Engineering Education in Portugal

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To say what I am going to say...

① Engineering Education in Portugal at a glimpse...
② Engineering Education and the Engineering Profession
   ③ The role of Ordem dos Engenheiros
① The Lisbon strategy, The Bologna Process and Engineering Education
   ② Two major documents in 2005 - The Bergen Communiqué and the European Directive on professional Recognition
⑤ Academic Degrees and Recognition of Professional Qualifications
   ⑥ Characterization of Levels and Profiles; Outcomes and Quality Assurance
⑤ Summarizing routes for different professional qualification levels
Engineering Education in Portugal
I - Reforms in the Portuguese Higher Education System

- We are right on the middle of a transition period for significant changes and reform in the Portuguese Higher Education System
- Main legislation of this legal structure
  - Dec. Law nº 42/2005 of 22 February - Mobility Instruments
  - Dec. Law nº 74/2006 of 24 March - Degree Structures
  - Dec. Law nº 64/2006 of 21 March - Access by older than 23
  - Dec. Law 38 /2007 of 16 August - Base law for quality assurance
  - Dec. Law ??? /2007 of ??? - National Agency to be promulgated
- Changes must occur up till the end of 2007/2008

Engineering Education in Portugal
II - Degree Structures and Academic Titles in the old system

- A binary system, slowly but steadily distorted in practice along the years
- Academic titles awarded by Portuguese Institutions of Higher Education before 2006/2007:
  - Bacharel: a 3 years course
  - Licenciado: a 5 years course (or 2 years after 'bacharel')
  - Mestre: 2 further years of study, after Licenciado, including a course and research dissertation
  - Doutor: 3 to 4 further years of research, after Licenciado or Mestre

- In the university sub-system
  - More theoretically oriented studies
  - Degree of Licenciado - integrated studies

- In the polytechnic sub-system
  - More applications-oriented studies
  - Two cycle system (Bacharel + Licenciado)
Engineering Education in Portugal

III - Degree Structures and Academic Titles in the new system

- Binary system renewed... in theory... Let us see the practice!
- A three cycle system, following the Bergen Agreements of the Bologna Process
- Academic Titles after the reform, 2006/2007 onwards:
  - **Licenciado** 6 to 8 semesters of work (full-time equivalent)
    - In both universities and polytechnic schools
  - **Mestre** after further 3 to 4 semesters or through an integrated programme
    - Mainly in universities, integrated programmes only in universities
  - **Doutor** after a minimum of 3 years of course and research work
    - Only in universities
- In relative terms, limited number of ‘more theoretically oriented study programmes’
- Short studies within or linked to first cycles

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The Offer of Engineering Education in Portugal

I - Before the reform

- Before - 297 Engineering Courses, conducting to the degree of Licenciado, under 126 Designations
- 64 Schools of Engineering in 45 Institutions of Higher Education
  - 29 institutions of the public subsystem
    - 14 Universities
    - 15 Polytechnic Institutes
  - 16 Institutions of the Private and Concordatary subsystem
    - 14 Universities
    - 2 Polytechnic Institutes
- Out of the 297 courses
  - 104 courses are currently accredited by Ordem dos Engenheiros, corresponding to 56 different designations
The Offer of Engineering Education in Portugal
I - Today, as the reform progresses...

Table 1 - Engineering study programmes approved in Portugal for 2007/2008,

<table>
<thead>
<tr>
<th>Institutions</th>
<th>First Cycle Degrees:</th>
<th>Second Cycle Degrees:</th>
<th>Integrated Second Cycle Degrees:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Universities **</td>
<td>47</td>
<td>62</td>
<td>47</td>
</tr>
<tr>
<td>Private Universities</td>
<td>31</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Public Polytechnic Institutes **</td>
<td>130</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Private Polytechnic Institutes</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>218</td>
<td>77</td>
<td>47</td>
</tr>
</tbody>
</table>

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   3.1 Two major documents in 2005 - The Bergen Communiqué and the European Directive on professional recognition

4. Academic Degrees and Recognition of Professional Qualifications
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5. Summarizing routes for different professional qualification levels
Engineering Education and the Engineering Profession
I - Professional Titles and Professional Competences

What is important is really to speak of competences!
In this respect there is some confusion in the Society, because the word ‘Licenciado’ is now employed with a different meaning relatively to the old system.

In the old system ‘Licenciado’ corresponded to competences of Second Cycle Studies.

Now, ‘Licenciado’ corresponds to competences of First Cycle Studies.

Engineering Education and the Engineering Profession
II - Professional Titles and Professional Regulation

Professional Titles are legally protected in Portugal:

- The professional title of Engenheiro (Engineer) is awarded by Ordem dos Engenheiros. All licenciados (Second Cycle Studies) may apply for the professional title of Engineer.

- The professional title of “Engenheiro Técnico” (Technical Engineer) is awarded to any bacharel (First Cycle Studies) by ANET (Associação Nacional dos Engenheiros Técnicos - National Association of Technical Engineers).

The Engineering Profession is partially regulated in Portugal:

- Some acts, namely in Civil Engineering, but also in areas of Electrical and Mechanical Engineering, can only be performed by members of Order of Engineers.

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Ordem dos Engenheiros
I - Legal Framework and Mission Statement (I)

- Ordem dos Engenheiros (OE) is the public association that represents the holders of a Licenciado (Second Cycle) diploma that work as Engenheiros (Engineers).
- OE was created in November 24, 1936 and is ruled by the Portuguese law, decree n. 119/92 of the 30th June, which contains all its legal competencies.
- OE is independent from the State and has administrative, financial, scientific, disciplinary and regulatory autonomy.
- OE is the single largest Portuguese professional association with about 40.000 members.

Ordem dos Engenheiros
I - Legal Framework and Mission Statement (II)

- Among other competencies:
  - To support and cooperate on the development of Engineering education in order to guarantee a high standard of the Engineering profession.
  - To promote exchanges with the national and foreign comparable organizations in order to develop any cultural and professional links involving the Engineers in the world.

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Ordem dos Engenheiros
II - Membership - Conditions of admission (I)

- For holders of a Diploma of Licenciado (Second Cycle) in Engineering by a Portuguese Institution or equivalent degree:
  To obtain the professional title of Engenheiro, OE requires the fulfillment of the following further conditions:

- To have been approved in an admission exam organized and run by OE
- To have gone through an approved period of training and to have attended an Ethics and Professional Conduct course also run by OE

The Quality Assurance (QA) procedure Today...
I - Formal Objectives, Practical Consequences

- Formal
  - The QA process aims at exempting candidates from the admission exam
  - A Candidate holding a diploma from a course that has been positively evaluated IS EXEMPTED from the admission exam

- Practical consequences
  - Far wider consequences
  - QA is an exercise that leads to significant organisational improvements
  - QA is perceived by the Society as a stamp of quality of a course offered by an institution
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The Lisbon Strategy for 2010: The three dimensions of the Strategy

A strategy based on Knowledge and Transnational Cooperation, where we can recognize -

✓ The Economy Dimension -
   ➢ Including the movement that converged in the creation of the EURO

✓ The Social Dimension -
   ➢ In line with the European culture of humanism, reasoning, freedom and democracy

✓ The Knowledge Society Dimension -
   ➢ Identified with the Bologna Process and the creation of the European Higher Education Area

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Political issues and changing paradigms

- How to combine these dimensions in drawing the European Trajectory of Development?

- Where to draw the line for promoting the enlarging of higher education? For mass education?

- Which framework for development?
  - A new offer of degrees
  - New methods of education
  - LifeLong Learning policies
  - Promoting TRUST for mobility and co-operation
    - Transparency, readability
    - Quality Assurance

From Bologna ... To Bergen... And to London
Main reform areas in Higher Education

- Curricular reform
  - Degree System and Teaching / Learning Paradigms
  - Quality Assurance
  - Recognition of degrees and study periods

- Funding Reform -
  - Different sources of income, Fees, Grants, EU fundings...

- Governance Reform -
  - Autonomy, Accountability, Strategic partnerships for which Quality Assurance is a major issue
Two major documents in this framework of development

I - The Bergen Declaration within the Bologna Process

- The Bergen Communiqué signed by Ministers of Education of
  45 Countries, on May 20, 2005
  - Framework for qualifications comprising three main cycles and a
    short cycle
  - Standards and guidelines for quality assurance in the EHEA
    - A model for peer review of quality assurance agencies on a
      national basis,
    - European register of quality assurance agencies based on
      national review.
  - Recognition of degree and study periods
    - Recognition of foreign qualifications and prior learning,

II - The Directive for the Recognition of Professional Qualifications (I)

- Reaffirms previous Directive, accepting 7 professional areas
  with recognized specifications
  - Medical training Minimum education - 6 anos IT
  - Training of veterinary surgeons Minimum education - 5 anos IT
  - Basic dental training Minimum education - 5 anos IT
  - Training as pharmacists Minimum education - 5 anos IT
  - Training of nurses Minimum education - 3 anos IT
  - Training of midwives Minimum education - 3 anos IT
  - Training of architects Minimum education - 4 anos IT

- Engineering (as Law and other areas) is out of this group
Two major documents in this framework of development
II - The Directive for the Recognition of
Professional Qualifications (II)

- Article 11 - Five levels of qualification particularly relevant for professions that are out of the Annex
  - 2 levels requiring secondary education, general or vocational
  - 1 level, requiring short post-secondary education, not necessarily at higher education level, plus professional training
  - 2 levels of post-secondary education at higher education level, plus adequate professional training

Two major documents in this framework of development
II - The Directive for the Recognition of
Professional Qualifications (III)

- Art. 11, e)
  ...completed a post-secondary course of at least four years’ duration...at a university or establishment of higher education...and where appropriate completed professional training...

- Art. 11, d)
  ...training at post-secondary level of at least three and not more than four years’ duration...at a university or establishment of higher education...as well as the professional training that may be required...

- Art. 11, c)
  ...training at post-secondary level other than that referred in d) and e) of a duration of at least one year...as well as the professional training which may be required in addition to that post-secondary course...
A striking coincidence or concerted action?

❖ The Bergen Declaration and the Directive point out in the same direction
  ✓ Recognition of different qualification levels and profiles
  ✓ Recognition that qualifications can be attained through routes in two different subsystems

❖ They fit remarkably well in the world of engineering and the offer of engineering education in Europe
❖ They should obviously be translated into our Quality Assurance systems

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Academic Degrees and Recognition of Professional Qualifications
I - Concerning level of qualification - (I) - Art. 11, c)

- Level of Qualification: Art. 11, c)
  - 1 year of post-secondary course work + Professional Training >= Z, with Z=1

- At least for the time being, in most countries, not leading to a recognised competence group of Engineering, though they are vital for the ‘Engineering Act’...

- Let’s identify them as Technicians

Academic Degrees and Recognition of Professional Qualifications
I - Concerning levels of qualification - (II) - Art. 11, d) and e)

- Two levels of qualifications associated to those levels approved in the Directive

- LEVEL 1 - Art. 11, d): (3-4)U + Professional Training >= Y, with Y=?
  - First Cycle Degrees are the basis for achieving Level 1 of qualifications (corresponding to different European designations)

- LEVEL 2 - Art. 11, e): >= 4U + Professional Training >= X, with X=?
  - Second Cycle Degrees are the basis for achieving the qualification of Engineer, or equivalent European designation
Academic Degrees and Recognition of Professional Qualifications
II - Concerning Profiles

- **Two main engineering profiles**
  - More Theoretically oriented
    - Programmes with a stronger emphasis on basic and engineering sciences in the first years
    - Generally linked to Second Cycle degrees
  - More Applications oriented
    - Designed to qualify after First Cycle, independently of pursuit of studies through Second Cycles, be it directly or through bridging programmes

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Academic Degrees and Recognition of Professional Qualifications
III - Offer of Programmes

- **Three main offers of Programmes in Engineering Education**
  - The offer of two-cycle programmes, within a philosophy of integrated studies, aiming mainly at fulfilling the requirements of accreditation and professional recognition at LEVEL 2
  - The offer of First-cycle programmes, aiming at fulfilling the level of requirements for accreditation and professional recognition of LEVEL 1
  - The offer of Second-cycle programmes, aiming at fulfilling the level of requirements for accreditation and professional recognition of LEVEL 2
Academic Degrees and Recognition of Professional Qualifications
IV - Routes for the different qualification levels (II)

Qualification Level

Level 2
Art. 11 e)

2nd cycle degree in Engineering + Training

Level 1
Art. 11 d)

1st cycle degree in Engineering + Training

Route T

Route A

Academic Level

Second Cycle

First Cycle

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Academic Degrees and Recognition of Professional Qualifications
IV - Routes for the different qualification levels (III)

Qualification Level

Level 2
Art. 11 e)

2nd cycle degree in Engineering + Training

Level 1
Art. 11 d)

1st cycle degree in engineering science (not leading to professional recognition) 1st cycle in Engineering + Training

Route T

Route A

Academic Level

Second Cycle

First Cycle

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Academic Degrees and Recognition of Professional Qualifications

V - New paradigm in the Degree System

- What in all is most relevant, and not so much spoken
  - Increase the attractiveness of the offer in order to bring into the system students with different interests... but with quality
  - Providing bridging programs between the two profiles
  - Implementing the concept of ‘accumulated credits’
  - Creating a true offer for lifelong learning through complementary modules of (advanced) specializations courses

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Academic Degrees and Recognition of Professional Qualifications

VI - Competences, Expectations from Industry, Cooperation

- New structures and programmes seem to answer more adequately the requirements of the Industry, particularly in the differentiation (of competences) offered

- With new, more flexible paths, it is expected that more diverse profiles of students are developed (more research oriented, more innovation oriented, with a higher entrepreneurial spirit, etc.)

- New competences and skills, particularly soft skills, will bring young candidates more ready for the job market than before

- Quality Assurance procedures should play a major role in required harmonization for improving mobility and cooperation
Programme outcomes for QA should always be related to potential recognition of engineering qualifications

As such:

There should be only one set of programme outcomes for QA in relation with Second Cycle Degrees

(Whatever the profile and programme)

There should be only one set of programme outcomes for QA in First Cycle Degrees

Programme Outcomes must be evaluated in relation with the level of intervention in the Engineering Act

- Social responsibility (namely, signing projects)
- Capacity to tackle large, complex problems
- Capacity to adapt to new jobs of high complexity and responsibility
- Capacity for effective activity in the production line
- ......

For the different subsets of Programme Outcomes, and for the First and Second Cycle Degrees, the differences in requirements are mostly related with

- scope, depth and breath
Academic Degrees and Recognition of Professional Qualifications  
VIII - The EUR-ACE Project (I)

- European Project of significant relevance, that aimed at establishing an European System for Accreditation of Engineering Education programmes
  - 14 European Institutions, among them the Portuguese Order of Engineers
    - FEANI, SEFI, CESAER, EUROCADRES, ENQHEE, ASIN, CTI, IEI, CoPI, UNIFI, OE, UAICR, RAEE, EC-UK
- The EUR-ACE Project was concluded in 2005 and has established:
  - Standards for Second Cycle degrees, viewed in an integrated perspective
  - Standards for First Cycles

Academic Degrees and Recognition of Professional Qualifications  
VIII - The EUR-ACE Project (II)

- The EUR-ACE project has lead to the creation in February 2006 of an European Association
  - The ENAEE - European Network for Accreditation of Engineering Education
- The ENAEE is responsible for maintaining and awarding the EUR-ACE label
- 6 European Agencies are currently accredited for awarding the EUR-ACE Label
  - The Order of Engineers is one such Agency and is now preparing its Quality Assurance procedures
The Quality Assurance process - preparing the future
I - National Activity and International Co-operation

- New QA System in testing phase
  - 2 pilot projects were carried out
  - In agreement with EUR-ACE Guidelines

- Active participation in EUR-ACE project

- Founder member of ENAEE - European Network for Accreditation of Engineering Education

The QA process - preparing the future
II - New Approach and Methodological Guidelines (I)

- New fresh approach
  - By requisites (16 criteria)
  - Focused to the professional practice
  - Evaluation on the basis of evidence
  - Emphasis on quality improvement
  - Follow-up of the quality plan of programmes
  - Obeying EUR-ACE standards and procedures
  - Seeking accreditation of OE by ENAEE
The QA process - preparing the future
II - New Approach and Methodological Guidelines (II)

The 16 Requisites

| REQUISITE 1 - LEGITIMACY OF THE COURSE OPERATION |
| REQUISITE 2 - ORGANISATION OF THE APPLICATION PROCESS |
| REQUISITE 3 - STRATEGY OF THE HIGHER EDUCATIONAL INSTITUTION WITH REGARD TO THE COURSE UNDER CONSIDERATION |
| REQUISITE 4 - COURSE DEVELOPMENT |
| REQUISITE 5 - COOPERATION WITH OTHER INSTITUTIONS |
| REQUISITE 6 - RANGE OF THE COURSE AND SPECIFIC SKILLS |
| REQUISITE 7 - CURRICULUM STRUCTURE AND PEDAGOGIC PROGRAMME |
| REQUISITE 8 - DESCRIPTION OF THE THEMES TAUGHT AND ACADEMIC ACTIVITIES |
| REQUISITE 9 - STANDARD OF TEACHING |
| REQUISITE 10 - INVOLVEMENT OF THE TEACHERS IN THE RUNNING OF THE COURSE |
| REQUISITE 11 - ADMISSION, MONITORING AND EVALUATION OF THE STUDENTS |
| REQUISITE 12 - EVALUATION OF THE COURSE BY STUDENTS, RECENT GRADUATES AND EMPLOYERS |
| REQUISITE 13 - SUITABILITY OF PREMISES |
| REQUISITE 14 - PEDAGOGIC FACILITIES |
| REQUISITE 15 - COURSE MONITORING |
| REQUISITE 16 - EFFECTS OF OTHER EVALUATIONS AND THE QUALITY ASSURANCE PLAN |

The Quality Assurance process
What comes next for OE?

OE is fully committed to Quality Assurance

Articulation with the National Accreditation System...

- Aiming at fulfilling our Statutory Obligation within this new paradigm of international co-operation
  - European Co-operation
  - Much in particular - Co-operation with countries of the Portuguese Spoken Universe

Supporting and co-operating on the development of Engineering education in order to guarantee the highest standard for the Engineering profession
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Bologna and Routes for Professional Qualification and Transnational Cooperation (I)

1. The Engineering Profession requires different qualification levels and education profiles that should be guaranteed and identified through transparent Quality Assurance Procedures
2. The framework being developed and put in practice within the Bologna agreements seem to serve adequately the needs of industry and society in general
   ✓ Short vocational studies, first cycle studies and second cycle studies (stand-alone or integrated) constitute the basis of such framework
3. The concept of Credit Accumulation, together with Lifelong Learning, is of utmost relevance in this new paradigm of building professional qualifications
Bologna and Routes for Professional Qualification and Transnational Cooperation (II)

- Second Cycle Programmes should be evaluated in terms of integrated outcomes
  - They should meet the requirements for professional recognition of the highest engineering level (Engineer or equivalent designation at European level)
- Professionally oriented First Cycle Degrees offer relevant competences to the Society in the engineering profession (those of qualified engineering professionals of First Level)
- First Cycle Degrees offered within theoretically oriented profiles may not meet immediately the requirements for professional recognition of First Cycles

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Bologna and Routes for Professional Qualification and Transnational Cooperation (III)

- Transnational co-operation and professional mobility require TRUST
- The mechanisms to build and consolidate such TRUST are indeed slowly, but steadily, being implemented in our Higher Education Institutions...
- At European level - Within the diversity of our cultures and traditions, and with the corresponding healthy difficulties, a new future of co-operation is being built...

With the Portuguese spoken countries - the new system of education should create an attractive environment for co-operation with mutual interest and benefit

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