Initial proposal for a jointly agreed IEA/ENAEE Glossary of Terminology

Preamble

The International Engineering Alliance (IEA) and the European Network for Accreditation of Engineering Education (ENAEE) have separately developed a range of policies and procedures to support the international recognition of engineering academic qualifications. Both use benchmarking of accreditation of engineering education programmes, leading to the enhancement of the quality of engineering education and furthering mutual recognition of engineering education in Europe and worldwide. One of the principal benefits of such mutual recognition is to facilitate the mobility of engineers in global professional activities.

The purpose of this proposal is to establish for the next step of collaboration a means of comparing the academic frameworks established separately by IEA and ENAEE. It is a first attempt to define the words needed to compare the statements of standards of engineering education in the IEA and ENAEE frameworks. It has been developed within the European and Global Engineering Education (EUGENE) project funded by the European Commission, by a small group that included representation of IEA and ENAEE.

The definitions in the Glossary have made use of existing definitions in the IEA [1] and TREE [2] Glossaries. At this stage explicit use has not been made of other existing glossaries, or of classifications in Bloom`s taxonomies. It is recognised that the present Glossary is provisional, and may well need to be amended or extended as a result of comparing the two frameworks. Consequently it is not intended to be complete or prescriptive, but an initial step in an iterative process towards a single glossary applicable to both frameworks.

The words in the Glossary have been selected using the following principles.

- A word is included if it was thought necessary for it to be understood by someone using either of the two frameworks to design or evaluate programmes.
- Relevant definitions from the IEA and Tree Glossaries have been used, although modified for some words.
- Definitions for some words in both the IEA and TREE Glossaries appear not to be in total agreement, and in such cases both definitions have been included.
- Words used in their normally understood dictionary sense are not included.
- For the time being and for further discussions the source the definition is shown in brackets but maybe deleted in a finally agreed version; definitions introduced by the EUGENE group are indicated by (New).

References:

[1] IEA definition of terms, Annex A of the IEA “Graduate Attributes and Professional Competencies”, Version 2 – 18 June 2009, available at:
http://www.washingtonaccord.org/IEA-Grad-Attr-Prof-Competencies-v2.pdf

[2] TREE glossary of terms, Outcome of the Socrates/Erasmus Thematic Network “Teaching and Research in Engineering in Europe”, Florence, 2007,
used as reference glossary by ENAEE, available at:
http://www.unifi.it/tree/dl/oc/a6.pdf

Glossary of Terminology

Ability.

A bodily or mental power to perform an action (IEA)

Awareness.

Knowledge of what is contained in a branch, spezialization, field of study, but not how to use that knowledge (for instance) to solve problems or implement designs. Critical awareness is knowledge of a topic that includes evaluation of the comparative merits of relevant technologies. (New).

In general, knowledgeable, being conscious; cognizant, informed alert; specifically in engineering context: being alert to identify conditions or situations that require action. (IEA).

Branch [of engineering].

A major subdivision of engineering, such as Chemical, Civil, Mechanical or Electrical Engineering. Engineering in totality is termed a discipline. Within a branch of engineering, there are specializations, eg hydraulic engineering. A student studies a field of study, which can include topics from different branches or specializations. (Modified TREE).

Besides a generally-recognised, major subdivision of engineering it can be a cross-disciplinary field of comparable breadth including combinations of engineering fields, for example Mechatronics, and the application of engineering in other fields, for example Bio-Medical Engineering. (modified IEA).

Coherent.

Logically connected and consistent; applied to knowledge or a programme, the knowledge is complete, ordered and systematic (New, adopted by IEA).

Complexity.

The property of being complex; that is having a number of interconnected parts. Use engineering judgement to work with complexity' means that the issue under consideration is not straightforward or amenable to analysis or calculation using standard methods, but requires judgement to balance possibly conflicting requirements. (Modified IEA and New).

Creativity.

The ability to produce new ideas, connections and solutions. (TREE).

Create:

Putting elements together to form a novel, coherent whole or make an original product: generating, planning, producing (IEA from Anderson-Krathwohl)

Critical.

Used to describe a factor, component, process, issue or decision in an engineering activity requiring analysis and judgement from which other consequences follow; an entity or operation that must be successfully implemented or completed to ensure that a more complex operation or

system can function: failure of the critical entity or operation compromises the whole. (IEA).

Engineering design.

Is the systematic process of conceiving and developing materials, components, systems and processes to serve useful purposes. Design may be procedural, creative or open-ended and requires application of engineering sciences, working under constraints, and taking into account economic, health and safety, social and environmental factors, codes of practice and applicable laws. (IEA).

Engineering design knowledge.

Knowledge that supports engineering design in a practice area, including codes, standards, processes, empirical information, and knowledge reused from past designs. (IEA).

Engineering fundamentals.

A systematic formulation of engineering concepts and principles based on mathematical and natural sciences to support applications. (IEA).

Engineering practice.

A generally accepted or legally defined area of engineering work or engineering technology. (IEA).

Engineering speciality or specialization.

A generally-recognised practice area or major subdivision within an engineering discipline, for example Structural and Geotechnical Engineering within Civil Engineering; the extension of engineering fundamentals to create theoretical frameworks and bodies of knowledge for engineering practice areas. (IEA).

Engineering sciences.

Include engineering fundamentals that have roots in the mathematical and physical sciences, and where applicable, in other natural sciences, but extend knowledge and develop models and methods in order to lead to applications and solve problems, providing the knowledge base for engineering specializations. (IEA)

Forefront.

Forefront of a branch of engineering or a specialization is the knowledge of recent developments in practice and research. In a field of study that combines knowledge from different branches, the forefront is interpreted as that of the combination and not of the individual branches. (Modified IEA and New).

Graduate attributes.

Form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practise at the appropriate level. The graduate attributes are exemplars of the attributes expected of graduates from an accredited programme. Graduate attributes are clear, succinct statements of the expected capability, qualified if necessary by a range indication appropriate to the type of programme. (IEA)

In-depth.

Level of engineering knowledge at or close to the forefront within a particular field of study. (New).

Key.

Key aspects and concepts are those essential to understanding a branch of engineering. (New).

Knowledge.

The outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, concepts, theories and practices that is related to a *field* of study, work or everyday life. (Modified TREE)

Learning Outcomes.

Statements of what a learner knows, understands and is able to do on completion of a learning process. They usually are defined in terms of knowledge, skills and/or competences. For assessment purposes they may be specified by learning outcomes indicators. (TREE).

Level.

A threshold standard of achievement within a hierarchy of levels, e.g. within a qualifications framework or a learning taxonomy. (modified TREE).

Lifelong Learning.

All learning activities undertaken throughout life, with the aim of improving knowledge, skills and competences. (TREE).

Manage.

Means planning, organising, leading and controlling in respect of risk, project, change, financial, compliance, quality, ongoing monitoring, control and evaluation. (IEA).

Mathematical sciences.

Mathematics, numerical analysis, statistics and aspects of computer science cast in an appropriate mathematical formalism. (IEA).

Natural sciences.

Provide, as applicable in each engineering discipline or practice area, an understanding the physical world including physics, mechanics, chemistry, earth sciences and the biological sciences, (IEA).

Programme [of study].

A curriculum recognised as higher education, and the completion of which provides the student with a higher education qualification. It has a set of learning outcomes and is composed of compulsory and optional course units/modules which lead to the achievement of a pre-determined set of learning outcomes. (Modified TREE).

Programme Outcomes.

General statements in the ENAEE Framework of the requirements in an agency's conditions for programme accreditation. (New).

Research-based knowledge.

A systematic understanding of knowledge and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of the academic discipline, field of study or area of professional practice. (IEA).

Responsibilities of engineering practice.

Include: social responsibilities, ethics, health and safety and other legislation; cultural; environmental responsibilities, including sustainable development and design and legislative responsibilities (IEA).

Skills.

The ability to apply *knowledge* to complete tasks and solve problems. Skills can be described as cognitive (use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments). (TREE).

Societal context [of engineering]

The aspects of society that are potentially or actually affected by any stage of the lifecycle of an engineering activity, both in a positive and negative way that must therefore be taken into account. (IEA).

Solution.

Means an effective proposal for resolving a problem, taking into account all relevant technical, legal, social, cultural, economic and environmental issues and having regard to the need for sustainability. (IEA).

Substantial equivalence.

Applied to educational programmes means that two programmes, while not meeting a single set of criteria, are both acceptable as preparing their respective graduates to enter engineering practice and/or formative development toward registration. (modified IEA).

Sustainability.

The condition sought by application of the principles of sustainable development. (IEA).

Transferable skills.

Skills acquired in one context that, with adaptation may be applied in another context (IEA).

Understanding.

The capacity for rational thought or inference or discrimination. (TREE).

Wider context of engineering.

The economic, social, regulatory, environmental context in which a particular engineering activity is performed. (IEA).