The Computer Engineering

Program Benchmarks

1. Introduction

Computer Engineering Profession is a discipline which combines electrical and computer science. This implies that computer engineers are electrical engineers that are trained additionally in the areas of software design and hardware-software integration.

Computer engineering is a profession which is involved in many aspects of computing, from the design of individual microprocessors, personal computers, and supercomputers, to circuit design.

Usual tasks of computer engineers include writing software and firmware for embedded microcontrollers, designing micro chips, designing analog and digital sensors for the industrial applications, designing mixed signal circuit boards, and designing operating systems. Computer engineers are also suited for robotics research that relies heavily on using digital systems to control and monitor electrical systems like motors, communications, and sensors.

The outcome of Computer Engineering is a product, or perhaps a process or system; so that it distinguishes it from Science and Mathematics. Thus, the criteria of content of computer engineering degree set out as follows in Table 1.

The primary purposes of the Benchmarking Statements are to assist:

- Higher education institutions in designing and validating programs of study;
- Academic reviewers and external examiners in verifying and comparing standards;
- Where appropriate, professional bodies during accreditation and review process;
- Students and employers when seeking information about higher education provision.

Table 1: Criteria of content of Computer Engineering Program:

Engineering Practice	
knowledge and understanding of	• manufacturing and/or operational practice • codes of practice and the regulatory framework • requirements for safe and secure operation
Intellectual abilities	• ability to produce solutions to problems through the application of methodologies related to computer engineering • knowledge and understanding ability to undertake technical risk evaluation
Practical skills	• ability to apply computer engineering techniques taking account of industrial and commercial constraints • project management and application of System and software engineering methodologies
General transferable skills	• the computer engineering approach to the solution of problems • time and resource management

	• teamwork and leadership

2. Assessment

In developing an assessment strategy some key factors should be considered:

- There must be sufficient clearly identified opportunities for students to demonstrate that they have met the threshold in all components of the benchmark;
- Achievement of threshold standards may, in some cases, be implicit in the learning process (e.g. the completion of a project may demonstrate attainment of some general transferable skills);
- Achievement of threshold standards should be possible without an individual student being required to pass all units of assessment. For example, a particular unit may include the assessment of only one element of the benchmark. A student may achieve the threshold in this element but not achieve a pass mark in the unit as a whole.
- Careful selection from a wide range of assessment methods can make the process more efficient and effective;
- It is important that the strategy provides sufficient opportunity for the best students to exhibit the level of innovation and creativity associated with excellence.

3. Recommendations

- The Benchmark Statements set out in Table 2 and based upon the rationale provided by the Criteria for Content above should be used to guide the academic review of programs in engineering.
- Individual disciplines within engineering should use the generic criteria of content in Table 1 to provide an interpretation of content and balance of attainment for their own discipline.
- Professional Engineering Institutions when setting criteria for their discipline and for the sections of the Engineering Council Register, for which they hold responsibility, should relate them to the generic criteria and the appropriate discipline-specific interpretation.

Table 2: Benchmark Statements:

Engineering practice	*Threshold*	*Good*	*Excellent*
Knowledge and understanding of ▪ manufacturing and/or operational practice ▪ ▪ codes of practice and the regulatory framework ▪ requirements for safe and secure operation	has a basic knowledge of current practice in the real word has knowledge of specific codes of practice in routine problems, including the role of design factors has a basic knowledge of codes of practice relating to hazards and operational safety understands the need for operational safety by design and good working practices	has a wide knowledge and good understanding of current practice has knowledge and some understanding of specific codes of practice, with some understanding of the limitations of the techniques and design factors involved has knowledge and understanding of codes of practice relating to hazards and operational safety and can apply these to familiar and some unfamiliar situations	has a comprehensive understanding of current practice, its limitations, and likely new developments has understanding of appropriate codes of practice, with wide understanding of the limits of the code and design factors involved has a comprehensive knowledge and understanding of codes of practice relating to hazards and operational safety, and can apply these to a wide range of situations
Intellectual abilities ▪ ability to produce solutions to problems through the application of methodologies related to computer engineering ▪ ▪ ▪ knowledge and understanding ability to undertake technical risk evaluation	can integrate knowledge of mathematics, science, information technology, design, business context and computer engineering practice, to solve routine problems as taught can evaluate typical technical risks, using the appropriate tools as taught	can integrate knowledge of mathematics, science, information technology, design, business context and computer engineering practice to solve problems, some of which are unfamiliar and require good understanding can evaluate technical risks, even in some unfamiliar circumstances	can integrate knowledge of mathematics, science, information technology, design, business context and engineering practice, to solve a wide range of computer engineering problems applying profound understanding to novel and challenging situations, is aware of limitations of solution methods can make general evaluations of technical risks, through an understanding of the basis of such

			risks
Practical skills ▪ ability to apply computer engineering techniques taking account of industrial and commercial constraints ▪ project management and application of System and software engineering methodologies	has some experience of applying computer engineering techniques taking account of commercial and industrial constraints can develop a project plan, identifying the resource requirements, and the timescales involved	has experience of applying computer engineering techniques taking account of a range of commercial and industrial constraints can apply standard management techniques to plan and allocate resources to projects	has experience of applying computer engineering techniques taking account of a wide range of commercial and industrial constraints can develop, monitor and update a plan, to reflect a changing operating environment
General transferable skills ▪ the computer engineering approach to the solution of problems ▪ ▪ time and resource management ▪ ▪ teamwork and leadership	can solve some general problems through systematic analysis and design methods can develop a personal plan of work to meet a deadline and to identify the main external constraints can work as part of a team	can solve some general problems through systematic analysis and design methods and where necessary learn new theories, concepts, methods etc in an unfamiliar situation outside the discipline area can identify the critical activities within a personal plan of work can undertake many of the roles within a team	can solve some general problems through systematic analysis design and planning, and where necessary, learn new theories, concepts, methods etc in an unfamiliar situation outside the discipline area can monitor and adjust a personal program of work on an on-going basis can undertake most of the roles within a team including leadership