Accreditation of Environmental Engineering Education at the School of Engineering, University of Firenze

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Outline:

• Introduction: the Environmental Engineer
• The Accreditation model EUR-ACE®
• The Italian ANVUR – AVA accreditation model
• Programme outcomes:
  ✓ First Cycle Degree (Bachelor) – FCD
  ✓ Second Cycle Degree (Master) – SCD

conclusive remarks & your questions!

2nd European Network for Accreditation of Engineering Education Conference
EUR-ACE®, the European Quality Label for Engineering Degree Programmes:
Impact and Perspectives

Leuven, 16th - 17th September, 2013
the “environment issue”

... the 'G-Science' Statements to Call World Leaders' Attention to How Science and Technology Can Help Solve Global Challenges:

- Energy and Water Linkage: Challenge to a Sustainable Future
- Building Resilience to Disasters of Natural and Technological Origin
- Improving Knowledge of Emissions and Sinks of Greenhouse Gases

United Nations Conference on Sustainable Development
Rio de Janeiro, June 2012
www.uncsd2012.org
http://sustainabledevelopment.un.org/

Leading the Way to the Future We Want

Environmental Engineer EURACE® ANVUR-AVA (I) Programme Outcomes
In 2013, according the Global Footprint Network since August 20th the total resources consumed by humanity has exceeded the capacity for the Earth to generate natural resources for the year 2013.

The Earth Overshoot Day in 2011 was September 27th, in 2000 it was November 1st, in 1990 it was December 7th.

BUT ... the Earth Overshoot Day in 2012 was August 22nd
“Environmental Engineer“

Who is she/he?

a professional figure with specific competences on the sustainability of human presence on the environment (i.e. management and protection of natural resources such as water and soil)

Why this Professional Figure?

to adequately answer to the demand of technical innovative competences (i.e. with an adequate knowledge of methods and technical contents in the field of environment, resources and territory engineering).
The globalization of challenges and problems to be faced, leads, in general, to the globalization of the engineering profession. The “environmental issues” are without boundaries ... the environmental engineer must have a multidisciplinary and interdisciplinary approach to satisfactorily face the problems at global scale ... with technical innovative competence. The environmental engineers, more and more, are involved in international projects were the effective collaboration requires not only the capacity to communicate in a common technical language, but also the assurance of an adequate and common level of technical competences, knowledge and understanding.

A good example of instrument for international recognition of qualifications, is the decentralized Europe-based accreditation system EUR-ACE®.
EUR-ACE® is the European quality label for engineering degree programmes at Bachelor and Master level.

EUR-ACE® is a framework and accreditation system that provides a set of standards that identifies high quality engineering degree programmes in Europe and abroad.

The EUR-ACE® label is a certificate awarded by ENAEE - European Network for Accreditation of Engineering Education through an authorised agency to a HEI (Higher Education Institution).

In Italy QUACING is the Agency for Quality Assurance & Accreditation of Engineering Programmes, i.e. the accreditation body for Italian Engineering Programmes, which is authorized to award the EUR-ACE® label.
The EUR-ACE® accreditation process phases

**Self Assessment phase**

- Internal Quality Working Group (academic, technical and support staff, students)
- Self-Assessment report

**External evaluation**

*Site Visit of an Accreditation Team to verify the compliance of the self-assessment activity and the contents of the report with the actual situation.*
Accreditation in Italy: ANVUR – AVA model

In Italy, the University and Research Assessment, nowadays, is regulated by ANVUR - Agenzia Nazionale per la Valutazione dell’Università e della Ricerca (National Agency for University and Research Assessment) …

… that recently has implemented the AVA – Autovalutazione, Valutazione periodica, Accreditamento (Self-assessment, Periodic Assessment and Accreditation) system for Italian Higher Education.

In the AVA system the expected learning outcomes for degree courses are described as general descriptors, i.e. with characteristics applicable to a large range of disciplines and profiles that at the same time take into account the peculiarities of the national higher education system.

The fundamental tool of AVA system is SUA - Scheda Unica Annuale del Corso di Studio (Annual Single Form of Degree Course). Within SUA, the expected learning outcomes of the quality assessment are based on Dublin Descriptors.
The First (Bachelor) – FCD and the Second (Master) – SCD Cycles of Environmental Engineering Programmes, held at the University of Firenze, are participating to both EUR-ACE (since February 2012) and ANVUR-AVA accreditation (since February 2013) systems and are applying both the models.

The quality and the status of environmental engineering graduates, and particularly the expected learning outcomes are assessed according the Dublin Descriptors as well as the more engineering focused EUR-ACE® skill descriptors.
…. in the programmes/curricula definition we do need to strength the links of the knowledge triangle: environmental education-innovation-research, with participation of students, public services, enterprises, and non-governmental organizations (i.e. interested stakeholders).
The educational needs of the interested parties were analysed with reference to the professional working world as well as the career opportunities. For both the programmes (FCD and SCD), the consultations has involved the main subjects representative of the world of production, services and professions:

- Associations of professionals, i.e. “Order” of Engineers, industrial and handcraft associations, production companies and service providers, Tuscany Region, Province of Firenze, Prato and Pistoia, ARPAT - Agenzia Regionale per la Protezione Ambientale della Toscana (Regional Agency of Environment Protection of Tuscany Region), Arno River Basin Authority, local land reclamation consortia, water resources management bodies.

- The consultation meetings has been carried out through the instrument of the Degree Course Steering Committee (Comitato di Indirizzo), consisting of a representative for each of the interested parties (academics and professionals)
The School of Engineering of the University of Firenze offers two degree courses in Environmental Engineering: the multidisciplinary first cycle degree in Civil, Building and Environmental Engineering and the more specific second cycle degree in Environmental Engineering.

The First Cycle Degree – FCD course in Civil, Building and Environmental Engineering was introduced in the year 2012/2013 as transformation and continuation of three exiting first cycle degree courses: “Civil Engineering”, “Building Engineering”, and “Environmental, Resources and Territory Engineering”.

The tradition of Civil Engineering at the University of Firenze dates back to 1970s, to the 1990s for Environmental Engineering and since 2000 for Building Engineering.

The FCD has as main aim the education of technicians with a suitable basic competences and understandings of methodologies and technical-specific skills of Civil, Building and Environmental Engineering. The degree course refers to four types of branches: Structures, Infrastructures, Building and Environment. Each branch corresponds to a specific educational path in which professional competences are developed starting and continuing a common core basis.
Learning outcomes of the FCD programme in Civil, Building and Environment Engineering with reference to the Environment branch

<table>
<thead>
<tr>
<th>DISCIPLINES &amp; ACTIVITIES</th>
<th>knowledge and understanding</th>
<th>applying knowledge and understanding</th>
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<tbody>
<tr>
<td><strong>Basic Knowledge</strong></td>
<td></td>
<td></td>
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<tr>
<td>Mathematics, Informatics and Statistics</td>
<td>Sharing a reference language</td>
<td>To interpret and to solve typical issues of environmental engineering.</td>
</tr>
<tr>
<td>Chemistry &amp; Physics</td>
<td></td>
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<tr>
<td><strong>Characteristic Skills</strong></td>
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<tr>
<td>Civil Engineering</td>
<td>Representation tools; principles of fluids, solids, soil, and structural mechanics</td>
<td>To represent, to analyse and to solve typical issues of environmental engineering; to collaborate and coordinate the activities with industry experts; to organize and to manage production activities; lifelong learning development particularly related to technology innovation.</td>
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<tr>
<td>Environment and Territory Engineering</td>
<td></td>
<td></td>
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<tr>
<td>Security, Civil, Environmental and Territory Protection</td>
<td></td>
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<tr>
<td><strong>Integrative Knowledge</strong></td>
<td>Main technological aspects of the use of materials; main elements of the representation of computational graphic; safety and quality management in industry</td>
<td>Monitoring and control of: quality management systems; the various aspects of the industrial risk.</td>
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Learning outcomes of the SCD programme in Environmental Engineering

The Second Cycle Degree – SCD course in Environmental Engineering aims at educating high-level professionals that have not only an advanced knowledge of general environmental and territory engineering methods and contents applied to environmental protection and control but also scientific skills on analytic and numerical modelling.

In addition economical and regulatory aspects are also present allowing a cultural/technical growth and capabilities for responsibility assumption.
Learning outcomes of the SCD programme in Environmental Engineering

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| Characteristic Skills for Environmental Engineering | - Territory and environment protection.  
- Plants and systems of environmental quality and energy production.  
- Environmental risk management | To identify, to formulate and to solve complex problems in innovative ways that may require an interdisciplinary approach; to design and to manage complex environmental systems and processes. |
| Integrative Knowledge | Specific and transversal knowledge also from the scientific and theoretical point of view | Enhancement of the capacity to interpret, to characterize and to solve complex engineering problems that require a typical interdisciplinary approach. |
soil protection, hydro-geological risk monitoring and mitigation measures
natural resources management: water quantity and quality protection
… renewable energies: hydropower, geothermal, wind, solar, biomass….
protection from water & soil

IT alluvione
UK flood
FR inondation
DE flut
ES inundaciones
PT inundação

IT siccità
UK drought
FR sécheresse
DE dürre
ES sequía
PT seca
GR ξηρασία
The globalization of challenges and problems leads to the globalization of the engineering profession.

Employability of engineering graduates is more than ever dependent on the internationally acceptability of the skills and abilities they have acquired.
Conclusive Remarks

Thank for your attention

*International Accreditation Systems such as EUR-ACE® system represent strong means towards the education of competitive highly-qualified global environmental engineers*

*What about the Italian ANVUR-AVA Accreditation System?*