Discussion on ABET Certification in Digital-Media Technology Program

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Abstract. ABET is a nonprofit, non-governmental organization that accredits college and university programs in the disciplines of applied science, computing, engineering, and engineering technology. It focuses on students, program educational objectives, student outcomes, continuous improvement, curriculum, faculty, facilities, institutional support etc. This paper discusses ABET certification in digital-media technology program.

Introduction

Engineering education program certification is a program certification organization which implements the program certification to engineering professional education in colleges and universities, by a profession or trade association (union), professional institute in conjunction with the field of education experts and relevant experts, industry enterprises to prepare into industry employment related engineering and technical personnel to provide education quality assurance. Engineering education program certification is internationally accepted engineering education quality guarantee system. It is the important foundation of engineering education and engineer's qualification international mutual recognition. The core of the engineering education program certification is to confirm that the engineering graduates meet the requirements of industry and the established quality standards, is a kind of training objectives and graduation export demand oriented qualified evaluation. Engineering education program certification requirements of professional curriculum setting, facilities, managerial condition configuration around the students graduated from the ability to achieve the core task, and to emphasize professional continuous improvement mechanism and culture in order to ensure the quality of professional education.

China has become a great nation of engineering education, but it will take some time to become the engineering education power needs by taking part in international program certification, with international standards, guide and the professional education standardize.

ABET (Accreditation Board for Engineering and Technology) was founded in 1932. ABET is a nonprofit, non-governmental organization that accredits college and university programs in the disciplines of applied science, computing, engineering, and engineering technology. It is internationally recognized as the most authority and universality of the certification system. So far, ABET accredits over 3,300 programs at more than 550 universities and 2500 colleges in 24 countries. ABET provides specialized, programmatic accreditation that evaluates an individual program of study, rather than evaluating an institution as a whole. The programs passing professional development certification means that its training system has one of the international communities. Quality of graduates and employment advantage will have greater improvement. All students major credits will be accepted by ABET sequence of colleges and universities in the period of validity.

ABET certification system focuses the subject, that each of the graduates are received a good education at school, including eight modules: students, program educational objectives, student outcomes, continuous improvement, curriculum, faculty, facilities, institutional support etc. This
certification is very emphasis on the people-oriented and student-centered. Authentication mainly examines all hardware and software associated with the students to ensure the realization of this goal.

In August 2014, the program chemical engineering and technology has passed the ABET certification in East China University of Science and Technology. Its first try provided valuable experience for domestic reform of higher engineering education. Tsinghua University has started the ABET certification at present.

ABET Certification in Program Digital-Media Technology Engineering

ABET certification standards include the quality of students, program educational objectives, student outcomes (a-k), continuous improvement, curriculum, faculty, facilities and institutional support. Program educational objectives, student outcomes (a-k) and training quality continuous improvement is the key factor that decides the success or failure of the certification.

Program Educational Objectives (PEO)

PEOs are broad statements describing the career and professional accomplishments that the Engineering Program is preparing graduates to achieve. Expected achievement of PEOs by graduates should occur 3-5 years after graduation.

Digital-media technology Engineering students shall acquire the education and skill set so that, upon graduation, they are prepared to achieve the following program educational objectives:

a) Identify, develop, and analyze realistic options for solving complex engineering challenges to create sustainable solutions.

b) Serve as leaders and contributing members in collaborative work environments.

c) Enhance the civil engineering profession by practicing in an ethical and responsible manner, engaging in lifelong learning, and earning professional licensure.

d) Engage stakeholders, such as public and private clients, government agencies, other design professionals, and the general public, by effectively communicating engineering perspectives and solutions.

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.

Program Curriculum

The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution.

The professional component must include:

a) One year of a combination of college level mathematics and basic sciences (some with experimental experience) is appropriate to the discipline. Basic sciences are defined as biological, chemical, and physical sciences.

b) One and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.

c) A general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.
Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.

One year is the lesser of 32 semester hours (or equivalent) or one-fourth of the total credits required for graduation.

The curriculum flowchart of “Digital-media technology program” is shown in Fig. 1.

Course Objectives

Course objectives are statements that specify what learners must know or be able to do as a result of a learning activity. Effective course objectives define the expectations of the instructor in terms of observable and measurable student behavior. There is a good method called “SMART” which means: Specific: Precisely states what the learner will be able to do. Measureable: Can be observed or assessed during or after the specified time. Action-Oriented: Includes an action verb that demonstrates a change in knowledge, behavior, or attitude. Reasonable: Reflects realistic expectations of knowledge, behavior, or attitude given time or scope. Time-bound: Specifies a time frame in which objectives will be achieved.

According to the above, Fig. 2 is the course objectives of “Foundation of Programming”:

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\text{Figure 1. Bachelor of DIGITAL-MEDIA TECHNOLOGY PROGRAM curriculum.}
\]
By the end of the semester, students will be able to:

a) Recognize 3 basic structures: sequence, select, loop
b) Explain the statement: if, switch, for, while etc.
c) Solve problems using 3 basic structures and their statements
d) Demonstrate program debugging skills
e) Define the concept of array
f) Practice array operations, such as insert/delete a element, array sort, find elements
g) Demonstrate on elementary ability to turn a complex problem into simple questions by top-down approach.

Figure 2. Course objectives of “Foundation of Programming (C language)”.

Rubrics

The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component must include:

A rubric is a type of scoring guide that assesses and articulates specific components and expectations for an assignment. Rubrics can be used for a variety of assignments: research papers, group projects, portfolios and presentations.

Rubrics help instructors: a) Assess assignments consistently from student-to-student; b) Save time in grading, both short-term and long-term; c) Give timely, effective feedback and promote student learning in a sustainable way; d) Clarify expectations and components of an assignment for both students and course TAs.

Rubrics help students: a) Understand expectations and components of an assignment; b) Become more aware of their learning process and progress; c) Improve their work based on timely and detailed feedback.

Rubric Development Guidelines: Choose an assignment or assessment for your course;

a) Outline the elements to be evaluated (these must be objectively measured)
b) Create a range for performance quality for each element
c) Add qualifications for each level of performance
d) Assign a numerical scale for each level

Here is a simple rubrics about for statement of Loop structure in “C programming” (in Table 1).

Table 1. Rubrics of “programming s=1+2+3+…+n”.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Variable definition (1points)</th>
<th>Input data (1points)</th>
<th>Loop (7points)</th>
<th>Output results (1points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 points</td>
<td>correct program frame declare 3 variables(sum, n, i) correct variables data type</td>
<td>correct input statement good data format</td>
<td>correct variables initial value good loop statement “for” correct loop body statements readability</td>
<td>correct output statement good data format</td>
</tr>
<tr>
<td>3 points</td>
<td>correct program frame declare 3 variables(sum, n, i) variables data type error</td>
<td>correct input statement bad data format</td>
<td>correct variables initial value bad loop statement correct loop body statements readability</td>
<td>correct output statement bad data format</td>
</tr>
<tr>
<td>Points</td>
<td>Correct Program Frame</td>
<td>Input Statement Error</td>
<td>Variables Initial Value Error</td>
<td>Correct Output Statement Error</td>
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<tr>
<td>2 points</td>
<td>correct program frame</td>
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<td></td>
<td>less variables declaration</td>
<td>input statement error</td>
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<td></td>
<td>variables data type errors</td>
<td>data format error</td>
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<td></td>
<td>variables initial value error</td>
<td>loop statement grammar error</td>
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<td></td>
<td>loop body error statements</td>
<td>correct loop body statements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 point</td>
<td>bad correct program frame</td>
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<tr>
<td></td>
<td>less variables declaration</td>
<td>input statement error</td>
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<td></td>
<td>variables data type errors</td>
<td>data format error</td>
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<td></td>
<td>no variables initial loop statement grammar error</td>
<td>loop body error difficult to read</td>
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<td>output statement error data format error</td>
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<tr>
<td>0 point</td>
<td>bad program frame</td>
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<td>no variables declaration</td>
<td>input statement error</td>
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<td>variables data type errors</td>
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<td>no output statement</td>
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Summary

The Program Integration

Engineering education program certification is for a program. At present domestic professional division is too thin, every segment of the program certification is almost impossible. So it is necessary to integrate the existing professional that is merging some relevant majors into a broader one. The existing major segments become research directions of the broad major. This will be conducive to engineering education program certification work.

Construct New Program by Engineering Education Accreditation Standard

In order to apply for certification, the program need at least 2 years of working with certification standards. Then we obtain lots of related support materials of program education. A longer period is needed for the program which has a big gap from ABET standards. Since ABET has been recognized as a standard of engineering professional education, the new major should be constructed according to the engineering education accreditation from the declaration, examination and approval to the teaching process.

References