

CRITERIA FOR ACCREDITING COMPUTING PROGRAMS

Effective for Evaluations During the
2010-2011 Accreditation Cycle

Incorporates all changes
approved by the
ABET
Board of Directors
as of
October 31, 2009



Computing Accreditation Commission

ABET, Inc.
111 Market Place, Suite 1050
Baltimore, MD 21202

Telephone: 410-347-7700
Fax: 410-625-2238
E-mail: accreditation@abet.org
Website: www.abet.org

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111 Market Place
Suite 1050
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Requests for further information about ABET, its accreditation process, or other activities may be addressed to the Accreditation Director, ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202 or to accreditation@abet.org.

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Criteria for Accrediting Computing Programs

Effective for Evaluations during the 2010-2011 Accreditation Cycle

Definitions

(From Section II.D.1. of the ABET *Accreditation Policy and Procedure Manual*)

While ABET recognizes and supports the prerogative of institutions to use and adopt 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 the career and professional accomplishments that the program is preparing graduates to achieve.

Program Outcomes – Program outcomes are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program.

Assessment – Assessment is one or more processes that identify, collect, and prepare data to evaluate the achievement of program outcomes and program educational objectives.

Evaluation – Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment practices. Evaluation determines the extent to which program outcomes or program educational objectives are being achieved, and results in decisions and actions to improve the program.

It is the responsibility of the program seeking accreditation to demonstrate clearly that the program meets the following criteria.

GENERAL CRITERIA

Criterion 1. Students

Students can complete the program in a reasonable amount of time. They have ample opportunity to interact with their instructors. Students are offered timely advising, by qualified individuals, about the program's requirements and their career alternatives. Students who graduate from the program meet all program requirements.

Criterion 2. Program Educational Objectives

The program has documented, measurable educational objectives that are based on the needs of the program's constituencies.

Criterion 3. Program Outcomes

The program has documented, measurable outcomes that are based on the needs of the program's constituencies.

The program enables students to achieve, by the time of graduation:

- (a) An ability to apply knowledge of computing and mathematics appropriate 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 4. Continuous Improvement

The program uses a documented process incorporating relevant data to regularly assess its program educational objectives and program outcomes, and to evaluate the extent to which they are being met. The results of the evaluations are documented and used to effect continuous improvement of the program through a documented plan.

Criterion 5. Curriculum

The program's requirements are consistent with its educational objectives and are designed in such a way that each of the program outcomes can be achieved. The curriculum combines 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 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 includes 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 are published.

Criterion 6. Faculty

A. Faculty Qualifications

Faculty members teaching in the program are current and active in the associated computing discipline. They each have the educational backgrounds or expertise consistent with their expected contributions to the program. Each has a level of competence that normally would be obtained through graduate work in the discipline, relevant experience, or relevant scholarship. Collectively, they have the technical breadth and depth necessary to support the program.

B. Faculty Size and Workload

There are enough full-time faculty members to provide continuity, oversight, and stability, to cover the curriculum reasonably, and to allow an appropriate mix of teaching, professional development, scholarly activities, and service for each faculty member. The faculty assigned to the program has appropriate authority for the creation, delivery, evaluation, and modification of the program, and the responsibility for the consistency and quality of its courses.

Criterion 7. Facilities

Institutional facilities including the library, other electronic information retrieval systems, computer networks, classrooms, and offices are adequate to support the educational objectives and outcomes of the program.

Computing resources are available, accessible, systematically maintained and upgraded, and otherwise adequately supported to enable students to achieve the program's outcomes and to support faculty teaching needs and scholarly activities. Students and faculty members receive appropriate guidance regarding the computing resources and laboratories available to the program.

Criterion 8. Support

The institution's support for the program and the financial resources available to the program are sufficient to attract and retain qualified faculty members, administer the program effectively, acquire and maintain computing resources and laboratories, and otherwise provide an environment in which the program can achieve its educational objectives and outcomes. Support and resources are sufficient to provide assurance that the program will retain its strength throughout the period of accreditation.

Criterion 9. Program Criteria

Each program must satisfy applicable Program Criteria (if any). Program Criteria provide the specificity needed for interpretation of the General Criteria as applicable to a given discipline. If a program, by virtue of its title, becomes subject to two or more sets of Program Criteria, then that program must satisfy each set of Program Criteria; however, overlapping requirements need to be satisfied only once.

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. Program Outcomes

The program enables students to achieve, 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 have the following amounts of course work or equivalent educational experience:

- a. Computer science: One and one-third years that includes:
 - 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 Qualifications

Some full time faculty members 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. Program Outcomes

The program enables students to achieve, by the time of graduation:

- (j) An understanding of processes that support the delivery and management of information systems within a specific application environment. [IS]

5. Curriculum

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

- a. Information Systems: One year that includes:
 - 1. coverage of the fundamentals of a modern programming language, data management, networking and data communications, systems analysis and design and the role of Information Systems in organizations. [IS]
 - 2. advanced coursework that builds on the fundamental coursework to provide depth. [IS]
- b. Information Systems Environment: One-half year of coursework that includes varied topics that provide background in 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, including those responsible for the IS curriculum development, hold a terminal degree 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. Program Outcomes

The program enables students to achieve, by the time of graduation:

- (j) An ability to use and apply current technical concepts and practices in the core information 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) An 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) An ability to assist in the creation of an effective project plan. [IT]

5. Curriculum

Students 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 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. These proposals were approved by the Computing Accreditation Commission (CAC) and were brought before the ABET Board of Directors on November 1, 2008 for preliminary approval. Before being approved for final implementation in the accreditation process, these proposals are published here for circulation among the institutions with accredited programs and other interested parties for review and comment.

The ABET Board of Directors has approved a two-year first reading review and comment period for the CAC Harmonized Criteria. Comments will be considered until April 1, 2010. The Harmonized Criteria presented in the Proposed Changes Section reflect changes based on comments received to-date during the two-year first reading period. These changes were approved by the CAC and presented to the ABET Board for information at the October 31, 2009 meeting. The ABET Board of Directors will determine, based on the comments received and on the advice of the CAC, the content of the adopted harmonized criteria in the fall of 2010. The harmonized criteria will first be applied by the CAC for accreditation actions during the 2011-2012 academic year.

Comments relative to the proposed criteria changes should be addressed to: Accreditation Director, ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 or to accreditation@abet.org.

Proposed CAC Harmonized Criteria
Approved by CAC
July 19, 2008
Recommended Additions and Deletions
Approved September 12, 2009

INTRODUCTION

This document contains three sections. The first section includes important **definitions** used by all ABET commissions. These definitions, taken from the ABET Accreditation Policies and Procedures Manual, are included here so that this document is self-contained.

The second section contains the **General Criteria** that must be satisfied by all programs accredited by the Computing Accreditation Commission of ABET.

The third section contains the **Program Criteria** that must be satisfied by certain programs. The applicable Program Criteria are determined by the technical specialties indicated by the title of the program. Overlapping requirements need to 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 and program educational objectives. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome or objective 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 and program educational objectives 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 to be satisfied only once.

GENERAL CRITERIA

All programs seeking accreditation from the Computing Accreditation Commission of ABET must demonstrate that they satisfy all of the following 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 objectives. Students must have access to advice 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 ~~assure~~ 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 and effective process, involving program constituencies, for the periodic review and revision of these program educational objectives.

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 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 4. Continuous Improvement

The program must regularly use a appropriate, documented ~~and effective processes that uses relevant assessment data to~~ for evaluating the extent to which ~~its~~ both the program educational objectives and ~~it's~~ the student outcomes are being attained. The results of these evaluations must

~~be systematically used to effect~~ 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 factors appropriate to the discipline. 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 safe and 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, ~~financial resources,~~ and effective leadership must be adequate to ensure the quality and continuity of the program ~~throughout the period of accreditation.~~

The 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

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]

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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.

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3. Student Outcomes

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- (l) An ability to effectively integrate IT-based solutions into the user environment. [IT]
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 - 2. information assurance and security. [IT]
 - 3. system administration and maintenance. [IT]
 - 4. system integration and architecture. [IT]
- b. Advanced course work that builds on the fundamental course work to provide depth. [IT]