

European Network for the Accreditation of Engineering Education (ENAE)

A pedestrian view of the
**EUR-ACE[®] Framework Standards
and Guidelines (EAFSG)**
for engineering education

Brussels, May 2015



Engineer

- An engineer is a professional practitioner who, using appropriate materials, designs components, processes, structures, and systems, while considering the limitations imposed by practicality, regulation, safety, and cost. The word engineer is derived from the Latin words *ingeniare* ("to contrive, devise") and *ingenium* ("cleverness") Wikipedia
- An engineering degree is an advanced academic qualification that is conferred in universities and other higher education institutions throughout the world.

“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)

A worldwide convergence

- What an engineering graduate is supposed to know and be able to do,
 - ✓ Programme outcomes
- 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

Two global overarching frameworks

International Engineering Alliance

- The Washington accord (1989-Engineers)
- The Sydney accord (2001-Engineering Technologists)
- The Dublin Accord (2002-Engineering Technicians)



The European Network for Accreditation of Engineering Education (2006-ENAE) with the EUR-ACE Accord (2014):

- EUR-ACE label for the Bachelor degree
- EUR-ACE label for the Master degree



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

The EUR-ACE system for programmes

The 2 pillars of the *EUR-ACE* «wisdom»

Programme outcomes

describe the

knowledge, understanding,
skills and abilities

which

an accredited engineering
degree programme must enable
a graduate to demonstrate.

Programme management

The programmes seeking the
label should demonstrate that
they are managed according to
quality assurance principles
(ESG, Bologna process)

The EUR-ACE system for programmes

Main references (www.enaee.eu)

Programme Outcomes

“EUR-ACE Framework
Standards and Guidelines”
(EAFSG)

Revised version
(March 31, 2015)

Programme Management

EAFSG (March 31, 2015)
«Best practice in
Accreditation of
Engineering Programmes»
Joint document IEA/ENAAEE
(June 2015)

EUR-ACE[®] Framework Standards and Guidelines (2008, revised 2015)

Programme outcomes for Engineering Education

Expected and achieved Programme Outcomes for Bachelor and Master Degree Programmes

Quality Assurance

- Programme Management
- Accreditation Agencies
(accreditation criteria and processes)

EUR-ACE[®] Framework Standards and Guidelines

- Student Workload Requirements
- Programme Outcomes Framework
- Programme Management
- Standards and Guidelines for accreditation agencies

EUR-ACE[®] Framework Standards and Guidelines

- Student Workload Requirements
- Programme Outcomes Framework
- Programme Management
- Standards and Guidelines for accreditation agencies

Student Workload Requirements

- Compliant with the Bologna process.
- 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-ECTS credits consistent with the above: i.e. a minimum of 270 ECTS credits (240 in some education systems).

EUR-ACE[®] Framework Standards and Guidelines

- Student Workload Requirements
- Programme Outcomes Framework
- Programme Management
- Standards and Guidelines for accreditation agencies

Programme Outcomes Framework (1)

Learning outcomes are statements of what the individual knows, understands and is able to do on completion of a learning process.

- The achievement of learning outcomes has to be assessed through procedures based on clear and transparent criteria.
- Learning outcomes are attributed to individual educational components and to programmes at a whole.
- They are also used in European and national qualifications frameworks to describe the level of the individual qualification.

ECTS Draft Users' Guide, 2015

Programme Outcomes Framework (2)

Sum of Learning Outcomes for all modules



Programme Outcomes

Programme Outcomes Framework (3)

Learning Outcomes vs. Programme Outcomes

Example for a Module Engineering Mechanics 2

- Apply equations for straight-line motion to solve problems with variable acceleration.
- Solve plane curvilinear motion problems in three different coordinate systems.
- Analyse dynamic problems using work/energy and impulse/momentum techniques.

Example “Engineering practice”

Graduates should be able to demonstrate,

- comprehensive understanding of applicable techniques and methods of analysis, design and investigation and of their limitations;
- practical skills, including the use of computer tools, for solving complex problems, realising complex engineering design, designing and conducting complex investigations;
- ...

ENAAE

Programme Outcomes Framework (4)

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

Programme Outcomes Framework (5)

Example: Bachelor Degree Programme

Knowledge and Understanding

The learning process should enable Bachelor Degree graduates to demonstrate:

- knowledge and understanding of the mathematics and sciences underlying their engineering specialisation, at a level necessary to achieve the other programme outcomes;
- knowledge and understanding of engineering disciplines underlying their specialisation, at a level necessary to achieve the other programme outcomes, including some awareness at their forefront;
- awareness of the wider multidisciplinary context of engineering.

Programme Outcomes Framework (6)

Example: Master Degree Programme

Knowledge and Understanding

The learning process should enable Master Degree graduates to demonstrate:

- in-depth knowledge and understanding of mathematics and sciences underlying their engineering specialisation, at a level necessary to achieve the other programme outcomes;
- in-depth knowledge and understanding of engineering disciplines underlying their specialisation, at a level necessary to achieve the other programme outcomes;
- critical awareness of the forefront of their specialisation;
- critical awareness of the wider multidisciplinary context of engineering and of knowledge issues at the interface between different fields.

EUR-ACE[®] Framework Standards and Guidelines

- Student Workload Requirements
- Programme Outcomes Framework
- Programme Management
- Standards and Guidelines for accreditation agencies

Programme Management (1)

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

Programme Management (2)

Programme aims

- The aims of accredited programmes must reflect the needs of employers and other stakeholders. The programme outcomes must be demonstrably consistent with the aims.

Teaching and learning process

- The teaching and learning process must enable engineering graduates to demonstrate the knowledge, understanding, skills and abilities specified in the Programme Outcomes. The programme curriculum must specify how this is to be achieved.

Programme Management (3)

Resources

- The resources to deliver the programme must be sufficient to enable the students to demonstrate the knowledge, understanding, skills and abilities specified in the Programme Outcomes

Student Admission, Transfer, Progression and Graduation

- The criteria for student admission, transfer, progression and graduation must be clearly specified and published, and the results monitored.

Programme Management (4)

Quality Assurance

- Engineering degree programmes must be supported by effective quality assurance policies and procedures.

EUR-ACE[®] Framework Standards and Guidelines

- Student Workload Requirements
- Programme Outcomes Framework
- Programme Management
- Standards and Guidelines for accreditation agencies

Standards and Guidelines for accreditation agencies (1)

Programme Evaluation and Accreditation

- Methods and Procedures
- Documentation
- Accreditation Process
- Decision-making
- Publication

Quality Assurance of Accreditation Agency

- Administration
- Status and Resources

Standards and Guidelines for accreditation agencies (2)

Programme Evaluation and Accreditation

- The methods and procedures of the agency must ensure that engineering degree programmes are accredited accurately in accordance with the agency's established standards.
- Documentation: The accreditation standards and procedures must be publicly available in an accessible format.

Standards and Guidelines for accreditation agencies (3)

Programme Evaluation and Accreditation (continued)

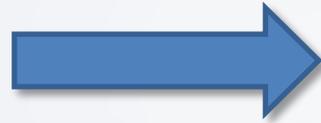
- The accreditation process must be effective in acquiring all the evidence necessary to make decisions.
- Accreditation decisions must be demonstrably accurate, consistent and unbiased.
- The agency must publish the outcome of the accreditation evaluation.

Standards and Guidelines for accreditation agencies (4)

Quality Assurance of Accreditation Agency

- Administration: The management, organisation and administration of the agency must ensure that the accreditation functions of the agency are implemented accurately and reliably.
- Status and resources: The agency must be independent of outside influences and have adequate resources to undertake accreditation.

ENAE authorises accreditation agencies to award the EUR-ACE® Label to engineering degree programmes they accredit, at Bachelor and Master degree level.



**Accreditation
Agencies**

**Bachelor & Master
Engineering
Degree
Programmes**





List of Authorised Agencies (May 2015)

FRANCE	CTI – Commission des Titres d’Ingénieur - www.cti-commission.fr .
GERMANY	ASIIN – Fachakkreditierungsagentur für Studiengänge der Ingenieurwissenschaften, der Informatik, der Naturwissenschaften, und der Mathematik e.V. - www.asiin.de
IRELAND	Engineers Ireland– www.engineersireland.ie
ITALY	QUACING – Agenzia per la Certificazione di Qualità e l’ Accreditemento EUR-ACE dei Corsi di Studio in Ingegneria – www.quacing.it
POLAND	KAUT - Komisja Akredytacyjna Uczelni Technicznych [Accreditation Commission of universities of Technology] – www.kaut.agh.edu.pl
PORTUGAL	Ordem dos Engenheiros – www.ordemengenheiros.pt
RUSSIA	AEER – Association for Engineering Education in Russia - www.aeer.ru .
ROMANIA	ARACIS – The Romanian Agency for Quality Assurance in Higher Education www.aracis.ro
TURKEY	MÜDEK – Association for Evaluation and Accreditation of Engineering Programmes www.mudek.tr
UK	Engineering Council – www.engc.org.uk
SWITZERLAND	OAQ - Swiss Center of Accreditation and Quality Assurance in Higher Education www.oaq.ch
FINLAND	FINHEEC - Finnish Higher Education Evaluation Council – www.finheec.fi
SPAIN	ANECA – Agencia Nacional de Evaluación de la Calidad y Acreditación, www.aneca.es jointly with IIE – Instituto de la Ingeniería de España, www.iies.es

EUROPE AND THE EUR-ACE SYSTEM

Countries (yellow)
with authorised
accreditation agencies



Members of ENAEE

ENAEE has currently 17 full members and 3 associate members, including **Engineering Organizations , Accreditation Agencies and others**

Full members

FEANI- Belgium - <http://www.feani.org>
ENGINEERING COUNCIL - United Kingdom - <http://www.engc.org.uk>
CTI – Commission des Titres d’Ingénieur –France - <http://www.cti-commission.fr>
ASIIN – Germany - <http://www.asiin-ev.de/pages/de/asiin-e.-v.php>
ORDEM DOS ENGENHEIROS -Portugal - <http://www.ordemosengenheiros.pt>
CoPI – Conferenza dei Presidi delle Facolta’ di Ingegneria Italiane – Italy - <http://www.confpresing.it>
ENGINEERS IRELAND - Ireland -<http://www.engineersireland.ie>
AEER – Association for Engineering Education in Russia - Russia - <http://aeer.ru/en>
EUROCADRES – Conseil des Cadres Européens - Belgium - <http://www.eurocadres.eu>
UNIFI – Scuola di Ingegneria dell’Universita degli Studi di Firenze - Italy - <http://www.unifi.it>
IDA – The Danish Society of Engineers - Denmark -<http://www.ida.dk>
BBT – Switzerland - <http://www.bbt.admin.ch>
MÜDEK – Assôciation for Evaluation and Accreditation of Engineering Programs - Turkey - <http://www.mudek.org.tr>
IIE – Instituto de la Ingeniería de España - Spain - <http://www.iies.es>
ARACIS – The Romanian Agency for Quality Assurance in Higher Education - Romania - <http://www.aracis.ro>
TEK – Finnish Association of Graduate Engineers - Finland - <http://www.tek.fi>
QUACING – Italy - <http://www.quacing.it>

Associate Members

CLAIU- Belgium - <http://www.claiu.org>
SEFI – Société Européenne pour la Formation d’Ingénieur - Belgium - <http://www.sefi.be>
IGIP – International Society for Engineering Education - Austria - <http://www.igip.org>

Thank you for your attention

www.enaee.eu

info@eur-ace.eu

