University of Puerto Rico at Bayamon

Student Outcomes and Performance Indicators Revision

Computer Science Program

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Introduction

Student outcomes and performance indicators changed based on the findings obtained from the previous cycle. This review is made based on the document named *Implementation of Recommendations* that compiles the findings and comments that arise from closing the previous assessment cycle. This document presents the SOs and their changes. Then, an alignment with ABET student outcomes is presented. Finally, this document presents what SOs contribute into strengthening the curriculum.

Student Outcomes and Performance Indicators Revision

Some Student Outcomes (SO) did undergo some changes but it was not significant. However, we performed an analysis in order to align them to the ones presented in the document ABET CAC 2020-2021 Criteria for Accrediting Computing Programs. Aligning our outcomes with those of ABET will make it easier when preparing the Self Study. However, there is one SO that has been adopted.

The following list presents each SO with their corresponding performance indicators.

a. An ability to apply knowledge of computing and mathematics appropriate to the discipline.

(a.1) Select the appropriate algorithm for a specific situation (Cog-Knowledge).

(a.2) Analyze the asymptotic running time of algorithms using big-O notation (Cog-Analysis)

(a.3) Apply mathematical concepts in the solution of a given problem (Cog-Application)

This outcome suffered no change.

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

(b.1) Analyze a problem (Cog-Analysis)

(b.2) Identify and define the computational requirements needed in a real situation (Cog-Synthesis).

(b.3) Choose the appropriate software and/or hardware tools to meet the desired goals (Cog-Evaluation).

This outcome suffered no change.

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

(c.1) Design solutions using pseudo code, diagrams or natural language (Cog-Synthesis).

(c.2) Implement an algorithm using the appropriate programming language (Cog-Application).

(c.3) Perform both unit and systems testing (Cog-Evaluation).

This outcome suffered no change.

d. An ability to function effectively on teams to accomplish a common goal.

(d.1) Evaluate a given problem within a team environment (Cog-Evaluation).

(d.2) Perform the duties assigned when working on a team (Affective-Responding).

This outcome suffered no change.

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

(e.1) Evaluate the ethical implications of an issue in the computing discipline.

(e.2) Evaluate the social impact of a given computing technology.

(e.3) Recognize the responsibilities inherent to the profession.

(e.4) Evaluate the consequences when breaking the law.

(e.5) Understand the vulnerabilities of a system to guarantee a high level of security of the data that needs to be secured.

The performance indicators for outcome e changed. Two additional performance indicators were added based on the analysis done from the previous cycle (e.4, e5).

Performance indicator (e.4) has been adopted as a recommendation from the External Advisory Board (EAB). This is not measured neither on the post-test, nor on the course, since no PI was available to measure it. However courses like COTI 4260 and COTI 3305 are covering it.

Students take the course COTI 4260 Intro. to Information Security however there is no place on the post-test to measure the security concepts covered on that course. There was no PI for that topic. We have added (e.5) in order to measure it.

f. An ability to communicate effectively with a range of audiences.

(f.1) Present different topics both orally and/or in writing (Affective-Responding).

(f.2) Explain technical concepts using the correct terminology (Affective-Valuing).

(f.3) Display knowledge of technical report writing skills (Cog-Knowledge)

This outcome suffered no change.

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

(g.1) Understand computational or technological advances and their impact on individuals, organizations and society. (Cog-Comprehension).

(g.2) Recognize the global and local impact of a given technology (Cog-Knowledge).

(g.3) Be aware of the state of the art in computing technology (Cog-Comprehension).

This outcome suffered no change.

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

This outcome suffered no change.

i. An ability to use current techniques, skills, and tools necessary for computing practices.

(i.1) Use hardware and software tools currently available (Cog-Application).

(i.2) Use current techniques and skills in the practice of the profession (Cog-Application).

This outcome suffered no change.

j. Apply computer science theory and software development fundamentals to produce computing-based solutions.

(j.1) Determine the most appropriate data structures needed to solve a given problem

(j.2) Appraise whether a given algorithm performed better than another.

(j.3) Determine the most appropriate programming paradigm needed to solve a problem

(j.4) Perform object oriented and structured analysis and design of software systems.

(j.5) Construct software systems of varying complexity.

This student outcome changed substantially. Student outcome (j) is the same student outcome (6) from ABET 2020 - 2021 CAC Criteria, however, we have realigned the performance indicators on this document. Notice that performance indicator (j.1) previously was (j.3), (j.2) was rephrased from (j.4), (j.3) is the same as in the previous cycle, (j.4) and (j.5) were (k.1) and (k.2) respectively.

Student Outcomes Alignment with ABET Student Outcomes

Outcomes are published in the department's assessment website[1] as well as in the University of Puerto Rico at Bayamon Website. We present this alignment by first stating the ABET student outcome (SO) and then the department's outcome with its corresponding performance indicators.

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

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

(b.1) Analyze a problem.

(b.2) Identify and define the computational requirements needed in a real situation.

(b.3) Choose the appropriate software and/or hardware tools to meet the desired goals.

Comments: The performance indicators of these outcomes are aligned with the nature of (1).

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.

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

(c.1) Design solutions using pseudo code, diagrams or natural language.

(c.2) Implement an algorithm using the appropriate programming language.

(c.3) Perform both unit and systems testing.

Comments: The performance indicators of these outcomes are aligned with the nature of (2).

3. Communicate effectively in a variety of professional contexts.

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

(f.1) Present different topics both orally and/or in writing.

(f.2) Explain technical concepts using the correct terminology.

(f.3) Display knowledge of technical report writing skills.

Comments: The performance indicators of these outcomes are aligned with the nature of (3).

4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

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[1] http://sici-acred.uprb.edu

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

(e.1) Evaluate the ethical implications of an issue in the computing discipline.

(e.2) Evaluate the social impact of a given computing technology.

(e.3) Recognize the responsibilities inherent to the profession.

(e.4) Evaluate the consequences when breaking the law.

(e.5) Understand the vulnerabilities of a system to guarantee a high level of security of the data that needs to be secured.

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

Comments: Outcomes (e) and (h) are aligned with (4).

5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

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

(d.1) Evaluate a given problem within a team environment.

(d.2) Perform the duties assigned when working on a team

Comments: It seems that (d) is aligned with (5) sufficiently.

6. Apply computer science theory and software development fundamentals to produce computing-based solutions. [CS]

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

(j.1) Determine the most appropriate data structures needed to solve a given problem

(j.2) Appraise whether a given algorithm performed better than another.

(j.3) Determine the most appropriate programming paradigm needed to solve a problem

(j.4) Perform object oriented and structured analysis and design of software systems.

(j.5) Construct software systems of varying complexity.

Comments: Student outcome (j) is the same student outcome (6) from ABET Criteria. The performance indicators of these outcomes are aligned with the nature of (6).

The following table summarizes the alignment discussed previously.

Student Outcomes (CS) alignment						
ABET	1	2	3	4	5	6

CS	b	c	f	e, h	d	j

Student Outcomes that impact Curriculum

Some of our student outcomes are not aligned directly with ABET outcomes. However these outcomes contribute to strengthening our curriculum. It is required that computing programs cover the nature of these outcomes. This is true since it is presented in the document titled CAC 2020-2021 Criteria for Accrediting Computing Programs (Criterion 5). These outcomes are:

(a) An ability to apply knowledge of computing and mathematics appropriate to the discipline.

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

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