laws and in turn are consistent with the EUR-ACE programme outcomes;
- a positive assessment of the programme quality, where for "quality" we intend the level of fulfilment of the educational objectives established coherently with the needs and expectations of all who have an interest in the educational service offered by the programme (interested parties), or, in other words, the level of fulfilment of the established "quality requirements".

Furthermore, it seems important to underline that in our understanding the accreditation process is not only a matter of "consumer protection", requiring a clear distance to be established between the accrediting agency and the programmes to be assessed, but at the same time it must constitute a provision of advice and guidance in pursuit of improvements in their quality, which requires a close relationship between the assessor and the assessed. In other words, we intend the aim of accreditation as a balance between accountability and improvement.

The aim of this paper is to present the criteria (as a consequence of some characteristics of our programmes), the above mentioned programme outcomes of reference and the requirements (intended as necessary conditions) established for the EUR-ACE accreditation, and the Model adopted for the internal assurance and the assessment of programme quality.

Assessment of the Consistency of Programme Outcomes

The first question which has required the definition of accreditation criteria is related to the organisation of our first cycle programmes after Bologna.

According to the ministerial decree which regulates the organisation of University studies in Italy [1], the first cycle Laurea programmes should have the aim "to supply student with adequate mastering of scientific methods and contents, even when oriented to the acquisition of specific professional competences".

Furthermore, in spite of the original objective to fulfil the majority of the job market needs with first cycle graduates, most first cycle graduates (between 70 and 80%) have chosen and are choosing to prosecute their studies in the second cycle programmes[2].

As a consequence almost all the first cycle programmes in Engineering offer an educational path oriented to the prosecution of studies in the second cycle Laurea Magistrale programmes. They may be subdivided in the following three categories:

- first cycle programmes with the aim to supply student with adequate mastering of scientific methods and contents, oriented to the prosecution of studies;
- first cycle programme with the aim to supply student with both adequate mastering of scientific

[2] *Two reasons at least for this choice.*
One is certainly the opinion of students, families and, in general, of the public that the first cycle degree is of less value than the second cycle one.
The other is represented by the fact that, if it is true that the education of three-year practice-oriented graduates was strongly supported by representatives of the labour market, it is also true that big industry never showed interest in these new professional figures, while small industry, which constitutes the actual industrial Italian fabric, has proved to be too small to take on even first cycle graduates.

methods and contents and specific professional competences;
- first cycle programmes which offer two educational paths, generally in the final year or in the final six-month period: one oriented to the prosecution of studies in second cycle programmes and one job oriented (the so-called "Y model", a solution adopted by many Engineering fist-cycle programmes).

As well known, a necessary condition for the EUR-ACE accreditation is that the degree programmes provide the education necessary for entry to the engineering profession. So we have established that, as a rule, accreditation can be granted only to first cycle programmes which offer an educational path job oriented or with the aim to supply specific professional competences. In both cases the presence of an adequate training period (at least 15 ECTS, according to our experience) is considered an important assessment element.

A second question which has required the definition of guidelines for our assessors is related to the assessment of the consistency of the programme outcomes established by the programmes with the EUR-ACE programme outcomes.

It is a fact that in Italy programmes have to define their programme outcomes, which should be a specification of the 'qualifying educational objectives' established by law in terms of programme outcomes for each of the 'classes' which programmes belong to [2, 3]. But, even if our country was the first to fully adopt the organisation in cycles of the University programmes required by the Bologna process, it is again a fact that our programmes have not yet metabolized the need to design the educational path starting from the definition of the programme outcomes and then to define a syllabus consistent with the established programme outcomes. On the contrary, the design of the educational path generally starts with the definition of the syllabus.

The result is that in general the "official" programme outcomes are very general, like the qualifying educational objectives established by law, and the "real" programme outcomes, which are the result of the learning outcomes specific of the didactic units of the syllabus, are not clearly defined.

As a consequence, the consistency of the programme outcomes with the EUR-ACE ones must be assessed with reference to the learning outcomes of the didactic units of the syllabus and to the presence of the educational activities necessary for their achievement.

A definition of the programme outcomes consistent with the EUR-ACE programme outcomes is certainly an improvement that we would like to promote with the accreditation process.

Another improvement that the accreditation process should promote is the attention to be paid by programmes to the definition of the transferable skills expected at the end of the educational process, to the definition of the associated didactic activities and particularly to the assessment of their achievement by students. At the moment this is certainly a weak point of our educational system, which in general and in spite of the solicitations of the labour market is reluctant to recognise the transferable skills of the same importance of the specific skills.

Of course, the programme outcomes we have to consider in the accreditation process are those established in the EUR-ACE Framework Standards [4], but also those established for each of the "classes" which programmes belong to [2, 3]. This has required the integration and revision of the EUR-ACE programme outcomes, to take into account the national requirements and understanding. The "QUACING Programme Outcomes" [5], consistent with the EUR-ACE and the national ones, are reported in Annex 1.

At the same time we have matured the conviction that some of the

EUR-ACE formulations and statements for sure need an improvement, particularly in order to clarify what is required and reduce the needs of their interpretation as far as possible.

Assessment of the Programme Quality

As for the assessment of the programme quality, the first necessary condition for a positive assessment that we have established is the presence of an internal quality assurance system.

As well known, "quality assurance" is a generic term which lends itself to many interpretations. For "internal quality assurance" we intend all the activities (processes) for the programme management finalised to the achievement of the established objectives and then aimed at "ensuring trust" in meeting the quality requirements to all interested parties. Therefore the quality assurance activities have to be concentrated on the activities necessary to provide objective evidence of the achieved quality.

Coherently with this definition, our approach to internal quality assurance requires:

- the definition of programme outcomes consistent with the needs and expectations of the society in general and of the labour market in particular;
- the design and planning of an educational path and the availability of academic staff, facilities, partnerships and student services suitable for the achievement of the established programme outcomes;
- the monitoring of the results of the educational process in order to assess the level of achievement of the established objectives and therefore the quality of the educational service offered;
- the continual or at least periodic improvement of the programme, through a process of self-assessment, finalised to the identification of the strong and weak points of the educational service offered, and a revision process, finalised to the adoption of the necessary improvement actions: it is a fact that to assure the programme quality means also that every effort is made to promote its constant improvement.

To promote the adoption of internal quality assurance systems consistent with this approach, an "ad hoc" instrument, the Model for internal assurance and assessment of programme quality [6], has been defined.

Starting from the definition of a set of "quality requirements" consistent with the requirements for programme assessment and subdivided in the same areas established in the EUR-ACE Framework Standards [4]:

Area A – Needs and Objectives,
Area B – Educational Process,
Area C – Resources (comprehensive of Partnerships),
Area D – Monitoring,
Area E – Management System,

the Model identifies the processes necessary for a management for quality of the programmes.

Then, for each identified process, the Model presents the behaviours expected by the programmes to fulfil the associated quality requirements. The whole of the expected behaviours constitutes the "QUACING System" for a management for quality of the programmes.

Furthermore, the Model specifies the informative documentation considered necessary to provide documental evidence of the programme quality. And the availability of a complete documentation of the established objectives and educational activities, available learning resources, results of the educational process and management system is the second necessary condition for a positive assessment of the programme quality.

The information and data of the informative documentation constitute also a necessary reference for the internal and external programme assessments.

Finally, the Model specifies the assessment criteria, which constitutes the reference for the identification

of the strong and weak points of the educational service offered and the determination of the level of fulfilment of the quality requirements. They may be:

- "coherence" criteria (e.g., coherence of the syllabus and of the characteristics of the didactic units with the established programme outcomes);
- "suitability" criteria (e.g., suitability of the academic staff for the achievement of the established programme outcomes).

When possible, the Model associate the criteria one or more indicators, useful in order to assess the level of fulfilment of the associated criterion.

The identified indicators may be "observable" or "measurable".

The observable indicators are indicators for which it is not possible to establish a unit of measurement (e.g., suitability of the admission requirements for a profitable participation of the students to the didactic activities of the first course year). Consequently, the assessment of the observable indicators relies on the preparation, capacity and experience of the assessors.

The measurable indicators are indicators for which it is possible to establish a unit of measurement (e.g., number of seats in a classrooms). They can be measured and consequently permit an objective assessment of their level of fulfilment.

Conclusions

The established accreditation criteria, guidelines and requirements, together with the programme outcomes of reference and the Model for internal assurance and assessment of programme quality, have certainly favoured homogeneous behaviours by the assessors in the first external visits for the EUR-ACE accreditation managed by QUACING Agency, whose final objective is the definition of a "Guide for assessors", with clear indications on the criteria and necessary conditions for the EUR-ACE accreditation.

At the same time the Model has proved to be a useful instrument for the implementation or the improvement of the internal quality assurance system of the programmes.

It is our opinion that the definition of similar criteria and conditions by ENAEE could be useful also in order to guarantee homogeneous behaviours by the Agencies authorised to grant the EUR-ACE label.

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ANNEX1 – QUACING PROGRAMME OUTCOMES

Knowledge and Understanding

Graduates should demonstrate knowledge and understanding at different levels of mathematics, sciences and engineering disciplines underlying their engineering specialisation and of the wider context of engineering. The underpinning knowledge and understanding of the fundamentals of their engineering specialisation are essential to satisfying the other programme outcomes.

First Cycle graduates should demonstrate:

- knowledge and understanding of mathematics and sciences underlying their engineering specialisation;
- knowledge and understanding of engineering disciplines underlying their specialisation, including some knowledge at its forefront;
- awareness of the wider multidisciplinary context of engineering.

Second Cycle graduates should demonstrate:

- advanced knowledge and understanding of mathematics and sciences underlying their engineering specialisation;
- advanced knowledge and understanding of engineering disciplines underlying their specialisation, including a critical awareness of its forefront;
- a critical awareness of the wider multidisciplinary context of engineering.

Engineering Analysis

Graduates should be able to analyse and solve engineering problems consistent with their level of knowledge and understanding and to recognise the importance of societal, health and safety, environmental and industrial/commercial constraints. Analysis can include the identification of the problem, clarification of the specification, consideration of possible methods of solution, selection of the most appropriate method, and correct implementation. Graduates should be able to use a variety of methods, including analytical methods, computational modelling and experimental methods.

First Cycle graduates should demonstrate:

- the ability to identify, formulate and solve engineering problems using established and relevant analytic, modelling and experimental methods;
- the ability to analyse engineering products, processes and systems.

Second Cycle graduates should demonstrate:

- the ability to solve problems that are unfamiliar, incompletely defined, and have competing specifications;
- the ability to formulate and solve problems in new and emerging areas of their specialisation;
- the ability to conceptualise engineering products, processes and systems;
- the ability to apply innovative methods in problem solving.

Engineering Design

Graduates should be able to realise engineering designs consistent with their level of knowledge and understanding. The designs may be of products (devices, artefacts, etc.) processes or systems and the specifications could be wider than technical, including an awareness of societal, health and safety, environmental and industrial/commercial considerations.

First Cycle graduates should demonstrate:

- the ability to develop and realise designs to meet defined and specified requirements, applying relevant design methodologies.

Second Cycle graduates should demonstrate:
- the ability to design solutions to unfamiliar problems, possibly involving other discipline, and to work with complexity, technical uncertainty and incomplete information;
- the ability to use creativity to develop new and original ideas and methods.

Investigations

Graduates should be able to use appropriate methods to pursue investigations and research of technical issues consistent with their level of knowledge and understanding.

Investigations may also involve execution of experiments and interpretation of data.

First Cycle graduates should demonstrate:
- the ability to conduct searches of literature and to consult and use data bases and other sources of information;
- the ability to consult and apply codes of practice and safety regulations;
- the ability to conduct analytic and modelling investigations;
- laboratory skills and the ability to conduct experiments;
- the ability to interpret data and draw conclusions.

Second Cycle graduates should demonstrate:
- the ability to identify, locate and obtain required data;
- the ability to design and conduct analytic, modelling and experimental investigations;
- the ability to critically evaluate data and draw conclusions;
- the ability to investigate the application of new and emerging technologies in their specialisation.

Engineering Practice

Graduates should develop practical skills for solving problems, design and realise engineering products, processes and systems, conducting investigations. These skills may include the knowledge, use and limitations of: materials; equipment and tools; technologies; analytic, modelling and experimental techniques and methods. They should also recognise the wider, non-technical implications of engineering practice.

First Cycle graduates should demonstrate:
- the ability to combine theory and practice to solve engineering problems;
- the ability to select and use appropriate materials, equipment and tools, technologies;
- the knowledge and understanding of applicable techniques and methods and of their limitations and the capacity to select appropriate techniques and methods;
- awareness of the health, safety and legal issues and responsibilities of engineering practice and of the impact of engineering solutions in a societal and environmental context;
- commitment to professional ethics, responsibilities and norms of engineering practice;
- awareness of economic, organisational and managerial issues (such as project management, risk and change management) of the business context.

Second Cycle graduates should demonstrate the same practical skills of a First Cycle graduate at the more demanding level of Second Cycle and furthermore:
- the ability to integrate knowledge from different branches, and handle complexity;
- the critical awareness of the non-technical implications of engineering practice.

Transferable Skills

The skills necessary for the practice of engineering, and which are applicable more widely, should be developed within the programme.

First Cycle graduates should be able to:

- function effectively as an individual and as a member of a team;
- communicate effectively in writing and orally, using at least another language of the European Union other than Italian;
- recognise the need for, and have the ability to engage in, independent life-long learning.

Second Cycle graduates should fulfil all the transferable skill requirements of a First Cycle graduate at the more demanding level of Second Cycle and should be able to:

- function effectively as leader of a team that may be composed of different disciplines and levels;
- communicate effectively with the engineering community in writing and orally, using fluently at least another language of the European Union other than Italian.

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