


<b>ENGINEERING COUNCIL OF SOUTH AFRICA</b> <i>Standards and Procedures System</i>		 <b>E C S A</b>
<b>Background to Accreditation of Engineering Education Programmes</b>		
<b>Status: Approved by Council</b>		
<b>Document : E-01-P</b>	<b>Rev-1</b>	

## 1 Purpose

The Engineering Council of South Africa (ECSA) operates a quality assurance system leading to the accreditation of a number of types of engineering education programmes. These programmes are currently the B.Sc.(Eng.)/BEng, BTech and National Diploma programmes. The standards, criteria, policies and procedures that define the accreditation system are defined in a set of documents whose structure is described in section 5. This first document in the set provides important background information on the quality assurance and accreditation system.

The process of professional development in engineering is continuous but has important stages. Typically, the first stage is to meet educational requirements, after which employment is entered. During employment, training is completed and experience is gained to attain the competencies for the second stage, namely professional registration. Holding a qualification attached to a programme accredited for the category of registration is one way of meeting the Stage 1 requirements.

Key definitions are given in section 2. Section 3 identifies ECSA's empowerment and obligation to accredit educational programmes. The objectives of accreditation are stated in section 4. Section 5 describes the structure of the documentation system for the accreditation process.

## 2 Definitions

### 2.1 General definitions

**Academic Support:** a process that provides additional learning support to students who are not prepared for the normal curriculum; academic support may be provided prior to or in addition to the normal curriculum.

**Accreditation:** is formal recognition awarded to an education or training programme through a quality assurance procedure that it meets criteria laid down for the type of programme.

**Accreditation Committee:** the Engineering Programme Accreditation Committee (EPAC) or the Technology Programme Accreditation Committee (TPAC) as dictated by the type of programme under consideration or the context.

**Accredited Examinations:** examinations or other forms of assessment that address the exit level outcomes within an accredited programme.

**Accredited Programme:** a programme that has been evaluated and recognised by ECSA as meeting stated criteria.

**Accredited Qualification:** a qualification awarded on successful completion of an accredited programme.

**Accreditation criteria:** are statements of requirements that must be satisfied by a programme in order to receive accreditation.

**Accreditation Visit:** an evaluation of an engineering education programme, based on examination of documentation and an on-site inspection to determine the programme's conformance with accreditation criteria.

**Assessment:** the process of determining the capability or competence of an individual which is carried out by evaluating performances.

**Broadly-defined engineering problems:** a class of problem with characteristics defined in document E-04-P.

**Category:** a mode of registration defined in or under the ECSA Act which has a distinctive purpose, characteristic competencies, defined principal routes to registration and educational requirements.

**Complex engineering problems:** a class of problem with characteristics defined in document E-04-P.

**Continuous Quality Improvement:** a process, based on the concept that improvement of a process is always possible, based on ongoing assessment of the process and measures to maintain and improve quality.

**Course:** a building block of a programme with defined prerequisites, content and learning objectives with assessment that, if completed successfully, provides credit toward a qualification.

**Credit:** a measure of the volume of learning attached to a course or module calculated according to the procedure defined in the relevant standard for the type of programme; a level may be associated with a number of credits.

**Education Provider:** a public or private higher education institution or body that conducts programmes leading to engineering qualifications of any type accredited by ECSA.

**Educational Objective:** a statement of the intended achievement that graduates of a programme must be capable of, often with emphasis on the early years after graduation.

**Engineering Education Programme:** an educational programme that aims to satisfy criteria prescribed by ECSA.

**Engineering Problem Solving:** is the process of finding solutions through a conscious, organised process that relies on the application of engineering knowledge and skills and generic competencies.

**Evaluation:** determining compliance of a result with prescribed criteria, based on documentation, inspection and the application of judgement supported by reasoning.

**Exit-level Outcome:** is a statement of what the student must demonstrate and the required level to qualify for award of a qualification; these actions indicate the student's capability to fulfill the educational objectives.

**External Moderation:** a moderation process in which the moderator(s) are not in the employ of the provider, make no input to the programme and have no prior contact with the students.

**Graduate:** a qualifying learner, irrespective of whether qualification is a degree or diploma.

**Knowledge Area:** a classification of curriculum content into defined types. See 2.2 below.

**Level:** a measure of learning demands in terms of types of problems, knowledge required, skills and responsibility, expressed in terms of level descriptors.

**Moderation:** is the process of ensuring that assessment of individuals is of the required standard and is consistent, objective and fair.

**Module:** synonymous with course.

**One-higher:** applied to a teacher's qualifications, means that the teacher has a relevant academic qualification of at least 120 credits beyond the qualification being taught or is professionally registered in an appropriate category.

**Programme:** a structured, integrated teaching and learning arrangement with a defined purpose, usually leading to a qualification.

**Provider:** except where the context indicates otherwise, a higher education provider.

**Qualification:** the formal recognition of a specified learning achievement, usually awarded on successful completion of a programme.

**Stage 1:** a point in the process of professional or occupational development in engineering at which a person fulfils the educational requirements to register as a candidate in the relevant category.

**Standards:** in the context of engineering educational programmes, statements of outcomes to be demonstrated, the level of performance and content baseline requirements.

**Well-defined engineering problems:** a class of problem with characteristics defined in document E-04-P

## 2.2 Knowledge Area Definitions

**Basic Sciences:** physics (including mechanics), chemistry, earth sciences and the biological sciences which focus on understanding the physical world, as applicable in each engineering disciplinary context.

**Complementary Studies:** cover those disciplines outside of engineering sciences, basic sciences and mathematics which are relevant to the practice of engineering in two ways:

- (a) Principles, results and method are applied in the practice of engineering, including engineering economics, the impact of technology on society and effective communication; and
- (b) Study broadens the student's perspective in the humanities or social sciences to support an understanding of the world.

**Computing and Information Technologies:** encompasses the use of computers, networking and software to support engineering activity and as an engineering activity in itself as appropriate to the discipline.

**Engineering Design and Synthesis:** 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.

**Engineering Sciences:** have roots in the mathematical and physical sciences, and where applicable, in other basic sciences but extend knowledge and develop models and methods in order to lead to engineering applications and solve engineering problems.

**Mathematical Sciences:** an umbrella term embracing the techniques of mathematics, numerical analysis, statistics and aspects of computer science cast in an appropriate mathematical formalism.

## 2.3 Abbreviations

BTech: Bachelor of Technology

CHE: Council on Higher Education

ECSA: Engineering Council of South Africa

ELO: Exit-level outcome

EPAC: Engineering Programme Accreditation Committee

HEQC: Higher Education Quality Committee

ND: National Diploma

TPAC: Technology Programme Accreditation Committee

## 3 Obligation and Authority to Accredit Engineering Programmes

The Engineering Profession Act, No 46 of 2000 empowers ECSA to conduct accreditation visits to evaluate educational programmes. The Act also determines the maximum interval between such visits. The Act empowers ECSA to grant accreditation, with or without conditions attached, to withdraw accreditation or to refuse accreditation.

Accreditation of a programme signifies that the programme complies with criteria for the educational requirements for registration in a professional category or as a candidate in the corresponding category. Accreditation focusses on programmes; the term *accredited* is not applied by ECSA to a department, school, faculty or education institution.

#### 4 Objectives of Accreditation of Engineering Programmes

The objective of accreditation of engineering programmes is to establish whether a programme meets the accreditation criteria laid down for the type of programme. Accreditation as complying with the criteria:

1. determines whether graduates meet the requirements for registration as a candidate and the educational requirement toward registration as a professional in the relevant category;
2. establishes whether the graduates of a programme are ready to enter engineering employment and are equipped to continue learning throughout their careers;
3. establish the international comparability of engineering educational programmes under agreements to which ECSA is a signatory;
4. assures the public of the quality of the programme;
5. encourages improvement and innovation in engineering education in response to national and global needs.

#### 5 Structure of the documentation

The structure of the documentation and relationships among individual documents is shown in Figure 1. The documentation system is modular and has a number of elements described in sections 5.1-5.4. The standards are based on the general policy of the ECSA Council stated in document G-01. In particular, learning outcomes are to be internationally comparable and procedures for accrediting programmes against prescribed standards are to be according to best practice, transparent and fair.

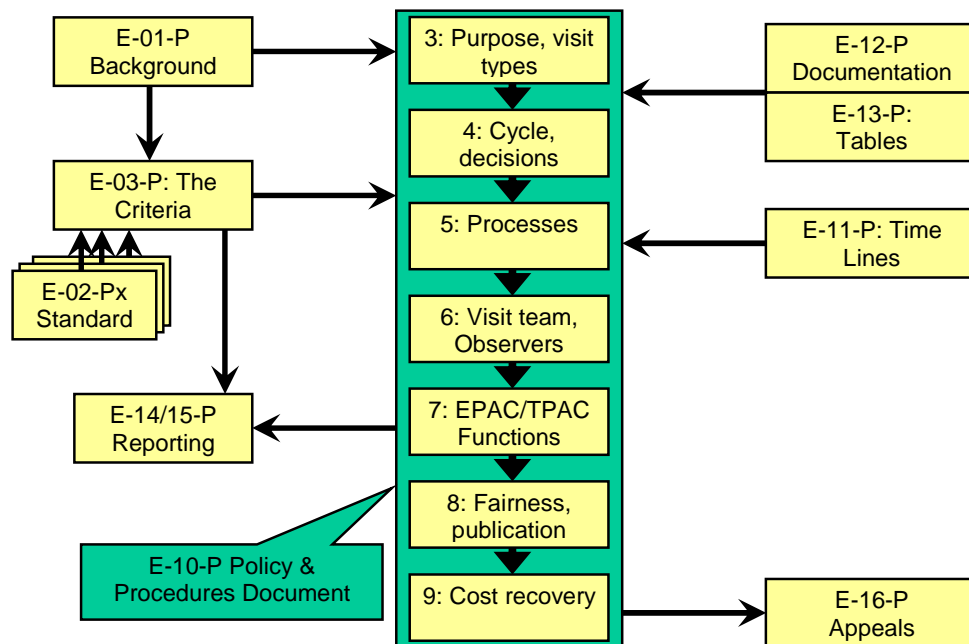


Figure 1: Structure of accreditation documentation

#### 5.1 Accreditation criteria

The accreditation criteria are the set of requirements that indicate that a programme is of adequate quality, including the structure, learning outcomes achieved, educational process and resourcing and sustainability. The accreditation criteria are defined in the following document for all types of programmes. The accreditation criteria make reference to the standards listed in 5.2.

**E-03-P:** Criteria for Accreditation of Engineering Programmes Meeting Stage 1 Requirements

The accreditation criteria apply to all types of programmes. Specific requirements for each programme type are defined in the standards listed in section 5.2.

## 5.2 Standards

These documents specify the permitted qualification designations, knowledge profile and exit level outcomes that are incorporated into the accreditation criteria for each type of programme:

**E-02-PE:** Standards for Accredited BSc(Eng)/BEng Programmes;

**E-02-PT:** Standards for Accredited BTech Programmes in Engineering Disciplines;

**E-02-PN:** Standards for Accredited National Diploma Programmes in Engineering.

## 5.3 Policies and procedures

The accreditation policies and process are defined in a set of modular documents:

**E-10-P:** Policy on Accreditation of Engineering Programmes Meeting Stage 1 Requirements

**E-11-P:** Procedure for Arranging and Conducting an Accreditation visit;

**E-12-P:** Documentation Requirements for Accreditation Visits;

**E-13-P:** Forms for Use in Accreditation Visit Documentation ;

**E-14-P:** Accreditation Team Report and Recommendation Format;

**E-15-P:** Accreditation Visit Leader's Report Format;

**E-16-P:** Procedure for Appeals Against Accreditation Decisions.

## 5.4 Listings of Accredited Programmes

**E-20-P:** List of Accredited Programmes

## 5.5 Best Practice and Training Material

The accreditation committees may develop and issue guidance on best practice in accreditation and training material from time to time. This material is informative. The normative documents listed in sections 5.1 to 5.4 take precedence in all cases.

## 6 Revision History

Version	Date	Revision authorised by	Nature of revision
Rev-0:C-A	16 Feb2006	Working Group	Adapted from PE-60
Rev-0: C-B	21 Feb 2006	Working Group	
Rev-0: C-C	24 July 2006	Working Group	
Rev-0: C-D	24 Aug 2006	Working Group	Minor Editorial changes, Document Number changed
Rev-0: C-E	30 Nov 2006	Working Group	Major editorial revision, new document identifiers inserted
Rev-0: C-F	19 January 2007	Working Group	Definitions expanded, document names corrected
Rev-0; Draft A	19 May 2007	EPAC, TPAC	Incorporation of comments and corrections
Rev-1	7 Feb 2008	Council	