PCS Information and Computing Accreditation Board

CRITERIA FOR ACCREDITING INFORMATION TECHNOLOGY EDUCATION PROGRAMS

Effective for Reviews

during the 2014-2015 Accreditation Cycle

PDN 004

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Preface

The Philippine Computer Society (PCS), with equitable representation from the Computing Society of the Philippines (CSP), the Philippine Society of Information Technology Educators (PSITE) Foundation, Inc., and the Philippine Software Industry Association (PSIA) has formed the PCS Information and Computing Accreditation Board (PICAB) as a standing committee of PCS, to create an outcomes-based accreditation system for computing and information technology (IT)-related baccalaureate degree programs in the Philippines. One of the purposes in creating this new accreditation system is to set standards for computing and IT-related programs whereby the standards are set by experts in the IT profession who are members of IT professional societies. The accreditation system is intended to stimulate continuous improvement of every program, while respecting the need to comply with the prescriptions of the Commission on Higher Education, to align the program with the mission of the higher education institution (HEI), and to respond to the requirements of constituencies, particularly the requirements of industry employers. Finally, this accreditation system is designed so that the accreditation system is substantially equivalent to those used by signatories of the Seoul Accord. This ensures that programs which PICAB decides to accredit are substantially equivalent to those accredited by the signatories of the SEOUL ACCORD, a mutual recognition agreement. At present there are 8 signatories of the Seoul Accord. They are: ABEEK (Accreditation Board for Engineering Education of Korea), ABET (Accreditation Board for Engineering and Technology, USA), ACS (Australian Computer Society), BCS

(British Computer Society), CIPS (Canadian Information Processing Society), HKIE (Hong Kong Institution of Engineers), IEET (Institute for Engineering Education of Taiwan), and JABEE (Japan Accreditation Board for Engineering and Technology).

PCS-PICAB has already signified to the Seoul Accord PICAB's intention to apply for provisional membership in the Seoul Accord. The key requirements for membership in the Seoul Accord are that the applicant-organization must be independent of program providers, and the applicant-organization must represent individuals engaged in the professional practice of computing and IT-related occupations.

PICAB has sitting on its Board of Directors representatives of PCS, CSP, PSITE, and PSIA. Although PICAB is a standing committee of PCS, PCS has delegated full authority to PICAB in all matters related to accreditation. Thus PICAB is autonomous in all matters pertaining to accreditation. PICAB has created a Computing Accreditation Commission (CAC), and PICAB has delegated full authority in making accreditation decisions to CAC. In matters of making accreditation decisions and in matters of implementing accreditation policies and procedures, CAC is autonomous, although it reports to PICAB, and PICAB in turn reports to PCS.

Accreditation is voluntary. An HEI with one or more computing or IT-related programs may apply to PCS-PICAB-CAC for the evaluation of its program(s). Among the accreditation requirements is a site visit led by a Team Chair. The members of a Visiting

Team are drawn from the PICAB Registry of Program Evaluators (PRPE). PEs must be IT professionals who are members of CSP, PCS, or PSITE. Candidates for the position of PE are recommended for training by CSP, PCS, PSITE, or PSIA. Those who successfully complete the PICAB training for Program Evaluators (PEs) are listed in the PICAB Registry of Program Evaluators (PRPE).

Central to an outcomes-based education is the specification of desired attributes that students in a program are expected to achieve. These desired attributes are stated as exemplars called *Graduate Attributes* by the Seoul Accord. These are called *Student Outcomes* in the PICAB-CAC criteria. ABET calls these attributes *Student Outcomes*. ABEEK and several other signatories of the Seoul Accord call them *Program Outcomes*. These desired attributes are defined in Section 1.

Since PICAB requires programs to have Seoul Accord-aligned desired Graduate Attributes, HEIs seeking accreditation of their programs from PICAB-CAC need to have outcomes-based educational programs.

HEIs that volunteer to have their ITE (information technology education) programs evaluated and accredited by PICAB-CAC can rest assured that their programs will be viewed vis-à-vis high standards in evaluations carried out by computing and IT professionals who know and understand the needs of industry and the profession. Furthermore, these PEs will have completed training on outcomes-based education and in the use of criteria that are substantially the same as those of the Seoul Accord signatories.

As stated earlier the baccalaureate degree program accreditation criteria defined and described in this document have been intentionally phrased to be substantially equivalent to the criteria used by signatories of the Seoul Accord. Thus, in wording, the criteria are similar to those of ABET and ABEEK, with necessary slight changes made to accommodate the peculiarities of tertiary education and the general needs of the computing and IT industry in the Philippines.

The essence of the accreditation criteria used by signatories of the Seoul Accord are essentially covered in the PICAB-CAC criteria. These criteria will evolve as we practice continuous improvement. The criteria are designed to reinforce CHED's directive to HEIs to modify their ITE programs to become outcomes-based, by focusing on what students learn, and to become demand-driven, by focusing on the needs of industry.

PICAB acknowledges that the resulting Criteria for the Accreditation of Programs in ITE described in this document are based in part on those indicated in the documents available on the web site of the Seoul Accord, based in part on those indicated in the documents available on the web site of ABET, and to a lesser extent, based in part on those indicated in the documents available on the web sites of the other signatories of the Seoul Accord. Great care has been taken to ensure that there is no significant departure from the criteria of the signatories of the Seoul Accord, to ensure that the PICAB criteria are substantially equivalent to those of the signatories of the Seoul Accord.

Introduction

The remainder of this document contains three sections:

- Section 1 describes definitions of terms used in the criteria contained in this document.

- Section 2, *General Criteria*, describes general criteria that apply to all computing and information technology-related programs evaluated for accreditation by PICAB-CAC.

- Section 3, *Program Criteria*, provides additional specific-program-based accreditation criteria. Every program accredited by PICAB-CAC must satisfy every criterion that is in the General Criteria, must satisfy the specific-program-based Program Criterion implied by the program title, and must conform to PICAB-CAC Policies and Procedures (as described in the PICAB Policies and Procedures Manual). In addition the program must comply with relevant requirements of the Commission on Higher Education (CHED).

Section 1. Definitions of Terms

To avoid misunderstandings, PICAB-CAC shall, in its documents and operations, use these definitions of terms and phrases that appear in Sections 2 and 3:

Higher Education Institution (HEI) - A higher education institution is a provider of tertiary level education authorized to offer baccalaureate degree programs by the Commission on Higher Education (CHED) of the Republic of the Philippines.

Information Technology Education (ITE) Program - An information technology education program is a baccalaureate degree program in a higher education institution (HEI) under the purview of the CHED Technical Panel for Information Technology Education (TPITE). At the present time (June 2014), these programs lead to the following degrees: Bachelor of Science in Computer Science, Bachelor of Science in Information Systems, and Bachelor of Science in Information Technology. Due to the fact that one of the programs uses *Information Technology* in its title, it has been suggested that instead of Information Technology Education Program, the better generic term to use in referring to this kind of program is *Computing Technology Education (CTE) Program* .

Student Outcomes (SOs) – Student outcomes describe desired attributes that students in a program aim to possess by the time of their graduation. These attributes relate to the knowledge, skills, and behaviors that students should acquire.

Student Outcomes Assessment (SOA) – Student Outcomes Assessment is a process (or set of processes) that identifies, collects, and prepares data to enable evaluation of the extent to which student outcomes are attained. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome being measured. Sampling methods may be used as part of the assessment process.

Student Outcomes Evaluation (SOE) –Student Outcomes Evaluation is a process or set of processes for interpreting the data accumulated through student outcomes assessment. SOE seeks to determine the extent to which SOs are attained as a result of the program as a whole.

Program Educational Objectives (PEOs) – Program Educational Objectives are broad statements that describe what the institution desires to have a program achieve. Program educational objectives are intentionally aligned with the mission of the higher education institution and designed to respond to the needs of the program's constituencies, particularly industry employers.

Program Educational Objectives Assessment (PEOA) – Program Educational Objectives Assessment is a process (or set of processes) that identifies, collects, and prepares data to enable the evaluation of the extent to which program educational objectives are attained. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the objective being measured. Appropriate sampling methods may be used as part of the assessment process.

Program Educational Objectives Evaluation (PEOE) – Program Educational Objectives Evaluation is a process or set of processes for interpreting the data accumulated through program educational objectives assessment. PEOE seeks to determine the extent to which PEOs are attained.

Course-intended Learning Outcomes (CILOs) – Course-intended learning outcomes (CILOs) establish what students should learn about the subject matter in the course. Student outcomes are broader than CILOs and several courses may be needed to address the same SO. Examinations and other student work provide evidence and therefore opportunities for assessing student outcomes.

S**emester Credit Hour** – One semester credit hour or one semester unit is the academic credit awarded a student upon his successful completion of a tertiary level course in a higher education institution (HEI) where a unit of the course is described as comprised of at least 17 hours of lecture (and/or discussion), or of at least 34 (to 51) hours of laboratory, computational session, or design session. A course may be made up of a combination of lectures and laboratory such as 3 units of lectures and one unit of laboratory for a total credit of 4 semester credit hours or 4 units (CMO No. 1 s2011, Commission on Higher Education, Philippines). The PICAB definition is the same as the CHED definition.

For programs in a higher education institution that uses a different definition of a unit, a conversion factor is required in order to determine the equivalent number of CHED-defined semester credit units earned from successful completion of a lecture-discussion course. The conversion factor may be determined by dividing by 17 the minimum number of lecture hours of the course in a term. This ratio is the conversion factor. Thus, if a higher education institution that uses a trimestral calendar defines a credit unit as 14 total hours of lecture-discussion or one hour per week for 14 weeks, then the conversion factor is 14/17. A 3-unit course in this system would then be equivalent to 3 (14/17) = 2.47 CHED-defined semester credit hours or 2.47 semester units. If the minimum number of lecture hours exceeds 17 then the

conversion factor is 1.0. Thus, for an HEI where one unit is defined as a minimum of 18 hours of lecture-discussion, the conversion factor is 1.0. CHED-defined laboratory semester credit hours may be similarly derived.

Since most HEIs in the Philippines define their lecture and laboratory credit units in accordance with CHED definition, the conversion factor for their course offerings would be 1. The credit units awarded by the institution for a course would therefore be equal to the credit units awarded as defined by CHED.

PICAB-CAC Accredited Program – A PICAB-CAC accredited program is a program in an HEI leading to a baccalaureate degree that has been evaluated and deemed to have satisfied all the general and applicable program-based criteria, the policies and procedures requirements of PICAB, and the relevant requirements of CHED. PICAB-CAC does not accredit individual graduates nor does it accredit organizational units of HEIs.

Section 2. General Criteria

Criterion 1. Program Educational Objectives

The program must have **published** program educational objectives that are aligned with the mission of the institution, the needs of the program's various constituencies, and these criteria. These objectives must be measurable and there must be a documented process for the establishment of the initial objectives and a documented process for the periodic review of these objectives such that the process ensures that the objectives are aligned with the prevailing institutional mission, the program constituents' prevailing needs, and these criteria.

Criterion 2. Student Outcomes

The program must have documented student outcomes that prepare graduates to attain the program educational objectives. There must be a documented process for the establishment of the initial student outcomes and a documented process for the periodic review and possible revision of these student outcomes.

The program must enable students to attain, by the time of their graduation the following characteristics:

(a) Ability to apply knowledge of computing, basic science, and mathematics appropriate to the discipline and the program educational objectives

(b) Ability to analyze a problem, and identify and define the computing requirements appropriate to the problem's solution

(c) Ability to design, implement, and evaluate the capability of a computer-based system, process, component, or program to meet desired needs

(d) Ability to function effectively on teams to accomplish a common goal

(e) Ability to understand professional, ethical, legal, security and social issues and responsibilities

(f) Ability to communicate effectively with a range of audiences

(g) Ability to analyze the local and global impact of computing on individuals, organizations, and society

(h) Ability to recognize the need for and ability to engage in continuing professional development

(i) Ability to use techniques, skills, and tools necessary to current computing practice

A program may specify its own set of outcomes to ensure attainment of its program educational objectives, but the program's student outcomes must cover the above 9 characteristics.

Criterion 3. Curriculum

A program's curriculum must be aligned with its program educational objectives and designed in such a way that each of the student outcomes can be attained. The curriculum must combine technical and professional requirements with general education requirements to prepare students for a professional career and further study in the computing discipline associated with the program, and for functioning in modern society.

The technical and professional requirements must include at least 45 semester credit hours (or equivalent) of up-to-date coverage of fundamental and advanced topics in the computing discipline associated with the program.

In addition, the program must include 9 semester credit hours (or equivalent) of mathematics beyond the pre-calculus level, and 6 semester credit hours of basic science appropriate to the discipline associated with the program. The program must include 15 semester credit hours (or equivalent) in humanities, the arts, and social sciences, not counting courses in communication skills.

For each course in the major required of all students, its content, expected performance criteria, and place in the overall program of study must be published.

Criterion 4. Students

(a) Student performance must be evaluated.

(b) Student progress must be monitored to foster success in attaining student outcomes, thereby enabling students to attain all program educational objectives by the time of their graduation.

(c) Students must be advised regarding curriculum and career matters.

The program must have and enforce policies related to accepting both new and transfer students, granting appropriate academic credit for courses taken outside the program, and determining appropriate academic credit for work in lieu of courses at an institution. The program must have and enforce procedures to ensure and document that students who graduate meet all graduation requirements.

Criterion 5. Faculty

Every faculty member teaching in a program must have expertise and educational background such that, collectively, the faculty is able to meet the demands of the program in a balanced manner. Claims to competence of faculty members must be supported by evidence such as education, professional credentials and certifications, professional experience, ongoing professional development, contributions to the discipline, teaching effectiveness, and communication skills.

Collectively, the faculty must have the breadth and depth necessary to be able to cover all curricular areas of the program.

The faculty members teaching major courses in the program must be of sufficient number so as to be able to maintain continuity, stability, oversight, student interaction, and advising. The faculty must have sufficient responsibility and authority to improve the program through development and revision of program educational objectives and student outcomes, as well as through the implementation of a program of study that fosters the attainment of student outcomes. If an administrative unit such as a department or college has two or more programs, a faculty member must be counted only once, for the purpose of determining the size of the program faculty.

Criterion 6. Facilities

Physical facilities: classrooms, offices, laboratories, and associated equipment must be adequate to support attainment of the student outcomes and to provide an environment conducive to learning. Modern tools, equipment, computing resources, and laboratories appropriate to the program must be available, accessible, and systematically maintained and upgraded to enable students to attain the student outcomes and to support program needs. Appropriate guidance and instructions regarding the correct use of and care for tools, equipment, computing resources, and laboratories must be provided to students in the program.

The library, computing, and information services must be adequate to support the educational, scholarly, and professional activities of the students and faculty.

Criterion 7. Institutional Support

Institutional support and leadership must be adequate to ensure the quality and continuity of the program.

Resources including institutional services, financial support, and support staff provided to the program must be adequate to meet program needs. The resources available to the program must be sufficient to attract, retain, and provide for the continued professional development of a qualified faculty. The resources available to the program must be sufficient to acquire, maintain, and operate infrastructures, facilities and equipment appropriate to the program, and to provide an environment in which student outcomes can be attained.

Criterion 8. Industry-Academe Linkage and Community-Oriented Programs

The program must ensure that it is responsive to the needs of stakeholders, particularly the needs of industry employers. There should be regular interactions between the students and faculty members of the program with IT professionals from industry through activities such as on-the-job student training, internships, visits to industry facilities, industry guided/approved capstone course projects, collaborative HEI projects sponsored by industry, and interactions with industry

leaders on advisory boards, to complement the academic program and benefit industry. These interactions should be planned such that both the programs and the employers reap tangible benefits.

Students and student organizations should engage in activities to assist communities as an avenue for societal service and also to gain understanding of the impact of computing solutions on society. The assistance should be based on the needs of the community.

Criterion 9. Program Improvement

The program must periodically use documented processes for student outcomes assessment, student outcomes evaluation, program educational objectives assessment, and program educational objectives evaluation. The results of the SOEs must be utilized as input for the documented periodic program improvement process, particularly with respect to courses in the curriculum. PEOEs should be utilized as input to the periodic program improvement process. Other available information, as appropriate, may be used as input to total program improvement. The periodic assessment and evaluation of student outcomes and the periodic assessment and evaluation of program educational objectives are intended to progressively improve the degree of attainment of SOs and PEOs.

Section 3. Program Criteria

Programs seeking accreditation from the Computing Accreditation Commission of PICAB must demonstrate that they satisfy all of the specific-program-based Program Criteria implied by the program title. These program criteria may impose additional student outcomes requirements, additional curricular requirements, and additional faculty requirements.

PROGRAM CRITERION FOR COMPUTER SCIENCE

This program criterion applies to ITE programs using *computer science* in their titles.

3. Additional Student Outcomes

   The program must require students to attain, by the time of their graduation:

   (j) Ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices and applicable standards. [CS]

   (k) Ability to apply design and development principles in the construction of software systems of varying complexity, in accordance with applicable standards. [CS]

5. Additional Curriculum Requirements

   Students must have the following course work:

   (a) Computer science: the required at least 45 semester credit hours (or equivalent) of technical and professional requirements must include:

      1. Coverage of the fundamentals of algorithms, data structures, software design, concepts of programming languages and computer organization and architecture. [CS]

2. A variety of programming languages and systems. [CS]
3. At least one high level language. [CS]
4. Advanced course work that provides depth by building on fundamental course work. [CS]

(b) Thirty (30) semester credit hours of basic science and mathematics:

1. Mathematics: At least 15 semester credit hours that must include discrete mathematics. The additional mathematics might consist of courses in areas such as calculus, linear algebra, numerical methods, probability, statistics, number theory, geometry, or symbolic logic. [CS]
2. Basic Science: A science component that develops an understanding of the scientific method and provides students with an opportunity to experience this mode of inquiry in courses for science or engineering majors that provide some exposure to laboratory work. The total semester credit hours in basic science plus mathematics must be at least 30. [CS]

6. Additional Faculty Requirements

Some full time faculty members must have a Ph.D. degree in a program of study essentially in computer science. Some research publications must be in computer science journals.

PROGRAM CRITERION FOR INFORMATION SYSTEMS

This program criterion applies to ITE programs using *information systems* in their titles.

3. Additional Student Outcomes

   The program must enable students to attain, by the time of their graduation:

   (j) Understanding of, and ability to support, the use, delivery, and management of information systems within an Information Systems environment. [IS]

5. Additional Curriculum Requirements

   Students must have course work on:

   (a) Information Systems: 30 semester credit hours that must include:

      1. the fundamentals of application development, data management, networking and data communications, security of information systems, systems analysis and design, and the role of Information Systems in organizations. [IS]
      2. advanced course work to provide depth by building on fundamental course work. [IS]

   (b) Information Systems Environment: 15 semester credit hours of course work that must include a cohesive set of topics that provides an understanding of an environment in which information systems will be applied professionally. [IS]

(c) Quantitative analysis or methods, including statistics. [IS]

6. Additional Faculty Requirements

Some full-time faculty members, including those responsible for IS curriculum development, must hold a terminal degree in a program of study and research in information systems.

PROGRAM CRITERION FOR INFORMATION TECHNOLOGY

This program criterion applies to ITE programs using *information technology* in their titles.

3. Additional Student Outcomes

   The program must require students to acquire, by the time of their graduation:

   (j) Ability to use and apply current technical concepts and practices in the core information technologies: human computer interaction, information management, programming, networking, and web systems and technologies. [IT]

   (k) Ability to identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems. [IT]

   (l) Ability to effectively integrate IT-based solutions into the user environment. [IT]

   (m) Ability to understand best practices and standards and their application. [IT]

   (n) Ability to assist in the creation of an effective project plan. [IT]

5. Additional Curriculum Requirements

   Students must have 45 semester credit hours of course work that includes:

   (a) Fundamentals of

      1. The core information technologies: human computer interaction,

information management, programming, networking, web systems and technologies. [IT]

2. Information assurance and security. [IT]
3. System administration and maintenance. [IT]
4. System integration and architecture. [IT]

(b) Advanced course work to provide depth by building on fundamental course work. [IT]