ENGINEERING COUNCIL OF SOUTH AFRICA *Standards and Procedures System*		
Background to Accreditation of University Engineering Bachelor Degrees		
Status: ESGB Project 2 Working Document		
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1. Purpose

Document **PE-61** defines the outcomes of a University Bachelors Degree Programme (B.Ing. or B.Sc.(Eng.)) that are required for Accreditation by ECSA. This document provides important background information to the standards defined in document **PE-61** and the Accreditation Procedures detailed in documents in the **PE-70** series.

The objectives of Accreditation are stated in section 2. Important principles and assumptions underlying the standards defined in document **PE-61** are stated in section 3. The method used to define standards is described in section 4.

2. Objectives of Accreditation

The objectives of Accreditation of University Engineering Bachelors Degree Programmes are:

1. To establish whether a programme meets the educational requirement toward registration as a Professional Engineer;
2. To establish whether the graduates of a programme are ready to enter engineering employment and are equipped to continue learning throughout their careers;
3. To establish the international comparability of degree programmes;
4. To assure the public of the quality of the programme;
5. To encourage improvement and innovation in engineering education in response to national and global needs.

3. Underlying Principles and Assumptions

A number of principles and assumptions underlie the Standards for Engineering Bachelors Degree Programme defined in document **PE-61**.

1. The standards are based on the general policy of the ECSA Council stated in document G-01. In particular, exit level standards are to be internationally comparable and procedures for accrediting programmes against those standards are to be according to best practice, transparent and fair.

2. The standards contain elements of transformation of degree programmes. It is recognised that the standards challenge educators both within engineering faculties and in supporting disciplines. The standards are those judged necessary for the engineering graduate and educators will be expected to rise to the challenges.

3. The required emphasis in the University Bachelors Degree is on fundamental knowledge and the generic abilities which enable the outcomes defined in document **PE-61** to be satisfied. First degrees cannot therefore be expected to contain an extensive body of specialist knowledge. However, a limited amount of specialist or advanced engineering science study is considered to be an important part of the educational experience.

4. A programme must have a coherent core of mathematics, basic sciences, engineering sciences and engineering economy which provides a viable foundation for further studies and lifelong learning. This core, together with design and synthesis, provides the engineering graduate with competence that differentiates the engineer from other professionals. The core must enable development in a traditional discipline or in an emerging engineering field[1].

5. The practical limitation on the amount of specialist study that can be accommodated in a programme is recognised in point 3 above. ECSA therefore encourages the provision of post-graduate course work programmes as a means for graduates to acquire specialist knowledge and to relieve pressure on the undergraduate programme resulting from significant amounts of specialist study. ECSA recognises that the extent of the necessary post-graduate course work varies across engineering disciplines. Post-graduate course work may be within higher degree or diploma programmes or as single certificated courses.

6. Document **PE-61** defines outcomes for the whole qualification for purposes of the National Qualification Framework. Unit Standards are not defined. The programme outcomes include the development of general abilities of problem solving, communication, analysis, teamwork, and societal aspects in order to be consistent with the SAQA critical cross-field outcomes.

7. ECSA wishes to encourage diversity and innovation in university engineering programmes and therefore confines its requirements in **PE-61** to the minimum set of outcomes. Institutions are therefore given freedom to determine how students attain outcomes and are assessed. Institutions will be asked to account for their approaches and assessment methods during Accreditation Visits.

8. An ability which is introduced by and is highly valued in the **PE-61** outcomes is team and multi-disciplinary working. The broad base of mathematics, basic sciences, engineering sciences coupled with design and some specialist knowledge gives the engineering graduate distinctive engineering competencies. The capacity to succeed in a multi-disciplinary environment is built on the abilities of communication and problem solving and an understanding of the wider environment of engineering activity. The emphasis is on working with people from other disciplines, not confined to engineering, through shared generic abilities, especially in communication, sound fundamental knowledge and a `speaking literacy' rather than detailed knowledge in the disciplines of collaborators.

9. The outcomes in **PE-61** introduce the requirement that the engineering graduate is expected to be sensitive to the wider social and economic contexts in which engineering is practiced.

4. Method used to define Standards

The requirements for an Accredited Engineering Programme meeting the educational requirements toward registration as a Professional Engineer are stated in document **PE-61** using the following steps:

1. The *outcomes* of an acceptable University Bachelors Degree Programme are stated in section 2 of document **PE-61** under ten headings:

    (a) Engineering problem solving
    (b) Application of specialist and fundamental knowledge, with specific reference to mathematics, basic sciences and engineering sciences

[1] While ECSA is concerned with education leading to registration, it is recognised an engineering degree enables the graduate to enter many important and successful careers outside professional level engineering. It is believed that the outcomes specified for accreditation purposes also assure the wider utility of engineering degrees.

(c) Engineering design and synthesis
(d) Investigation, experimentation and data analysis
(e) Engineering methods, skills, tools and information technology
(f) Professional and general communication
(g) Impact of engineering activity on society and the environment
(h) Team and multidisciplinary working
(i) Lifelong learning
(j) Professional ethics and practice

2. The minimum programme content is defined in section 3 of **PE-61** in six principal knowledge areas essential to an engineering degree:

(a) Mathematics, including numerical methods and statistics
(b) Basic Sciences: the natural sciences essential to the programme
(c) Engineering Sciences
(d) Engineering Design and Synthesis
(e) Computing and Information Technology
(f) Complementary Studies: the knowledge required in engineering practice:

(i) The immediate environment of engineering including communications, engineering economics, health, safety and the environment.
(ii) Studies intended to broaden the graduate's perspective and provide a sample of the wide environment of the engineer.

3. *Indicative guidelines* on the fundamental engineering sciences required for degree programmes carrying disciplinary or cross-disciplinary designations are listed in section 4 of **PE-61**. Requirements for specialist engineering study are given in this section.

5. Revision History

Version	Date	Revision authorised by	Nature of revision
Revision - 0	16 April 1998	Council	Initial Issue
Revision - 0	10 October 2000	No change	Converted to PDF format
Revision - 1	30 October 2001		