CRITERIA FOR ACCREDITING COMPUTING PROGRAMS

Effective for Reviews During the 2017-2018
Accreditation Cycle

Incorporates all changes approved
by the
ABET
Board of Delegates
Computing Area Delegation as of
October 29, 2016

Computing Accreditation Commission

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Criteria for Accrediting Computing Programs

Effective for Reviews during the 2017-2018 Accreditation Cycle

INTRODUCTION

This document contains three sections:

The first section includes important **definitions** used by all ABET commissions.

Definitions

While ABET recognizes and supports the prerogative of institutions to adopt and use the terminology of their choice, it is necessary for ABET volunteers and staff to have a consistent understanding of terminology. With that purpose in mind, the Commissions will use the following basic definitions:

> **Program Educational Objectives** – Program educational objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. Program educational objectives are based on the needs of the program's constituencies.
> **Student Outcomes** – Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program. **Assessment** – Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome being measured. Appropriate sampling methods may be used as part of an assessment process.
> **Evaluation** – Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes are being attained. Evaluation results in decisions and actions regarding program improvement.

The criteria for accreditation are in two sections

General Criteria – General Criteria apply to all programs accredited by an ABET commission. Each program accredited by an ABET commission must satisfy every Criterion that is in the General Criteria for that commission.
Program Criteria – The Program Criteria provide discipline-specific accreditation criteria. Programs must show that they satisfy all of the specific Program Criteria implied by the program title. Any overlapping requirements need be satisfied only once.

All programs seeking accreditation from the Computing Accreditation Commission of ABET must demonstrate that they satisfy all of the following General Criteria.

GENERAL CRITERIA

Criterion 1. Students

Student performance must be evaluated. Student progress must be monitored to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives. Students must be advised regarding curriculum and career matters.

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

Criterion 2. Program Educational Objectives

The program must have published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria. There must be a documented, systematically utilized, and effective process, involving program constituencies, for the periodic review of these program educational objectives that ensures they remain consistent with the institutional mission, the program's constituents' needs, and these criteria.

Criterion 3. Student Outcomes

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

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

(a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline

(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

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

(e) An understanding of professional, ethical, legal, security and social issues and responsibilities

(f) An ability to communicate effectively with a range of audiences

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

(h) Recognition of the need for and an ability to engage in continuing professional development

(i) An ability to use current techniques, skills, and tools necessary for computing practice.

Criterion 4. Continuous Improvement
The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the continuous improvement of the program. Other available information may also be used to assist in the continuous improvement of the program.

Criterion 5. 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 and professional requirements with general education requirements and electives 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 one year of up-to- date coverage of fundamental and advanced topics in the computing discipline associated with the program. In addition, the program must include mathematics appropriate to the discipline beyond the pre-calculus level. 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 6. Faculty
Each faculty member teaching in the program must have expertise and educational background consistent with the contributions to the program expected from the faculty member. The competence of faculty members must be demonstrated by such factors 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 to cover all curricular areas of the program.

The faculty serving in the program must be of sufficient number to maintain continuity, stability, oversight, student interaction, and advising. The faculty must have sufficient responsibility and authority to improve the program through definition 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.

Criterion 7. Facilities
Classrooms, offices, laboratories, and associated equipment must be adequate to support attainment of the student outcomes and to provide an atmosphere 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. Students must be provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories available to the program.

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

Criterion 8. 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 staff (both administrative and technical) 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 for the program, and to provide an environment in which student outcomes can be attained.

PROGRAM CRITERIA

All programs seeking accreditation from the Computing Accreditation Commission of ABET must demonstrate that they satisfy all of the specific Program Criteria implied by the program title.

PROGRAM CRITERIA FOR COMPUTER SCIENCE AND SIMILARLY NAMED COMPUTING PROGRAMS

Lead Society: CSAB

These program criteria apply to computing programs using computer science or similar terms in their titles.

3. Student Outcomes

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

   (j) An 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. [CS]

   (k) An ability to apply design and development principles in the construction of software systems of varying complexity. [CS]

5. Curriculum

   Students must have the following amounts of course work or equivalent educational experience:

   a. Computer science: One and one-third years that must include:

1. Coverage of the fundamentals of algorithms, data structures, software design, concepts of programming languages and computer organization and architecture. [CS]
2. An exposure to a variety of programming languages and systems. [CS]
3. Proficiency in at least one higher-level language. [CS]
4. Advanced course work that builds on the fundamental course work to provide depth. [CS]

b. One year of science and mathematics:

1. Mathematics: At least one half year 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. 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. [CS]

6. Faculty
Some full time faculty members must have a Ph.D. in computer science.

PROGRAM CRITERIA FOR INFORMATION SYSTEMS AND SIMILARLY NAMED COMPUTING PROGRAMS

Lead Society: CSAB

These program criteria apply to computing programs using information systems or similar terms in their titles.

3. Student Outcomes
The program must enable students to attain, by the time of graduation:
(j) An understanding of and an ability to support the use, delivery, and management of information systems within an Information Systems environment. [IS]

5. Curriculum
Students must have course work or an equivalent educational experience that includes:

a. Information Systems: One year that must include:

1. coverage of 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 that builds on the fundamental course work to provide depth. [IS]

b. Information Systems Environment: One-half year of course work that must include a cohesive set of topics that provide an understanding of an environment in which the information systems will be applied professionally. [IS]

c. Quantitative analysis or methods including statistics. [IS]

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

PROGRAM CRITERIA FOR INFORMATION TECHNOLOGY AND SIMILARLY NAMED COMPUTING PROGRAMS

Lead Society: CSAB

These program criteria apply to computing programs using information technology or similar terms in their titles.

3. Student Outcomes
   The program must enable students to attain, by the time of graduation:
   (j) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, and web systems and technologies. [IT]
   (k) An 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) n ability to effectively integrate IT-based solutions into the user environment. [IT]
   (m) An understanding of best practices and standards and their application. [IT]
   (n) n ability to assist in the creation of an effective project plan. [IT]

5. Curriculum
   Students must have course work or an equivalent educational experience that includes:
   a. Coverage of the fundamentals of
      1. the core information technologies of 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 system architecture. [IT]
   b. Advanced course work that builds on the fundamental course work to provide depth. [IT]

PROPOSED CHANGES TO THE CRITERIA

The following section presents proposed changes to these criteria as approved by the ABET Computing Area Delegation on October 29, 2016, for a one-year review and comment period. Comments will be considered until June 15, 2017. The ABET Computing Area Delegation will determine, based on the comments received and on the advice of the CAC, the content of the adopted criteria. The adopted criteria would only become effective if approved by the ABET Computing Area Delegation Meetings in the fall of 2017 and the earliest possible application would be for accreditation reviews during the 2018-19 academic year.

Comments relative to the proposed criteria changes should be addressed to: Director, Accreditation Operations, ABET, 415 N. Charles Street, Baltimore, MD 21201 or to accreditation@abet.org.

PROPOSED REVISIONS TO THE

Criteria for Accrediting Computing Programs

Effective for Reviews during the 20XX-20YY Accreditation Cycle

The criteria for accreditation are in two sections.

General Criteria – General Criteria apply to all programs accredited by an ABET commission. Each program accredited by an ABET commission must satisfy every criterion that is in the General Criteria for that commission.

Program Criteria – The Program Criteria provide discipline-specific accreditation criteria. Programs must show that they satisfy all of the specific Program Criteria implied by the program title. Any overlapping requirements need be satisfied only once.

Definitions

While ABET recognizes and supports the prerogative of institutions to adopt and use the terminology of their choice, it is necessary for ABET volunteers and staff to have a consistent understanding of terminology. With that purpose in mind, the Commissions will use the following basic definitions:

Program Educational Objectives – Program educational objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. Program educational objectives are based on the needs of the program's constituencies.

Student Outcomes – Student outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviors that students acquire as they progress through the program.

Assessment – Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome being measured. Appropriate sampling methods may be used as part of an assessment process.

Evaluation – Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes are being attained. Evaluation results in decisions and actions regarding program improvement.

The Computing Accreditation Commission also uses the following definitions:

One Academic Year - For programs using standard semester units, one academic year is defined as 30 semester units. For programs using standard quarter units, one

academic year is defined as 45 quarter units. For other programs, one academic year requires an equivalent amount of coursework.

College-Level Mathematics – College-level mathematics consists of mathematics above the pre-calculus level.

General Criteria 3 and 5

Criterion 3 Student Outcomes

~~**The program must have documented student outcomes that prepare graduates to attain the program educational objectives. There must be a documented and effective process for the review and revision of these student outcomes.**~~ The program must have documented and publicly stated student outcomes that include (1) through (5) below and any additional outcomes required by applicable Program Criteria. The program may define additional student outcomes at its discretion.

1. An ability to analyze a problem, and to identify and define the computing requirements appropriate to its solution.
2. An ability to design, implement, and evaluate a computer-based solution to meet a given set of computing requirements in the context of the discipline.
3. An ability to communicate effectively with a range of audiences about technical information.
4. An ability to make informed judgments in computing practice based on legal and ethical principles.
5. An ability to function effectively on teams to establish goals, plan tasks, meet deadlines, manage risk, and produce deliverables.

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

- ~~a) **An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline**~~
- ~~b) **An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**~~
- ~~c) **An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs**~~
- ~~d) **An ability to function effectively on teams to accomplish a common goal**~~
- ~~e) **An understanding of professional, ethical, legal, security and social issues and responsibilities**~~
- ~~f) **An ability to communicate effectively with a range of audiences**~~
- ~~g) **An ability to analyze the local and global impact of computing on individuals, organizations, and society**~~
- ~~h) **Recognition of the need for and an ability to engage in continuing professional development**~~
- ~~**i) An ability to use current techniques, skills, and tools necessary for computing practice.**~~

Criterion 5 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 and professional requirements with general education requirements and electives 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 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 technical and professional requirements must include at least one year of up-to-date coverage of fundamental and advanced topics in the computing discipline associated with the program. In addition, the program must include mathematics appropriate to the discipline beyond the pre-calculus level. 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.**~~

The curriculum requirements specify subject areas, but do not prescribe specific courses. The program must include each of the following in a manner appropriate to its discipline:

1. At least one academic year of up-to-date coverage of fundamental and advanced computing topics that provides both breadth and depth.
2. College-level mathematics.
3. Current techniques, skills, and tools necessary for computing practice.
4. Information assurance and security principles and practices.
5. Concepts involving the local and global impact of computing solutions on individuals, organizations, and society.

PROPOSED REVISIONS TO THE
Program Criteria for Computer
Science and
Similarly Named Computing Programs

Lead Society: CSAB

These program criteria apply to computing programs using computer science or similar terms in their titles.

3. Student Outcomes

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

~~(j) **An 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. [CS]**~~

~~(k) **An ability to apply design and development principles in the construction of software systems of varying complexity. [CS]**~~

In addition to outcomes 1 through 5, the following outcomes are required:

6. An ability to apply theory in the design and implementation of computer-based solutions. [CS]
7. An ability to reason about and explain computer-based solutions at multiple levels of abstraction. [CS]

5. Curriculum

~~**Students must have course work or an equivalent educational experience that includes:**~~

- ~~a.~~**Computer science: One and one-third years that must include:**
  - ~~1.~~**Coverage of the fundamentals of algorithms, data structures, software design, concepts of programming languages and computer organization and architecture. [CS]**
  - ~~2.~~**An exposure to a variety of programming languages and systems. [CS]**
  - ~~3.~~**Proficiency in at least one higher level language. [CS]**
  - ~~4.~~**Advanced course work that builds on the fundamental course work to provide depth. [CS]**
- ~~b.~~**One year of science and mathematics**
  - ~~1.~~**At least one-half year that must include discrete mathematics. The additional mathematics might consist of course work in areas such as calculus, linear algebra, numerical methods, probability, statistics, number theory, geometry or symbolic logic. [CS]**
  - ~~2.~~**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 and engineering majors that provide some exposure to laboratory work. [CS]**

The curriculum requirements specify subject areas, but do not prescribe specific courses. These requirements are:

a. Computer science: At least one and one-third academic years that must include:
    1. Computer science fundamentals including:
        a. Algorithms and complexity, computer science theory, concepts of programming languages, and software development.
        b. At least three of the following: computer architecture and organization, information management, networking and communication, operating systems, and parallel and distributed computing.
    2. Advanced course work that builds on fundamental topics to provide both breadth and depth.
    3. Design, implementation, and evaluation of computer-based solutions of varying complexity.
    4. In-depth coverage of at least one high-level language.
    5. A project requiring integration of knowledge and skills acquired in earlier course work.

b. Mathematics: At least one-half academic year of college-level mathematics that must include discrete mathematics. The additional mathematics might consist of course work in areas such as calculus, linear algebra, numerical methods, probability, statistics, number theory, or geometry.

c. Science: Natural science course work that develops an understanding of the scientific method, provides exposure to laboratory work, and provides students with an opportunity to experience this mode of inquiry in courses appropriate for science or engineering majors.

6. Faculty

~~**Some**~~ At least one full time faculty member~~s~~ must have a Ph.D. in computer science.

PROPOSED REVISIONS TO THE
Program Criteria for Information
Systems and
Similarly Named Computing Programs

Lead Society: CSAB

These program criteria apply to computing programs using information systems or similar terms in their titles.

Definition

Information Systems Environment - 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.

3. Student Outcomes

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

In addition to outcomes 1 through 5, the following outcome is required:

6. ~~**(j) An understanding of and an**~~ An ability to support the delivery, use, ~~delivery,~~ and management of information systems within an information systems environment. [IS]

5. Curriculum

~~**Students must have course work or an equivalent educational experience that includes:**~~

~~a. **Information Systems: One year that must include:**~~

~~1.**Coverage of 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 that builds on the fundamental core to provide depth. [IS]**~~

~~b. **Information systems environment: One-half year of course work that must include a cohesive set of topics that provide an understanding of an environment in which the information systems will be applied professionally [IS]**~~

~~c.**Quantitative analysis or methods, including statistics [IS]**~~

The curriculum requirements specify subject areas, but do not prescribe specific courses. These requirements are:

a. Information systems: At least one academic year that includes coverage of fundamentals and applied practice in application development; data and information management; IT infrastructure; systems analysis, design and

acquisition; project management; and the role of information systems in organizations.

b. Information systems environment: At least one-half additional academic year of course work that includes a cohesive set of topics that provide an understanding of an environment in which information systems are applied professionally.

c. Quantitative analysis or methods that must include statistics.

6. Faculty

Some At least one full-time faculty member**s, including those responsible for the IS curriculum development,** must hold a terminal degree with a program of study in information systems.

PROPOSED REVISIONS TO THE
Program Criteria for Information
Technology and
Similarly Named Computing Programs

Lead Society: CSAB

These program criteria apply to computing programs using information technology or similar terms in their titles.

3. Student Outcomes

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

6. **An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, and web systems and technologies. [IT]**
7. **An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation, and administration of computer-based systems. [IT]**
8. **An ability to effectively integrate IT-based solutions into the user environment. [IT]**
9. **An understanding of best practices and standards and their application. [IT]**
10. **An ability to assist in the creation of an effective project plan. [IT]**

In addition to outcomes 1 through 5, the following outcome is required:

6. An ability to identify and analyze user needs and to take them into account in the selection, integration, evaluation, and administration of computer-based systems. [IT]

5. Curriculum

~~**Students must have course work or an equivalent educational experience that includes:**~~

~~a.**Coverage of the fundamentals of**~~

~~1.**The core information technologies of 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 system architecture; [IT]**~~

~~b.**Advance course work that builds on the fundamental course work to provide depth. [IT]**~~

The curriculum must include coverage of fundamentals and applied practice in the following areas:

a. The core information technologies of human-computer interaction, information management, programming, web systems and technologies, and networking.
b. System administration and system maintenance.
c. System integration and system architecture.