

Quality in engineering education

Bernard Remaud, ENAEE president

ENAEE workshop – Berlin – May 2016





European Network for the Accreditation of
Engineering Education

**The European Network for
the Accreditation
of Engineering Education (ENAE)
awarding the EUR-ACE[®] label**

(www.enaee.eu)

ENAE 10th anniversary



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ENAE 10th anniversary

- **Conceived in September 2000** as the “European Standing Observatory for Engineering Profession and Education” (ESOEPE), supported by funding of the European Commission Socrates and Tempus programmes
- **Born in February 2006** with 14 concerned Associations around the cradle...
- First General Assembly: 30 March 2006
- Founding members
FEANI (acting Secretariat), RAEE (RU), SEFI, CTI (France), CoPI(IT), UNIFI/TREE, IEI-EngineersIreland, EUROCADRES, OE (Ordem,...) (PT), EC (UK),

ENAE 10th anniversary

What does one expect for a newborn institution?

- Growth
- Strengthening
- Accountability
- Achievements
- Visibility

10 years later, where we are

The ENAEE workshop (Berlin-2016):

- Main trends and achievements(this talk)
- ENAEE in action: hot issues (T. Dogu)
- ENAEE in the global context of engineering education(D. Mc Grath–H.Hanharan)
- New challenges for the 10 next years(Round Table –M.Molzahn)

A

ENAE strengths, spreading and achievements

ENAE initial objectives

“Accreditation of engineering educational programmes as **entry route to the engineering profession** (...) to improve at the same time **academic quality** and relevance for the job market”

EUR-ACE is programme accreditation; to qualify it better, it can be called “**pre-professional accreditation**”

(Giuliano Augusti, 1st ENAE president)

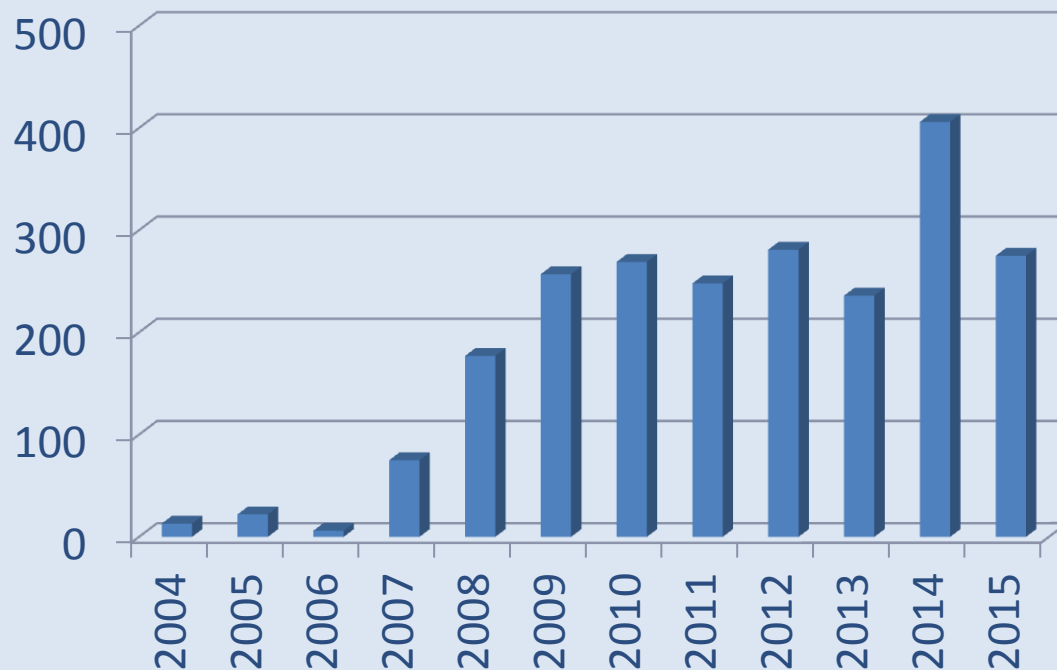
Awarded EUR-ACE labels (Mid 2011)

AgencyJan	Date auth.	Countries accr.	FCD	SCD	TOTAL
ASIIN	Nov. 2006	DE, CH	184	150	334
CTI	"	FR,BE, BG, ES		229	229
Eng Ireland	"	IE	70	25	95
RAEE	"	RU, KZ	46	50	96
EngC	"	UK	4	26	30
Od. Eng	"	PT	4	26	30
MÜDEK	Jan. 2009	TR	111	0	111

7 authorised agencies, 901 labels awarded

Awarded EUR-ACE labels (until 2015)

**Total Number of EUR-ACE Labels
Issued by Different Agencies**



AS of April 2015

First Cycle deg	976
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Second Cycle deg.	687
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Second Cycle deg Integrated	603
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13 authorised agencies – 2 266 labels awarded in 32 countries

A decentralized process to award the EUR-ACE labels



EUR-ACE[®] Label



**Accreditation
Agencies**

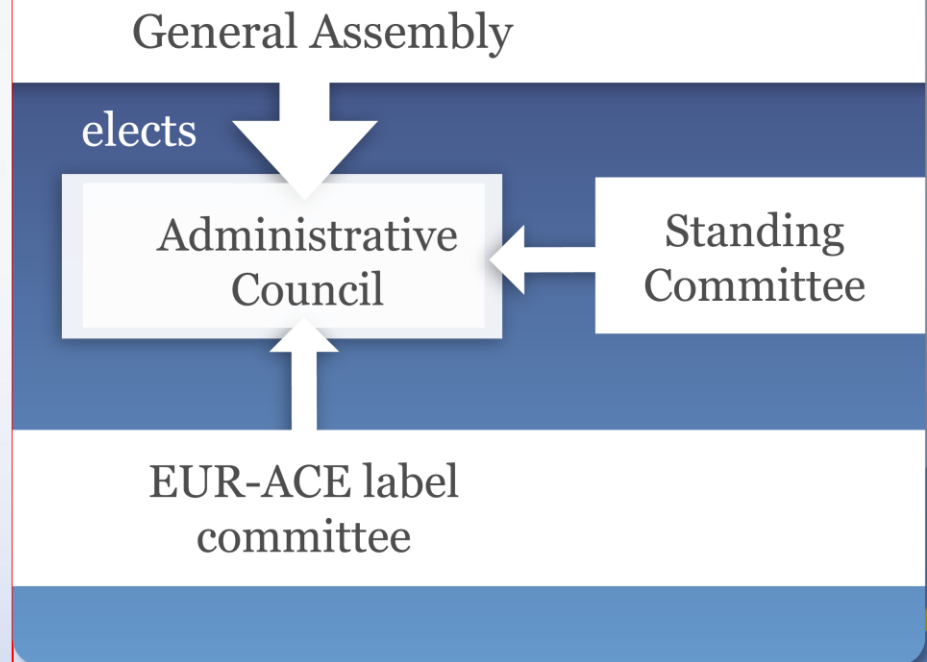
**Bachelor & Master
Engineering
Degree
Programmes**



Structure of ENAEE

- General Assembly (20 members)
- President
- Administrative Council (10 elected members, including the President, two Vice-Presidents and the Treasurer)
- Standing Committee (4 members of Administrative Council and the Chair of the Label Committee.)
- Label Committee (qualified representatives, one from each authorized agency)

The Structure of ENAEE



The **EUR-ACE®** label,
listed by the European Commission among the
“**European Quality Labels**”,
guarantees the quality of an engineering degree
programme and its suitability as an
entry route to the engineering profession
(pre-professional accreditation)

While at the same time assuring:

- scientific and academic quality
- relevance for the “engineering” job

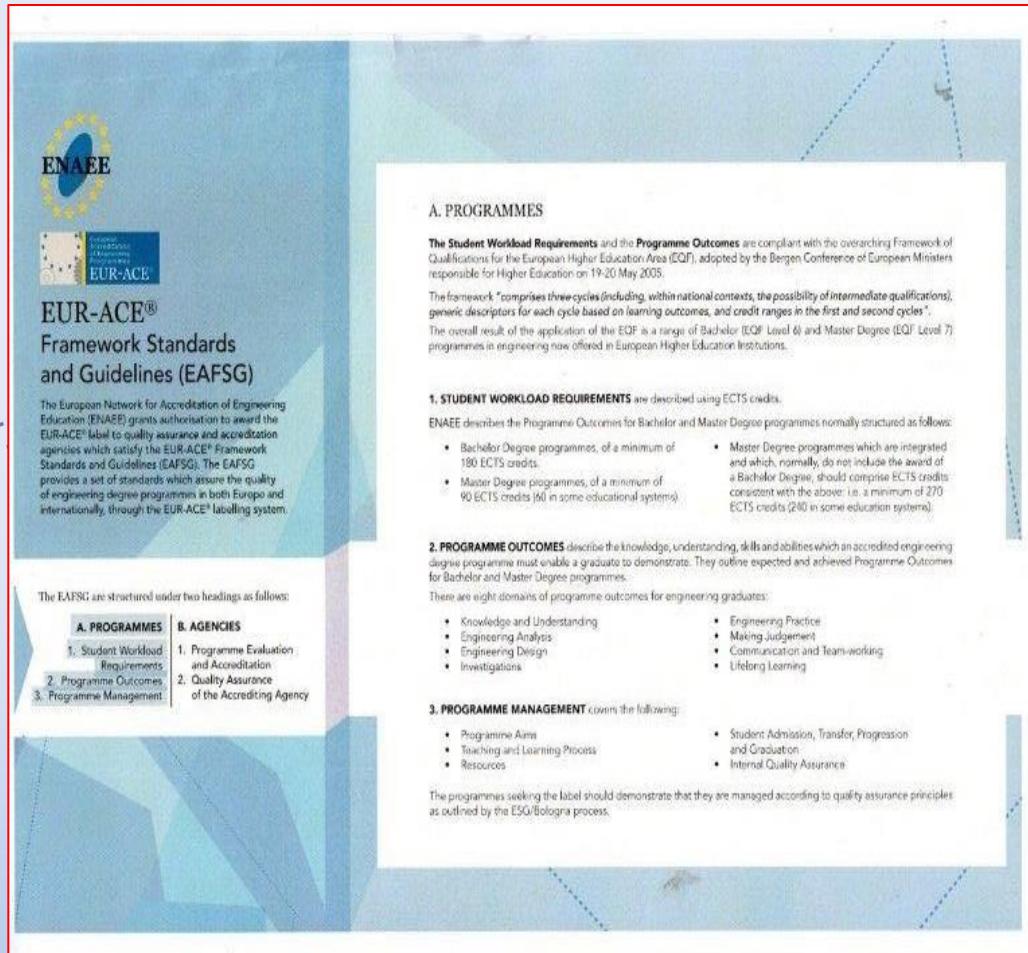
EUR-ACE Accord

On 19th November 2014, the 13 authorised agencies signed a Mutual Recognition Agreement whereby they accept each other's accreditation decisions in respect of Bachelor and Master of Engineering degree programmes which they accredit.



ENAEE

EUR-ACE Framework Standards and guidelines



The image shows the cover of the EUR-ACE Framework Standards and Guidelines (EAFSG) document. The cover is blue and white with the ENAEE logo at the top left. Below the logo, it says "EUR-ACE® Framework Standards and Guidelines (EAFSG)". A small text box explains that ENAEE grants authorization to award the EUR-ACE label to quality assurance and accreditation agencies. The main content area is divided into two columns: A. PROGRAMMES and B. AGENCIES. Column A lists: 1. Student Workload Requirements, 2. Programme Outcomes, 3. Programme Management. Column B lists: 1. Programme Evaluation and Accreditation, 2. Quality Assurance of the Accrediting Agency. At the bottom, it states that the EAFSG is structured under two headings as follows:

A. PROGRAMMES

1. Student Workload Requirements
2. Programme Outcomes
3. Programme Management

B. AGENCIES

1. Programme Evaluation and Accreditation
2. Quality Assurance of the Accrediting Agency

The EAFSG is structured under two headings as follows:

A. PROGRAMMES

The Student Workload Requirements and the Programme Outcomes are compliant with the overarching Framework of Qualifications for the European Higher Education Area (EQF), adopted by the Bergen Conference of European Ministers responsible for Higher Education on 19-20 May 2005.

The framework "comprises three cycles (including, within national contexts, the possibility of intermediate qualifications), generic descriptors for each cycle based on learning outcomes, and credit ranges in the first and second cycles".

The overall result of the application of the EQF is a range of Bachelor (EQF Level 6) and Master Degree (EQF Level 7) programmes in engineering now offered in European Higher Education Institutions.

1. STUDENT WORKLOAD REQUIREMENTS are described using ECTS credits.

ENAEE describes the Programme Outcomes for Bachelor and Master Degree programmes normally structured as follows:

- Bachelor Degree programmes, of a minimum of 180 ECTS credits.
- Master Degree programmes, of a minimum of 90 ECTS credits (60 in some educational systems).
- Master Degree programmes which are integrated and which, normally, do not include the award of a Bachelor Degree, should comprise ECTS credits consistent with the above: i.e. a minimum of 270 ECTS credits (240 in some educational systems).

2. PROGRAMME OUTCOMES describe the knowledge, understanding, skills and abilities which an accredited engineering degree programme must enable a graduate to demonstrate. They outline expected and achieved Programme Outcomes for Bachelor and Master Degree programmes.

There are eight domains of programme outcomes for engineering graduates:

- Knowledge and Understanding
- Engineering Analysis
- Engineering Design
- Investigations
- Engineering Practice
- Making Judgement
- Communication and Team-working
- Lifelong Learning

3. PROGRAMME MANAGEMENT covers the following:

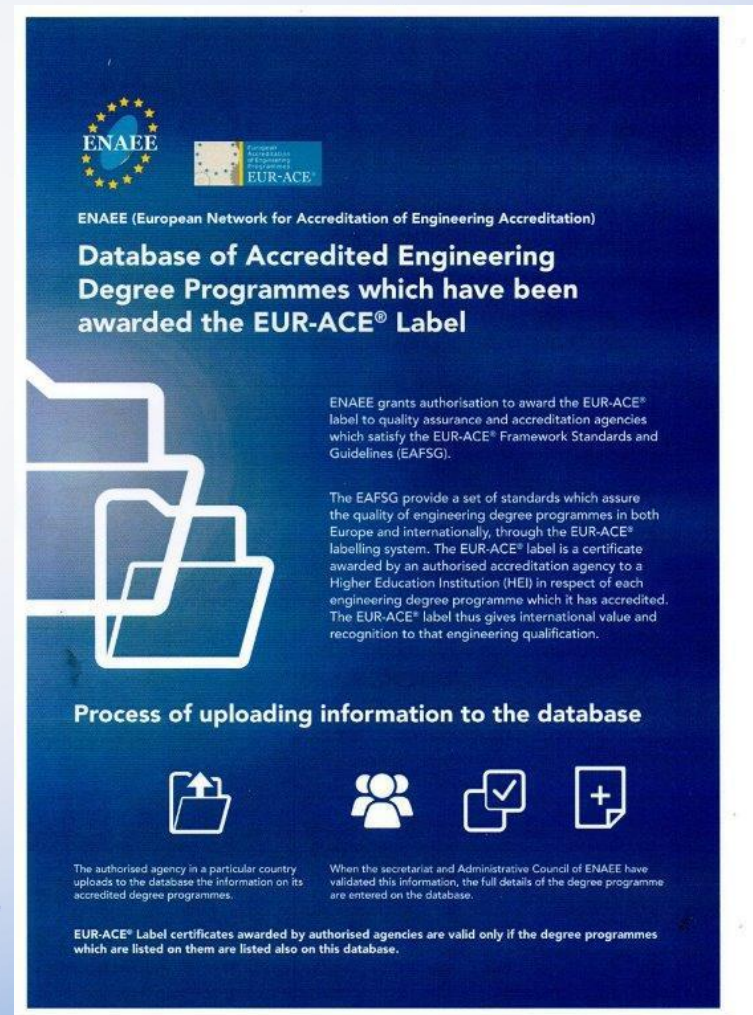
- Programme Aims
- Teaching and Learning Process
- Resources
- Student Admission, Transfer, Progression and Graduation
- Internal Quality Assurance

The programmes seeking the label should demonstrate that they are managed according to quality assurance principles as outlined by the ESG/Bologna process.



EUR-ACE® Database

A database of accredited Engineering Degree programmes which have been awarded the EUR-ACE® label



ENAEE (European Network for Accreditation of Engineering Accreditation)

Database of Accredited Engineering Degree Programmes which have been awarded the EUR-ACE® Label

ENAEE grants authorisation to award the EUR-ACE® label to quality assurance and accreditation agencies which satisfy the EUR-ACE® Framework Standards and Guidelines (EAFSG).

The EAFSG provide a set of standards which assure the quality of engineering degree programmes in both Europe and internationally, through the EUR-ACE® labelling system. The EUR-ACE® label is a certificate awarded by an authorised accreditation agency to a Higher Education Institution (HEI) in respect of each engineering degree programme which it has accredited. The EUR-ACE® label thus gives international value and recognition to that engineering qualification.

Process of uploading information to the database

The authorised agency in a particular country uploads to the database the information on its accredited degree programmes.

When the secretariat and Administrative Council of ENAEE have validated this information, the full details of the degree programme are entered on the database.

EUR-ACE® Label certificates awarded by authorised agencies are valid only if the degree programmes which are listed on them are listed also on this database.

B

ENAE challenges and opportunities

- A global convergence with a wide context diversity
- Learning outcomes and the university paradigms
- Programme accreditation on the long range

B

ENAE challenges and opportunities

- A global convergence with a wide context diversity
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“Engineer, engineering”

- A wide diversity of professional status and regulation – the process through which an engineer becomes authorized to practise engineering and/or provide engineering professional services to the public – applies in many different countries. Wikipedia
- A wide diversity of educational systems: the «engineering degree» may exist or not, and may be regulated or not...

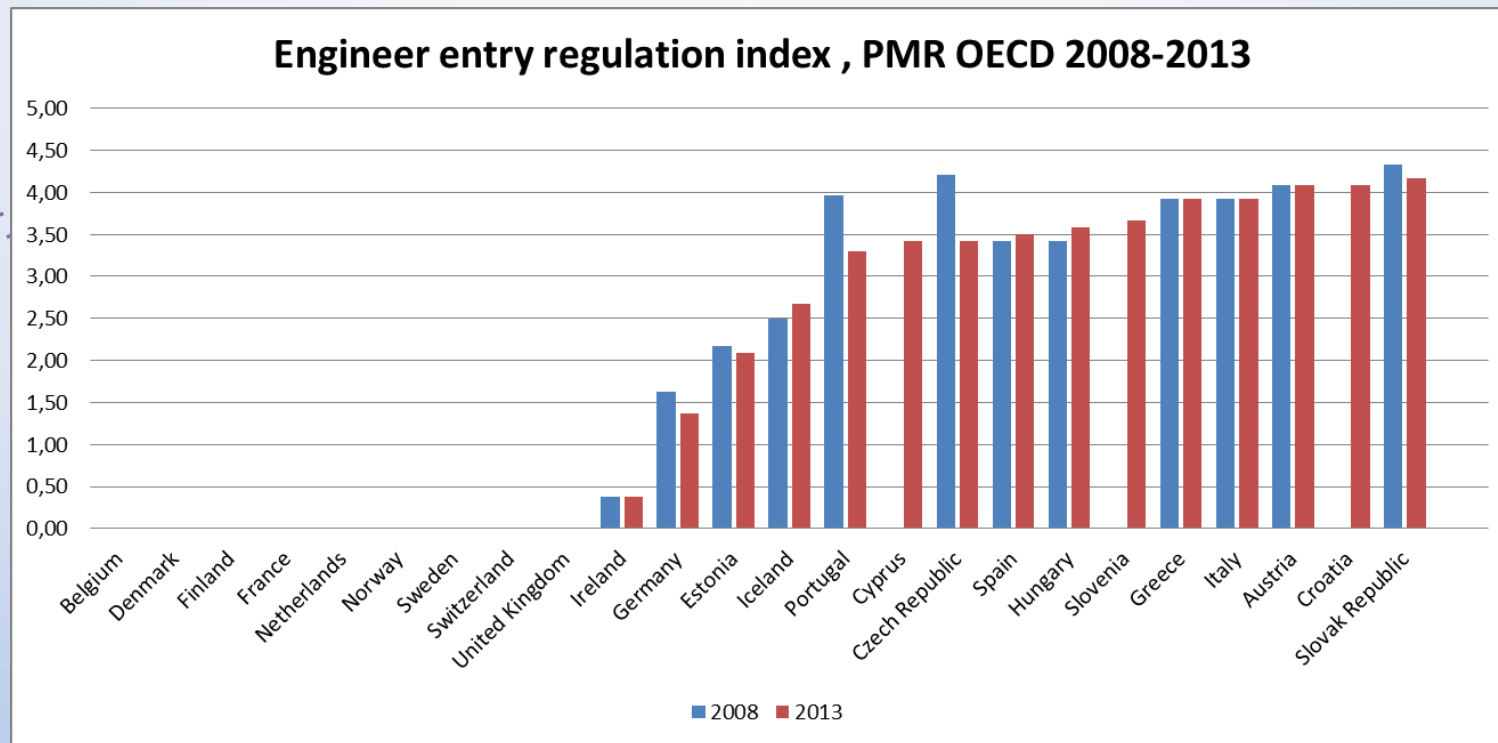
BUT

“In OECD countries and throughout the world, there is a **great degree** of consensus concerning what an engineer is supposed to know and be able to do.”
(Tuning-AHELO report)

“Engineer, engineering”

A wide diversity of professional status and regulation.

Engineers regulated very differently among European States



A worldwide convergence

- What an engineering graduate is supposed to know and be able to do,
 - ✓ Programme outcomes/graduate attributes
- Requirements and goals for the educational system to provide engineering graduates with the expected outcomes,
 - ✓ Quality Assurance for the programme providers and for the accreditation agencies

The 2 pillars of ENAEE « wisdom »

Quality assurance

Assessment of the processes and procedures:

- Programme aims
- Teaching and learning procedures resources
- Students (from admission to graduation)
- Internal quality assurance

Compliant with the

- ESG -European standards and guidelines for Quality Assurance in the EHEA-
- « Best practice in engineering programme accreditation » (IEA/ENAEE)

Programme outcomes

What an engineering degree must enable a graduate to demonstrate

8 domains for the knowledge, understanding, skills and abilities

2 levels of achievements

- Bachelor degree (min 180 ECTS)
- Master degree(min 90 ECTS)

The equivalences of the EUR-ACE and IEA systems is still an issue.

On the ENAEE roadmap

- Always question and revise the EAFSG relatively to the objectives (“**pre-professional accreditation**”)
- What reach for the global convergence on the outcomes.
Joint IEA/ENAEE standards? Joint IEA/ENAEE framework to clarify convergences/divergences?
- Measure and Compare Achievements of Learning Outcomes in Higher Education in Europe(Tuning-CALOHEE)

B

ENAE challenges and opportunities

- A global convergence with a wide context diversity
- Learning outcomes and the university paradigms
- Programme accreditation in the future

From the Humboldt model...

The concept of « Humboldtian » university used today agglomerates several elements including the following:

- the unity of research and teaching;
- the freedom of research and teaching (academic freedom)
- the university aims at furthering pure science (science free of vested interests);

University: a community of teachers and students dedicated to pure science

... to the EHEA keywords (Bucharest communiqué)

- Investing in higher education for the future
- Quality assurance
- Enhancing employability to serve Europe's needs
- Qualifications frameworks for Higher Education

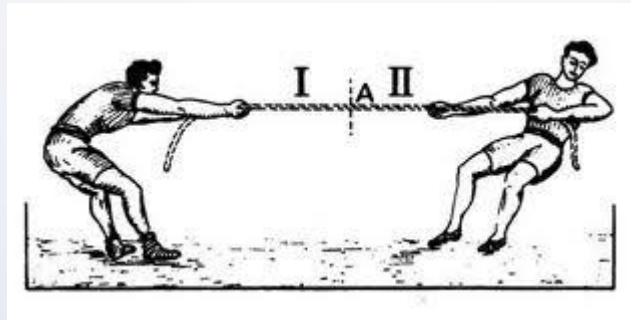
One of the priorities

Work to enhance employability, lifelong learning, problem-solving and entrepreneurial skills through improved cooperation with employers, especially in the development of educational programmes;

A challenge for accreditation

A tension within individuals and institutions between the definition of graduates profiles:

- A well-educated scientist able to find his/her own way in the professional life (**emphasis on knowledge, input-based**)



- A competent « junior » engineer able to engage rapidly into a profession (**emphasis on abilities and skills, outcome-based**)

The (OECD) Tuning-AHELO report (2011)

Learning outcomes are often viewed as a threat that will streamline education and limit academic freedom.

Some observations from here and there

- « Student mobility is a waste of time: my lectures are among the best on the subject »
- « This topic (my domain of research) is essential to any engineering education »
- A final engineer project on « The Higgs boson theory »
- « The employers and society representatives have no right to give their views on my teaching »
- « Quality assurance is a concept good for car building not for education »
- Etc.

The end of the Humboldt university?

Professionnalisation, employability, evaluation, quality assurance, fulfilments of the society needs...What remains from the Humboldt model?

A delicate balance between :

- Education of students for the long term

And

- Their preparation to immediate insertion in the profession

B

ENAE challenges and opportunities

- A global convergence with a wide context diversity
- Learning outcomes and the university paradigms
- Programme accreditation in the future

Lessons learnt from the ENAEE experience

- An agreed framework to cope with the diversity of education systems and engineering profession organisation
- A powerful tool for managers to (re)design curricula
- Good practices: same degree awarded from different pathways (initial education, continuing education, professional experience validation)

Lessons learnt from the ENAEE experience

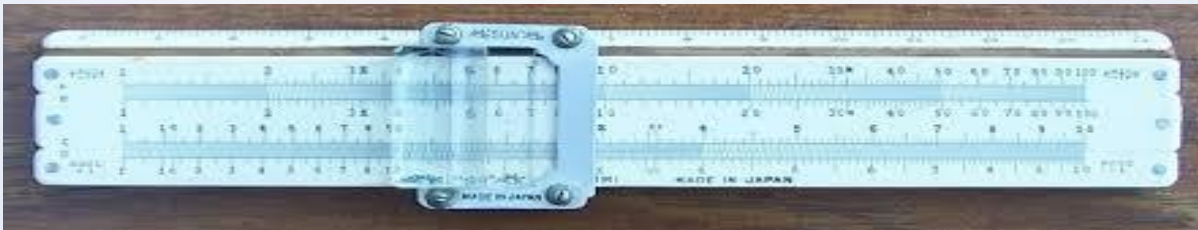
- Difficulties for HEIs to link LOs and programme contents and outcomes
- Difficulties for HEIs to assess each student's achievements in terms of Programme Outcomes
- Difficulties for agencies to assess that HEIs assess students achievements
- Difficulties for ENAEE to assess the real understanding and practice of the agreed Programme Outcomes in all countries

Lessons learnt from the ENAEE experience

- Without a strong Quality Assurance system, the Programme Outcomes may remain a superficial layer disconnected with the reality.

ENAE challenge

- « The Watchdogs of College Education rarely bite » (The Wall Street Journal, June 2015)



Basic standards

high quality standards

Excellence

To develop rigorous standards for quality, but also assure that the standards are rigorously enforced.

Issues that ENAEE needs to consider

- “Institutions that request to undergo the extensive institutional review, will be exempted from programme accreditation” (Flemish Parliament, 2015, about the revision to the system of quality assurance by NVAO).
 - “ The revised system of quality assurance is based on **trust and autonomy** and places the responsibility for ensuring and enhancing the quality of education more **fully in the hands of the institutions.** ”
- Test of time
 - “Programme accreditation also brought about a **substantial administrative and financial burden** and these no longer outweighed the potential benefits.”

Thank you

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