PCS Information and Computing Accreditation Board

CRITERIA FOR ACCREDITING COMPUTING AND INFORMATION TECHNOLOGY EDUCATION (CITE) PROGRAMS

Optional for Reviews after 20 October 2018 and
During the 2019-2020 Accreditation Cycle

Mandatory for Reviews Starting with the 2020-2021 Accreditation Cycle

Incorporates all changes approved by PICAB Board of Directors
as of 20 October 2018

This supersedes all versions before 20 October 2018.

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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 education (CITE) for baccalaureate degree programs in the Philippines. One of the purposes in creating this new accreditation system is to set standards for computing and information technology-related programs whereby the standards are set by experts in the Computing and Information Technology profession who are members of computing and information technology professional societies. The accreditation system is intended to stimulate continuous improvement of every program, respecting the prerogatives of Higher Education Institutions (HEIs) to align their programs with their missions, and to respond to the needs of constituencies, particularly the needs of industry employers. Finally, this accreditation system is designed so that it 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 is a Provisional Member of the Seoul Accord. PICAB intends to apply for full membership or signatory status in the Seoul Accord in the near future. The key requirements for full 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 information technology-related occupations. Finally, the applicant must be a Provisional Member for at least four (4) years.

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 computing and information technology education (CITE) 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 information technology 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 information technology industry in the Philippines.

The essence of the accreditation criteria used by signatories of the Seoul Accord are 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 CITE programs to become outcomes-based, by focusing on what students learn, and to become demand-driven, by focusing on the needs of the stakeholders.

PICAB acknowledges that the resulting Criteria for the Accreditation of Programs in CITE 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).

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 of PICAB Document No. 004 – Criteria for Accrediting CITE Programs.

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 as evidenced by a Government Recognition from CHED.

Computing and Information Technology Education (CITE) Program – A computing and 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 (September 2018), 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, to avoid confusion, PICAB-CAC will use *Computing and Information Technology Education (CITE)* in referring to the three programs collectively.

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.

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. PICAB-CAC does not accredit individual graduates nor does it accredit organizational units of HEIs.

Complex Computing Problems - Complex computing problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.

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 and publicly stated student outcomes that include one (1) through five (5) below and any outcomes required by applicable Program Criteria. The program may define additional outcomes.

Graduates of the program will have an ability to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solution;
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline;
3. Communicate effectively in a variety of professional contexts;
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles; and
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

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 five (5) characteristics.

Criterion 3. Curriculum

The program's requirements must be consistent 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, professional, and general education components to prepare students for a career, further study, and lifelong professional development in the computing discipline associated with the program.

The curriculum requirements specify topics, but do not prescribe specific courses. The program must include mathematics appropriate to the discipline and at least forty-five (45) semester credit hours (or equivalent) or up-to-date coverage of fundamental and advanced computing topics that provide both breadth and depth. The computing topics must include:

1. Techniques, skills and tools necessary for computing practice;
2. Principles and practices for secure computing; and
3. Local and global impacts of computing solutions on individuals, organizations, and society.

Criterion 4. Students

To ensure quality standards are maintained:

1. Student performance must be evaluated;
2. Student progress must be monitored to assist students in completing program requirements thereby enabling students to attain all student outcomes by the time of their graduation; and
3. 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, and student outcomes 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. Other available information, as appropriate, may be used as input to total program improvement. The periodic assessment and evaluation of student outcomes are intended to progressively improve the degree of attainment of SOs.

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 CITE programs using *computer science* in their titles.

2. Additional Student Outcomes

In addition to outcomes one (1) through five (5), graduates of the program will also have an ability to:

(6) Apply computer science theory and software development fundamentals to produce computing-based solutions.

3. Additional Curriculum Requirements

The curriculum requirements specify topics, but do not prescribe specific courses.

These requirements are:

(a) Computer science: at least forty-five (45) semester credit hours (or equivalent) of technical and professional topics must include:

1. Substantial coverage of algorithms and complexity, computer science theory, concepts of programming languages, and software development;
2. Substantial coverage of at least one (1) general-purpose programming language;
3. Exposure to computer architecture and organization, information management, networking and communication, operating systems, and parallel and distributed computing;
4. The study of computing-based systems at varying levels of abstraction;
5. A major project that requires integration and application of knowledge and skills acquired in earlier course work; and
6. Principles and practices for secure computing.

(b) Mathematics: At least fifteen (15) semester credit hours (or equivalent) that must include discrete mathematics and must have mathematical rigor at least equivalent to introductory calculus. The additional mathematics might include course work in areas such as calculus, linear algebra, numerical methods, probability, statistics, symbolic logic, or number theory.

(c) Natural Science: At least eight (8) semester credit hours (or equivalent) in natural science course work intended for science and engineering majors. This course work must develop an understanding of the scientific method and must include laboratory work.

5. Additional Faculty Requirements

Some full-time faculty must have PhD in Computer Science, or a doctoral degree provided that there is a track record of scholarly work of research articles and conference papers whose titles are in computer science fields.

PROGRAM CRITERION FOR INFORMATION SYSTEMS

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

Definition: An information systems environment is an organized domain of activity within which information systems are used to support and enable the goals of the activity. Examples of information systems environments include (but are not limited to) business, health care, government, not-for-profit organizations, and scientific disciplines.

2. Additional Student Outcomes

In addition to outcomes one (1) through five (5), graduates of the program will also have:

(6) An understanding of and an ability to support the use, delivery, and management of information systems within an Information Systems environment.

3. Additional Curriculum Requirements

The curriculum requirements specify topics, but do not prescribe specific courses.

These requirements are:

(a) Information systems: At least thirty (30) semester credit hours (or equivalent) that include coverage of fundamentals and applied practice in application development; data and information management; information technology infrastructure; systems analysis, design and acquisition; project management; and the role of information systems in organizations;

(b) Information systems environment: At least fifteen (15) additional semester credit hours (or equivalent) of a cohesive set of topics that provide an understanding of an information systems environment;

(c) Quantitative analysis or methods that must include statistics; and

(d) Principles and practices for secure computing.

5. 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 that includes computing and information technology, and current research and other scholarly activities that include information systems topics or professional experience in a managerial capacity in information systems.

PROGRAM CRITERION FOR INFORMATION TECHNOLOGY

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

2. Additional Student Outcomes

In addition to outcomes one (1) through five (5), graduates of the program will also have an ability to:

(6) Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems.

3. Additional Curriculum Requirements

The curriculum requirements specify topics, but do not prescribe specific courses. The curriculum must include coverage of fundamentals and applied practice in the following:

(a) The core information technologies of human-computer interaction, information management, programming, web systems and technologies, and networking;

(b) System administration and system maintenance; and

(c) System integration and system architecture.