



European Qualifications Frameworks and Accreditation of Engineering Education

Sebastião Feyo de Azevedo
Faculty of Engineering, University of Porto, Portugal
Ordem dos Engenheiros - Engineers Portugal
ENAAE - European Network for Accreditation of Engineering Education
sfeyo@fe.up.pt
<http://www.fe.up.pt/~sfeyo>

International Colloquium
Towards Global Recognition in Engineering Education and Profession

Organized by RAEE - Russian Association for Engineering Education
21 May 2009, St. Petersburg, Russia

1



To say what I am going to say...

- ① **The need for reform and change**
 - ① **New paradigms to meet social, cultural, scientific and technological development**
- ② **Qualifications Frameworks**
 - ② **Main concepts and instrumentes for change**
 - ② **QF complementary layers - Meta Frameworks**
 - ② **QF complementary layers - Sectoral Frameworks**
 - ② **QF complementary layers - Descriptors at Syllabus level**
- ③ **Quality Assurance and Recognition of Qualifications**
 - ③ **Academic degree structures and Quality Assurance in Engineering**
 - ③ **Recognition in a global context**
- ④ **Closing Notes**



Global World

A new Paradigm of Coexistence - COOPETITION

- ☞ A very fast changing World
- ☞ Progress observed in Science and Technology, namely
 - ✓ in digital systems and communications
 - ✓ in health and life sciences
- ☞ Political changes that took place in Europe in the eighties
- ☞ Expectations and demands of Society and of Today's Life
 - ✓ Education for All
 - ✓ Quality requirements and increased competitiveness
 - ✓ Need for mobility
 - ✓ Need for Lifelong Learning
- ☞ A NEW PARADIGM of COOPERATION AND COMPETITION
- ☞ RECOGNITION OF QUALIFICATIONS - A COMMON NEED

SFA, RAEE Colloquium, St. Petersburg, 21 May 2009

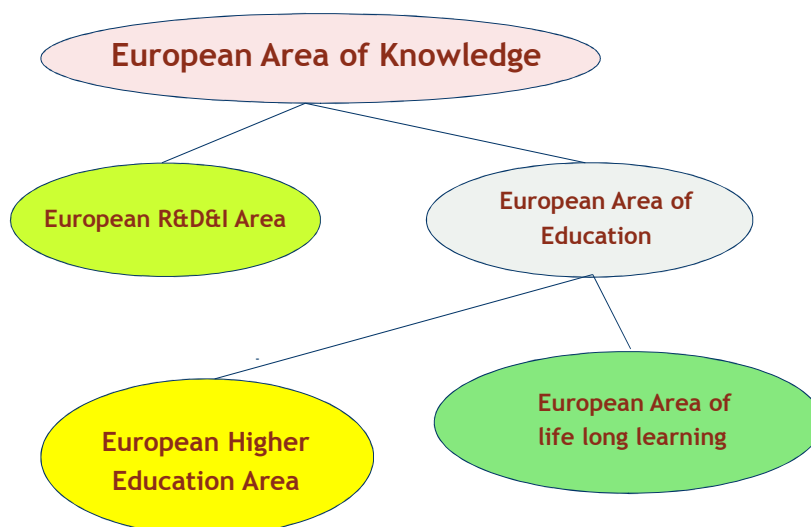
www.fe.up.pt/~sfeyo

sfeyo@fe.up.pt



The Bologna Process

Building the European Area of Knowledge... till 2010 !!!....



SFA, RAEE Colloquium, St. Petersburg, 21 May 2009

www.fe.up.pt/~sfeyo

sfeyo@fe.up.pt

The Core of the Bologna Reforms Structure and Substance for the Education Area

- ☞ **The Structure - basically done**
 - ✓ **A Degree Structure - QUALIFICATIONS FRAMEWORKS**
 - ✓ **A System to measure work and OUTCOMES - ECTS**
 - ✓ **A System to document qualifications - DIPLOMA SUPPLEMENT**
 - ✓ **A System to guarantee transparency - QUALITY ASSURANCE**
- ☞ **The Substance - changes to a large extent still to occur**
 - ✓ **New contents... closer to more immediate Societal concerns**
 - ✓ **Teacher-Centred to Student-Centred methodologies**
 - ✓ **Teaching based on Teacher Inputs to Learning Centred in well defined objectives - Learning Outcomes**
 - ✓ **Teaching Times to Student Workloads required to achieve desired Learning Outcomes**

The Core of the Bologna Reforms Keywords characterizing Structural Issues

- ☞ **MOBILITY, COOPERATION, TRUST, ACCREDITATION**
 - ✓ **MOBILITY AND COOPERATION** require professional recognition
 - ✓ **Professional recognition** requires **TRUST**
 - ✓ **TRUST** requires transparency and readability of structures and professional qualifications
- ☞ **All is achieved through:**
 - ✓ **COMPARABLE QUALIFICATIONS FRAMEWORKS**
 - And**
 - ✓ **RECOGNISED QUALITY ASSURANCE PROCEDURES**

The Core of the Bologna Reforms The Relevance of the Substance EUA: New methods and new Publics for Higher Education

In Trends V Report, European University Association, 2007, p. 8

“There is an increasing awareness that the most significant legacy of the [Bologna] process will be a change of educational paradigm across the continent. Institutions a **The Core of the Bologna Reforms** re slowly moving away from a system of teacher-driven provision, and towards a student-centered concept of higher education.

Thus the reforms are laying the foundations for a system adapted to respond to a growing variety of student needs.

Institutions and their staff are still at the early stages of realizing the potential of reforms for these purposes

The Bologna Process What needs to be understood

- ☞ Understand the Bologna Process as one of the dimensions of the prevailing strategy for European development
- ☞ Understand the Bologna Process as having two main groups of objectives, naturally interlinked
 - ✓ Objectives of political, social, and economical nature
 - ✓ Objectives of a dominant academic nature
- ☞ Understand that indeed these objectives mean, in many countries, a major reform (... a small revolution...) in Higher Education and in Society



To say what I am going to say...

- ① The need for reform and change
 - ① New paradigms to meet social, cultural, scientific and technological development
- ② **Qualifications Frameworks**
 - ② **Main concepts and instrumentes for change**
 - ② QF complementary layers - Meta Frameworks
 - ② QF complementary layers - Sectoral Frameworks
 - ② QF complementary layers - Descriptors at Syllabus level
- ③ Quality Assurance and Recognition of Qualifications
 - ③ Academic degree structures and Quality Assurance in Engineering
 - ③ Recognition in a global context
- ④ Closing Notes



Relevant Concepts and Instruments for the changes I - Understanding the terminology

- ☞ Knowledge - the outcome of the assimilation of information through learning
 - ✓ The ability to recall or remember facts without necessarily understanding them (Bloom's taxonomy)
- ☞ Skills - the ability to apply knowledge and use know-how to complete tasks and solve problems
 - ✓ Cognitive skills - the use of logical, intuitive or creative thinking
 - ✓ Practical skills - Manual dexterity or the use of methods, materials, tools, instruments...
- ☞ Competences - the proven ability to use knowledge, skills and abilities
 - ✓ Capacity of doing, with different levels of autonomy and responsibility - manage and supervise; manage and work with high level of technical complexity; work independently in complex and uncertain environments, at practical or strategic levels.

Relevant Concepts and Instruments for the changes II - Learning Outcomes - a core concept

- ☞ **Learning Outcomes** describe what a learner is expected to know, understand and be able to do after successful completion of a process of learning.
 - ✓ They are expressed through **Qualification Descriptors**
 - ✓ They **MUST** relate to level descriptors in National and European qualifications frameworks.

Relevant Concepts and Instruments for the changes III - ECTS - European Credit (Accumulation) and Transfer System (I)

- ☞ **ECTS** is a learner-centred system for credit accumulation and transfer based on the transparency of **learning outcomes** and learning processes.
 - ✓ It aims to facilitate planning, delivery, evaluation, recognition and validation of qualifications and units of learning as well as student mobility.
- ☞ **ECTS credits** are based on the workload students need in order to achieve expected **learning outcomes**.

Relevant Concepts and Instruments for the changes

III - ECTS- European Credit (Accumulation) and Transfer System (II)

- ☞ **Workload** indicates the time students typically need to complete all learning activities (such as lectures, seminars, projects, practical work, self-study and examinations) required to achieve the expected learning outcomes.

- ☞ **60 ECTS credits** are attached to the workload of a full-time year of formal learning (academic year) and the associated learning outcomes.

- ☞ In most cases:
 - ✓ student workload ranges from 1,500 to 1,800 hours for an academic year,
 - ✓ whereby one credit corresponds to 25 to 30 hours of work.

Relevant Concepts and Instruments for the changes

IV - Qualifications Frameworks

- ☞ **Strictus sensus** a Qualifications Framework (QF) is a systematic description of an education system, expressing the expected learning outcomes for a given qualification, that is expressing what a learner is expected to know, understand and be able to do after successful completion of a process of learning.

- ☞ QF thus focus mainly on outcomes and on the several learning paths, including those of lifelong learning, that may lead to a given qualification.



Qualifications Frameworks The different layers - Who does what...

- ☞ **High level descriptors - Meta Frameworks**
 - ✓ Characterized at institutional level of governments and stakeholders
 - ✓ They represent the 'legal crust'
- ☞ **Complemented by Sectoral and Specific descriptors**
 - ✓ By area and specialty
 - ✓ In close cooperation with higher education institutions and professional associations
 - ✓ In transnational cooperation
 - ✓ They represent Bologna in practice
- ☞ **Complemented by Curriculum descriptors - core contents**
 - ✓ Typically developed in Education Working parties and Academic Consortiums, at European Level, or within regulatory bodies at national level
 - ✓ They are the basis for credibility of the whole system



To say what I am going to say...

- ① The need for reform and change
 - ① New paradigms to meet social, cultural, scientific and technological development
- ② **Qualifications Frameworks**
 - ② Main concepts and instrumentes for change
 - ② **QF complementary layers - Meta Frameworks**
 - ② QF complementary layers - Sectoral Frameworks
 - ② QF complementary layers - Descriptors at Syllabus level
- ③ **Quality Assurance and Recognition of Qualifications**
 - ③ Academic degree structures and Quality Assurance in Engineering
 - ③ Recognition in a global context
- ④ **Closing Notes**



Meta Frameworks of Qualifications for Transparency, Recognition and Mobility

☞ Three major documents at High Level

- ✓ **The QF-EHEA - Qualifications Framework for the European Higher Education Area**
 - **Adopted in Bergen 2005, within the Bologna Process**
- ✓ **The EQF-LLL - European Qualifications Framework for Lifelong Learning**
 - **Adopted by the EC - approved on April 23, 2008 by the Parliament and the Council of the European Union**
- ✓ **The Directive for Recognition of Professional Qualifications, approved by the European Parliament and by the Council on September 7, 2005**
 - **National laws should have been passed in all EC Countries till the end of 2007**



Three major documents

I - QF-EHEA - Qualifications Framework for the European Higher Education Area

- ☞ **A degree structure with three main cycles and a short cycle within or linked to the First Cycle**
- ☞ **Adopts the Dublin Descriptors developed by the 'Joint Quality Informal Group' as the cycle descriptors, characterizing levels to be attained in**
 - *knowledge and understanding*
 - *applying knowledge and understanding*
 - *making judgements*
 - *communication*
 - *Learning skills*
- ☞ **These are high level broad descriptors that will have to lead to more specific descriptors in each area or specialty within a given area**

Three major documents

II - EQF-LLL - The European Qualifications Framework for Lifelong Learning

- ☞ Approved by the Parliament and the Council of the European Union on April 23, 2008
- ☞ Adopts 8 levels of qualifications characterized in terms of
 - *Knowledge*
 - *Skills*
 - *Competences*
- ☞ Adopts common principles for Quality Assurance in Higher Education and Vocational Education and Training in the context of the European Qualifications Frameworks
- ☞ Establishes a link of compatibility with the Framework for Qualifications of the European Higher Education Area

Three major documents

III - The Directive for Recognition of Professional Qualifications (September 2005) (I)

- ☞ Reaffirms previous Directive, accepting 7 professional areas with recognized specifications
- ☞ Engineering (as Law) is out of such group
 - ✓ For these - three main levels are recognized as associated to professional qualifications (the all important Article 11)
- ☞ Right now, the European Database of regulated professions of the EU Member states, Iceland, Norway, Lichtenstein and Switzerland is available for consultation at http://ec.europa.eu/internal_market/qualifications/regprof/index.cfm



Three major documents III - The Directive for Recognition of Professional Qualifications (II)

- ☞ Art. 11, e) - higher level
...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) - intermediate level
...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) - lower level
...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...



Qualifications Frameworks and the Directive A striking coincidence or concerted action?

Bologna QF-EHEA CYCLES	European Union EQF-LLL LEVELS	EU-Directive of Professional Recognition Art. 11 - LEVELS
Third Cycles	Level 8	
Second Cycles	Level 7	Art 11° e)
First Cycles	Level 6	Art. 11° d)
Short Cycles Linked to or Within First Cycles	Level 5	Art. 11° c)



To say what I am going to say...

- ① The need for reform and change
 - ① New paradigms to meet social, cultural, scientific and technological development
- ② **Qualifications Frameworks**
 - ② Main concepts and instrumentes for change
 - ② QF complementary layers - Meta Frameworks
 - ② **QF complementary layers - Sectoral Frameworks**
 - ② QF complementary layers - Descriptors at Syllabus level
- ③ Quality Assurance and Recognition of Qualifications
 - ③ Academic degree structures and Quality Assurance in Engineering
 - ③ Recognition in a global context
- ④ Closing Notes



Relevance of Sectoral and/or Curriculum Frameworks Taken from the BFUG document - Bologna Beyond 2010 February, 2009

“... While learning outcomes have been generically defined for the degree structure in the context of the Dublin descriptors, the key point is to develop subject specific descriptors for knowledge, skills and competences.”

Relevance of Sectoral and/or Curriculum Frameworks Taken from the BFUG document - Bologna Beyond 2010 February, 2009

“Common reference points could also be developed for an entire sector, which might lead to the definition of sectoral descriptors and the establishment of sectoral qualifications frameworks...”

Relevance of Sectoral and/or Curriculum Frameworks Taken from the Leuven/Louvain-la-Neuve Communiqué 29 April 2009

“...
Curricular reform will thus be an ongoing process leading to high quality, flexible and more individually tailored education paths.

Academics, in close cooperation with student and employer representatives, will continue to develop learning outcomes and international reference points for a growing number of subject areas
...”

Bringing Qualifications Frameworks into Practice

I - Sectoral or Subject Specific Frameworks

Initiatives that came to life along the years

- ☞ TUNING methodology
 - ✓ E4 proposals for Engineering
- ☞ TU3 proposals - Delft, Eindhoven e Twente
- ☞ EUR-ACE standards for professional quality assurance
- ☞ CDIO - Conceive-Design-Implement-Operate
- ☞ ABET standards for professional quality assurance
- ☞ European projects to identify core knowledge and competences at discipline level
- ☞ Initiatives leading to core curricula recommendations
 - ✓ European Working Parties on Education and joint initiatives at academic level

The EUR-ACE Framework and Accreditation System

I - System Characterization

- ☞ Compatible with the European Standards and Guidelines for Quality Assurance (adopted in Bergen, 2005)
- ☞ Programme Assessment Procedures should include clear information and evidence on the following components:
 - ✓ Needs, objectives and outcomes
 - ✓ Educational process
 - ✓ Resources
 - ✓ Assessment of the educational process
 - ✓ Management system
- ☞ In this context, 'the criteria to be assessed' and the associated 'requirements' in the form of questions, valid for both FC and SC programmes, should be addressed when assessing an Engineering programme on education


The EUR-ACE Framework and Accreditation System II - Knowledge and Competence areas

- ☞ **Programme Outcomes that must be satisfied**
 - **6 areas of competences are defined**
 - ✓ Knowledge and Understanding
 - ✓ Engineering Analysis
 - ✓ Engineering Design
 - ✓ Investigations
 - ✓ Engineering Practice
 - ✓ Transferable (personal) Skills
 - **For each category, the EUR-ACE Framework Standards list the expected Programme Outcomes of First Cycle and Second Cycle Studies**

Qualifications Frameworks and Quality Assurance I - Clustering of qualifications descriptors QF-EHEA - EQF-LLL - EUR-ACE

Table 1 - Clustering of qualifications descriptors in different frameworks


Bologna, QF-EHEA	EU, EQF-LLL	EUR-ACE
A. Knowledge and understanding	1. Knowledge	I. Knowledge and understanding
B. Applying knowledge and understanding	2. Skills	II. Engineering analysis
C. Making Judgments	3. Competences	III. Engineering design
D. Communications skills		IV. Investigations
E. Learning skills		V. Engineering practice
		VI. Transferable skills


 Universidade do Porto
 Faculdade de Engenharia
FEUP

Qualifications Frameworks and Accreditation -

Qualifications Frameworks and Quality Assurance - II - What is equal, what is different (I) QFs, the Directive and the EUR-ACE System

Bologna QF-EHEA CYCLES	European Union EQF-LLL LEVELS	EUR-ACE	EU-Directive of Professional Recognition Art. 11 - LEVELS
Third Cycles	Level 8		
Second Cycles	Level 7	Second Cycles	Art 11° e)
First Cycles	Level 6	First Cycles	Art. 11° d)
Short Cycles Linked to or Within First Cycles	Level 5		Art. 11° c)


 Universidade do Porto
 Faculdade de Engenharia
FEUP

Qualifications Frameworks and Accreditation -

Qualifications Frameworks and Quality Assurance II - What is equal, what is different (III) EUR-ACE First Cycles / QF-EHEA -First Cycles / EQF-LLL- Level 6

EUR-ACE - First Cycles

	I.1	L2	L3	L4	II.1	II.2	III.1	III.2	IV.1	IV.2	IV.3	V.1	V.2	V.3	V.4	VI.1	VI.2	VI.3	VI.4	VI.5
QF - EHEA																				
FC-A	■	■	■	■																
FC-B					■	■	■	■	■	■	■	■	■	■	■				■	■
FC-C					■	■	■	■	■	■					■			■		
FC-D																■	■	■		
FC-E												■	■	■						■
EQF-LLL																				
L6.1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
L6.2		■	■	■	■	■	■	■	■	■	■	■	■	■						
L6.3.1																■			■	
L6.3.2																■		■		■

SFA, RAEE Colloquium, St. Petersburg, 21 May 2009

www.fe.up.pt/~sfeyo sfeyo@fe.up.pt

Qualifications Frameworks and Quality Assurance

II - What is equal, what is different (IV)

EUR-ACE Second Cycles / QF-EHEA -Second Cycles / EQF-LLL- Level 7

		EUR-ACE - Second Cycles																		
		I.1	I.2	II.1	II.2	II.3	II.4	III.1	III.2	III.3	IV.1	IV.2	IV.3	IV.4	V.1	V.2	V.3	VI.1	VI.2	VI.3
QF - EHEA	SC-A																			
	SC-B																			
	SC-C																			
	SC-D																			
	SC-E																			
EQF-LLL	L7.1.1																			
	L7.1.2																			
	L7.2																			
	L7.3.1																			
	L7.3.2																			

SFA, RAEE Colloquium, St. Petersburg, 21 May 2009

www.fe.up.pt/~sfeyo

sfeyo@fe.up.pt

Qualifications Frameworks and Quality Assurance

II - What is equal, what is different (II)

CDIO-Dublin-EUR-ACE-ABET

Table 1 - Relation between CDIO - Dublin Descriptors - EUR-ACE Standards - ABET EC2000 accreditation requirements

		Dublin - Master					EUR-ACE						ABET										
		a)	b)	c)	d)	e)	1	2	3	4	5	6	a	b	c	d	e	f	g	h	i	j	k
1	Technical knowledge and reasoning	1.1 Knowledge of underlying sciences	1				1						1										
		1.2 Core engineering fundamental knowledge	1				1						1										
		1.3 Advanced engineering fundamental knowledge	1				1						1										1
2	Personal and professional skills and attributes	2.1 Engineering reasoning and problem solving	1	1	1		1	1	1				1										
		2.2 Experimentation and knowledge discovery	1	1			1	1	1	1			1										
		2.3 System thinking	1				1	1	1	1			1										
		2.4 Personal skills and attitudes	1			1	1	1	1	1	1		1										1
		2.5 Professional skills and attitudes	1	1		1	1	1	1	1	1		1										
3	Interpersonal skills: Teamwork and communication	3.1 Teamwork									1							1					
		3.2 Communications				1					1									1			
		3.3 Communications in foreign languages				1					1												
4	Conceiving, Designing, Implementing and Operating systems in the enterprise and societal context	4.1 External and societal context		1						1	1	1									1	1	
		4.2 Enterprise and business context		1						1	1	1									1		
		4.3 Conceiving and engineering systems		1																			
		4.4 Designing		1																			
		4.5 Implementing		1																			
		4.6 Operating		1																			

SFA, RAEE Colloquium, St. Petersburg, 21 May 2009

www.fe.up.pt/~sfeyo

sfeyo@fe.up.pt



To say what I am going to say...

- ① The need for reform and change
 - ① New paradigms to meet social, cultural, scientific and technological development
- ② **Qualifications Frameworks**
 - ② Main concepts and instrumentes for change
 - ② QF complementary layers - Meta Frameworks
 - ② QF complementary layers - Sectoral Frameworks
 - ② **QF complementary layers - Descriptors at Syllabus level**
- ③ **Quality Assurance and Recognition of Qualifications**
 - ③ Academic degree structures and Quality Assurance in Engineering
 - ③ Recognition in a global context
- ④ Closing Notes



Descriptors at Syllabus (contents) level I - Recommendations of the WPE-EFCE (I)

- ☞ **WPE-EFCE - Working Party on Education - European Federation of Chemical Engineering**
- ✓ Currently with 38 members, representing 24 Countries
- ✓ Developed between 2003 and 2005 an exercise of identification of core curriculum for chemical engineering - contents and methodologies
- ✓ See EFCE Bologna Recommendations (2005) at
http://www.efce.info/Bologna_Recommendation.html

Descriptors at Syllabus (contents) level

I - Recommendations of the WPE-EFCE (II)

- ☞ See WPE site on <http://www.efce.info/wpe.html>
- ☞ These recommendations cover
 - Learning outcomes
 - General chemical engineering skills and knowledge
 - Transferable skills
 - Achieving the learning outcomes
 - Core curriculum
 - Teaching and learning
 - Industrial experience
 - Review of the educational process
 - Student assessment
- ☞ The core curriculum proposed covers only approx. two thirds of a first and a second level degree study

Descriptors at Syllabus (contents) level

II - The CHEMPASS Project (2006-2009) (I)

- ☞ Financed by the European Commission within the Erasmus Mundus Programme - Action 4: "Enhancing Attractiveness". Started: November 2006. E.U. grant for 3 years.
- ☞ Composed of 13 Higher Education Institutions of 9 European countries and 1 of South Africa:
CPE Lyon (France) (Coordinator), Institut Quimic de Sarrià (Spain), Universidade do Porto (Portugal), Politecnico di Torino (Italy), INPL-ENSIC Nancy (France), INPT-ENSIACET Toulouse (France), Technische Universiteit Delft (The Netherlands), University College Dublin (Ireland), Technische Universität München (Germany), UCTM Sofia (Bulgaria), Jagiellonian University (Poland), Lappeenranta University of Technology (Finland), Durban University of Technology (South Africa).

Descriptors at Syllabus (contents) level II - The CHEMEPASS Project (2006-2009) (II)

☞ Milestones

- ✓ Identification of relevant general and specific Learning Outcomes for Chemical Engineering Programmes
- ✓ Identification of knowledge to be tested among Chemical Engineering core subjects
- ✓ Development of a database with test questions

Descriptors at Syllabus (contents) level III - The VDI-GVC Recommendation for Chemical and Processing Engineering (2008) (I)

- ☞ VDI-GVC approved qualifications frames for degree course for Process Engineering, Chemical Engineering and Biomolecular or Bioprocess Engineering
- ☞ Recommendations cover both 'more theoretically oriented' and 'more vocationally oriented' profiles
- ☞ Recommendations apply to consecutive Bachelor's and Master's degree courses

Descriptors at Syllabus (contents) level

III - The VDI-GVC Recommendation for Chemical and Processing Engineering (2008) (II)

☞ Recommendations are structured in:

- ✓ Professional profile and qualification framework
- ✓ Qualifications for admission to the course
- ✓ Structure of the degree course
- ✓ Contents of the degree course

☞ The Professional profile and qualification framework is organized in the six main outcomes adopted by EUR-ACE

To say what I am going to say...

- ① The need for reform and change
 - ① New paradigms to meet social, cultural, scientific and technological development
- ② Qualifications Frameworks
 - ② Main concepts and instrumentes for change
 - ② QF complementary layers - Meta Frameworks
 - ② QF complementary layers - Sectoral Frameworks
 - ② QF complementary layers - Descriptors at Syllabus level
- ③ Quality Assurance and Recognition of Qualifications
 - ③ Academic degree structures and Quality Assurance in Engineering
 - ③ Recognition in a global context
- ④ Closing Notes

Academic Degree Structures and Quality Assurance in Engineering I - Concerning levels of qualification

- ☞ **Two levels of qualifications associated to those levels approved in the Directive of Professional Recognition and recognized in the EQF-EHEA and the EQF-LLL**
 - **1st Cycle, Level 6, Art. 11, d): (3-4)U**
 - ✓ **First Cycle Degrees are the basis for achieving the qualification of Technical (or Associate) Engineers, whatever the European designation**
 - **2nd Cycle, Level 7, Art. 11, e): $\geq 4U$**
 - ✓ **Second Cycle Degrees are the basis for achieving the qualification of Engineers, or equivalent European designation**

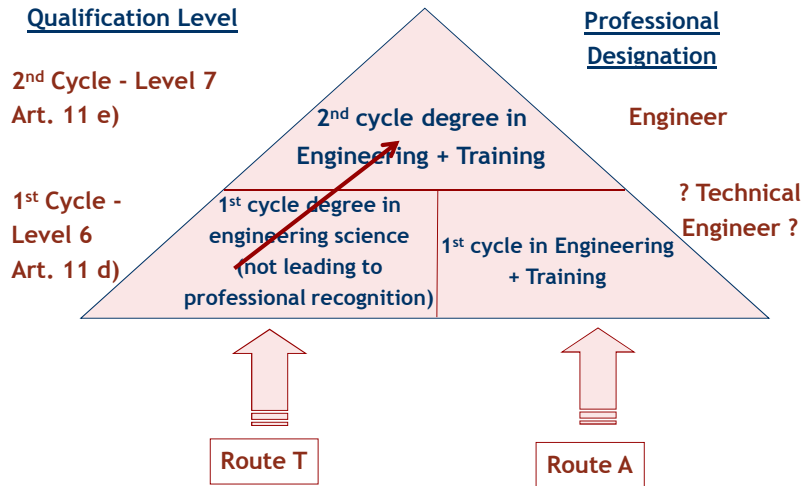
Academic Degree Structures and Quality Assurance in Engineering II - Concerning Profiles

- ☞ **Two main profiles in Engineering**
 - **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**



Academic Degree Structures and Quality Assurance in Engineering

III - Routes for the different qualification levels



SFA, RAEE Colloquium, St. Petersburg, 21 May 2009

www.fe.up.pt/~sfeyo

sfeyo@fe.up.pt



Academic Degree Structures and Quality Assurance in Engineering

IV- Differences between levels of qualifications

- ☞ Programme Outcomes must be evaluated in relation with the level of intervention in the Engineering Activity
 - 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 in Engineering, the differences in outcomes are mostly related with
 - scope, depth and breadth
- ☞ For the Master degree, developing the right **ATTITUDE** to use knowledge or skills in a given situation is a major outcome

SFA, RAEE Colloquium, St. Petersburg, 21 May 2009

www.fe.up.pt/~sfeyo

sfeyo@fe.up.pt



Academic Degree Structures and Quality Assurance in Engineering V - Programme Outcomes for Accreditation (I)

- ☞ Quality assurance procedures rely on accepted qualifications frameworks
- ☞ Programme outcomes for accreditation should always be related to **potential professional recognition of engineering qualifications**

- ↪ **As such:**
- ☞ There should be only one set of programme outcomes for accreditation of Second Cycle Degrees
 - ↪ **(Whatever the profile and programme)**
- ☞ There should be only one set of programme outcomes for accreditation of First Cycle Degrees



Academic Degree Structures and Quality Assurance in Engineering V - Programme Outcomes for Accreditation (II)

- ☞ Programme Outcomes for Accreditation of Second Cycle Degrees
 - ✓ Whatever the programme and profile, be it an 'Integrated Programme' (?) or First-Second Cycle Degree, we should evaluate **Integrated Outcomes**
 - We are not going to accredit the part corresponding to '120 ECTS'...
- ☞ Programme Outcomes for First Cycle Degrees
 - ✓ First Cycle Degrees for 'more applications oriented programmes' **must** satisfy such requirements, **BUT**
 - ✓ In Integrated or 'more theoretically oriented profiles' the 'First Cycle within these programmes' **may not meet** the requirements for accreditation

Recognition of Qualifications - a Worldwide Issue

I - EUR-ACE vs. other existing global 'accords' [W-S-D] (I)

- ☞ **Different "accords":**
 - Washington Accord
 - Sydney Accord
 - Dublin Accord
- ☞ **Different "registers":**
 - EMF International Register of Professional Engineers
 - ETMF International Register of Engineering Technologists
 - APEC Register of Professional Engineers

Recognition of Qualifications - a Worldwide Issue

I - EUR-ACE vs. other existing global 'accords' [W-S-D] (II)

- ☞ **Fundamental differentiation/barrier between**
 - "Professional Engineers" and
 - "Engineering Technologist"
- ☞ **Define all recognized (accredited) "Engineers' " degrees as "Bachelor".**
- ☞ **These features are not in the spirit of the EQF nor of EU Directive 2005/36**
- ☞ **Indeed discussion is currently in the air, and will have to be continued, concerning recognition of standards**

Recognition of Qualifications - a Worldwide Issue

III - OECD Initiative

AHELO - Assessment of HE Learning Outcomes

- ☞ **Potentially the largest, most comprehensive assessment of universities yet devised**
 - The aim is to measure various types of Learning Outcomes and to examine a wide range of possible criteria to assess their influence in those outcomes
- ☞ **10 Countries involved in the start-up, on May 2008**
 - Australia, Belgium (Flanders), Finland, Italy, Japan, Korea, Mexico, The Netherlands, Norway, Sweden
- ☞ **Composed of four strand of work**
 - Assessment of generic skills
 - Assessment of discipline-specific skills in Engineering
 - Assessment of discipline-specific skills in Economics
 - Research-based value-added strand - assessing the “value-added” factors of Higher Education Institutions

To say what I am going to say...

- ① The need for reform and change
 - ① New paradigms to meet social, cultural, scientific and technological development
- ② Qualifications Frameworks
 - ② Main concepts and instrumentes for change
 - ② QF complementary layers - Meta Frameworks
 - ② QF complementary layers - Sectoral Frameworks
 - ② QF complementary layers - Descriptors at Syllabus level
- ③ Quality Assurance and Recognition of Qualifications
 - ③ Academic degree structures and Quality Assurance in Engineering
 - ③ Recognition in a global context
- ④ Closing Notes



Bologna and Routes for Professional Qualification and Transnational Cooperation

- ☞ The Engineering Profession requires different qualification levels and education profiles that should be guaranteed and identified through transparent Quality Assurance Procedures
- ☞ 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
- ☞ The concept of Credit Accumulation, together with Lifelong Learning, is of utmost relevance in this new paradigm of building professional qualifications



Qualifications Frameworks, Quality Assurance and Recognition of Professional Qualifications (I)

- ☞ Sectoral Frameworks represent Bringing Bologna into Practice
- ☞ National Qualifications Frameworks should be tuned with Meta Frameworks adopted and recognized at international level
- ☞ Quality Assurance procedures should
 - ✓ Be in substantial conformity with Standards and Guidelines for Quality Assurance accepted by all stakeholder
 - ✓ Accomodate the recognition of descriptors developed at sectoral and syllabus level



Qualifications Frameworks, Quality Assurance and Recognition of Professional Qualifications (II)

- ☞ Mobility is a distinctive need of Today's Global World
- ☞ Recognition of professional qualifications is a major task ahead...
- ☞ Mobility and Recognition of Qualifications are not an illusion, a dream, an objective or a target...

They are as **MUST**...

Required for Peace and Progress on Earth