



ABET, Inc.
111 Market Place, Suite 1050
Baltimore, MD 21202
Phone: 410-347-7700
Fax: 410-625-2238
www.abet.org
accreditation@abet.org

Applied Science Accreditation Commission
Computing Accreditation Commission
Engineering Accreditation Commission
Technology Accreditation Commission

December 24, 2008

John A. Orr
Provost, Provost's Office
Worcester Polytechnic Institute
100 Institute Road
Worcester MA 01609

Dear Dr. Orr :

A Draft Statement presenting the findings of the recent evaluation by the Computing Accreditation Commission of ABET is enclosed. Your institution is invited to submit a written response to this Draft Statement within thirty days following the receipt of this letter. Institutions are encouraged to submit their formal responses to the ABET Draft Statement electronically. Your response is particularly important if you believe any of the facts or observations presented in the Draft Statement are in error. Further, if the Draft Statement indicates that a program is considered to have weaknesses or deficiencies, you are encouraged to document any corrective actions that have been taken to remedy these shortcomings.

Please return the enclosed Acknowledgement of Receipt of Draft Statement to ABET Headquarters as quickly as possible. This form should indicate whether or not you intend to submit a written or electronic response to the enclosed Draft Statement.

Please limit any response to matters covered by the Draft Statement and affecting the potential accreditation of a program. If you agree with the assessment of the visiting team and wish to provide no response, please indicate this on the enclosed Acknowledgement of Receipt of Draft Statement.

It should be noted that a weakness or deficiency is considered to have been corrected only if the corrective action has been made effective during the academic year of the evaluation and is supported by official documentation. Where action has been initiated to correct a problem but has not yet taken full effect or where only indications of good intent are given, the effectiveness of the corrective action cannot always be presumed; in such cases, evaluation by the Commission at the time of the next evaluation may be required.

Your institution's response to the Draft Statement will be carefully reviewed by the Commission, and accreditation decisions will be determined by the Commission during its Summer Meeting in July. You should expect to receive official notification of accreditation actions together with the Final Statement during the period from mid-August to mid-September.

RECEIVED

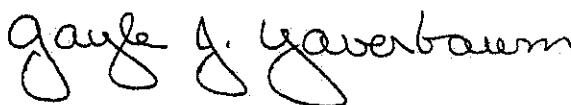
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Neither the presence nor absence of a stated, projected accreditation action in any program discussion commits the Commission to a particular final action. The official accreditation action for each program is taken by vote of the entire Commission at its Summer Meeting following consideration of the team's findings along with the institution's response to the Draft Statement.

The Commission considers all Draft Statements to be unofficial documents distributed only for review and comment. The enclosed Draft Statement does not represent the final official views of the Commission; therefore, it should be handled confidentially. Please limit release of this document in whole or in part only to persons involved in the preparation of your response to the Commission.

Instructions for distribution of your response to the Draft Statements are enclosed. If you elect to provide a response, your response must be provided within 30 days to the addressees indicated in these instructions.

Sincerely,

A handwritten signature in cursive script that reads "Gayle J. Yaverbaum".

Gayle J. Yaverbaum, Chair

Computing Accreditation Commission

Enclosure: Draft Statement
Acknowledgment of Receipt of Draft Statement
Instructions for Distribution of Response

cc: Harold Grossman, Computer Science Dept., Editor
Stuart H. Zweben, Chair, Team Chair
Dennis D. Berkey, President and CEO
Lance Schachterle, Assistant Provost for Academic Affairs

WORCESTER POLYTECHNIC INSTITUTE

DRAFT STATEMENT FOR REVIEW AND COMMENT

This is a confidential statement from the Computing Accreditation Commission to the Worcester Polytechnic Institute. It is intended for internal use only and is not for release except as allowed by policies of ABET, Inc.

I. INTRODUCTION

Worcester Polytechnic Institute (WPI), the nation's third oldest private technological university, was established in 1865. Located about 35 miles west of Boston, MA and comprising 18 academic departments, WPI offers more than 50 undergraduate and graduate degree programs. The institute enrolls more than 3,000 undergraduate students and nearly 1,000 graduate students and has 275 FTE faculty members. It offers a highly flexible curriculum, wherein the student is responsible for his or her own educational plan within a relatively small set of constraints.

WPI's current academic organization has each of its department chairs, including the Computer Science Department Chair, reporting directly to the provost. Under a proposed reorganization plan, the Computer Science Department Chair would report to a Dean of Arts & Sciences.

The following program at the Worcester Polytechnic Institute was evaluated during the 2008-09 cycle for possible accreditation under the New Criteria version of the CAC/ABET "Criteria for Accrediting Computing Programs" (*Criteria*) dated November 3, 2007 using the new *Criteria*:

- BS Degree in Computer Science, evaluated under the Computer Science Program Criteria (previously evaluated in the 2002-03 cycle and accredited at that time).

II. REPORT OF FINDINGS

The *Criteria* is composed of the General Criteria and Program Criteria. Each criterion provides the underlying principles that each program must meet. A program must meet both the General Criteria and all applicable Program Criteria to be accredited.

This section contains the report of the findings at the time of the visit. CAC considers the following comments to relate directly to its accreditation actions. This draft statement reflects any corrections of factual errors provided by the Worcester Polytechnic Institute within seven days of the visit. Information on corrective actions submitted after the visit will be considered during the evaluation of the institution's due process response to this draft statement, even if this information was submitted within seven days of the visit.

A program's accreditation action will be based upon the findings summarized in this statement. These findings will be updated as appropriate during the evaluation of the institution's due

process response. Actions will depend on the program's range of compliance or non-compliance with the criteria. This can be determined from the following terminology:

- **Deficiency:** A deficiency indicates that a criterion, policy, or procedure is not satisfied. Therefore, the program is not in compliance with the criteria.
- **Weakness:** A weakness indicates that a program lacks the strength of compliance with a criterion, policy, or procedure to ensure that the quality of the program will not be compromised. Therefore, remedial action is required to strengthen compliance with the criterion, policy, or procedure prior to the next evaluation.
- **Concern:** A concern indicates that a program currently satisfies a criterion, policy, or procedure; however, the potential exists for the situation to change such that the criterion, policy, or procedure may not be satisfied.
- **Observation:** An observation is a comment or suggestion that does not relate directly to the accreditation action but is offered to assist the institution in its continuing efforts to improve its programs.

Computer Science Program

The Computer Science Program is administered by the Computer Science Department, which also offers a Computers with Applications undergraduate program, and master's and doctoral programs in computer science. The department also jointly offers a program in interactive media and game development with the Department of Humanities and participates in a new program on Robotics Engineering with other engineering departments. The various programs are suitably differentiated in university publications.

The Computer Science Program had an enrollment of 246 students in academic year 2008-09. There are 22 full-time faculty members in the department.

Program Strength(s)

1. The Interactive Qualifying Project is a unique, significant element of the program requiring students to investigate the interaction of science, technology, and society. This includes interaction with students from other, non-technical disciplines and with other world cultures; several of the projects are performed outside the United States. This institutional requirement fosters an unusually strong enabling of several of the abilities in the Criterion 3 CAC outcomes.
2. The faculty in the computer science department appears to have a particularly high level of collegiality and a high level of commitment to undergraduate education. This camaraderie and commitment fosters collaborative activities and learning environments that enhance the experience of the students in the program. Students were particularly complimentary to the faculty's level of commitment to them.
3. The Major Qualifying Project not only provides a good capstone experience for the students, but it is taken seriously at an institutional level wherein it is regularly evaluated for its strengths and weaknesses. This extra level of care by the institution enables the students' experiences in the capstone projects to sustain a high level of rigor and better prepare students for the type of problems they may encounter upon graduation.
4. The program affords a high degree of application of the principles that are being learned. This application emphasis prepares the students well for subsequent employment, as was reinforced by alumni as well as current students who have had internships.

Status of Shortcomings from the Previous Review

1. At the time of the last visit, class sizes were quite large in a significant number of computer science courses, both in the lower and upper divisions. While enrollments in the program have since been declining, their impact on actual class sizes is not clear.

Status: This is no longer a concern.

2. The program technically requires only 9 semester hours of science. However, the institution has a number of unique characteristics and a strong advising system, which should have all students taking the equivalent of 12 semester hours of science. New wording of the program requirements, placed in the 2004-05 catalog, should ensure that all students have the equivalent of 12 hours of science. However, this needs to be monitored and the effectiveness of this new wording evaluated.

Status: This is no longer a concern.

3. New wording in the 2004-05 catalog, coupled with the institution's strong advising system, should ensure that, beyond the required six-hour science sequence, students take sufficient coursework in science or from courses that enhance the student's ability to apply the scientific method. However, the effectiveness of the new catalog requirements needs to be evaluated.

Status: The wording in the new criteria place different requirements on the science component of the curriculum. While there is no longer a concern with respect to the wording in the former criteria, there still is a concern with respect to the science requirement under the new criteria, as noted below.

Summary of Shortcomings from the Current Review

The program satisfies the General Criteria and the Computer Science Program Criteria with no shortcomings except as follows:

Program Weaknesses

1. Criterion 2, Program Educational Objectives. The criterion requires that the program have documented, measurable educational objectives based on the needs of the program's constituencies. Program educational objectives should describe the career and professional accomplishments that the program is preparing its graduates to achieve. While the program has documented sixteen statements that it calls educational objectives, many of the statements are not about expected career and professional accomplishments of its graduates, but rather read more like statements of program outcomes. This makes it difficult to determine what are the real expected career and professional accomplishments of graduates of the program.
2. Criterion 3, Program Outcomes. The criterion requires that the program have documented, measurable program outcomes based on the needs of its constituencies. Program outcomes should be statements about what the program is expecting all of its students to know or be able to do by the time of graduation. While the program has a set of 21 outcomes, five of them are stated in terms of what "a majority of students" or "almost all students" will be able to do. Another outcome is that students will participate in a class or project team. Such statements inhibit an understanding of the skills and knowledge that the program is expecting

of all students by the time of graduation. In addition, the statement of some of the outcomes in the catalog differs from that on the program's web site.

3. Criterion 4, Continuous Improvement. Two factors contribute to this weakness.
 - a. The criterion requires that the program use a documented process to evaluate the extent to which the program educational objectives and program outcomes are being met. The program does not appear to have threshold performance criteria against its program educational objectives or program outcomes. Though it does regular assessment, the lack of success criteria limits the ability of the assessment process to determine how well the educational objectives or outcomes are being met.
 - b. This criterion also requires that the results of the evaluations are used to effect continuous improvement of the program. While program improvements have been made, documented evidence showing that the program is using the data gathered as a result of the assessment process toward program improvements ("closing the loop") is limited. The lack of defined performance criteria also contributes to this limited evidence.
4. Criterion 9, Program Criteria. The criterion requires that the program's course work in computer science includes coverage of the fundamentals of algorithms, data structures, software design, concepts of programming languages and computer organization and architecture. Because of the unusually flexible manner in which program requirements can be met, a student may graduate without taking courses that cover several core computer organization and architecture topics that are expected in a computer science curriculum such as is exemplified in the curriculum recommendations of our professional societies. For example, storage systems, main memory organization and operation, cache memories, instruction pipelining, buses, RISC/CISC and SIMD/MIMD architectural concepts may not be included in the student's program of study. Indeed, some of the transcripts of recent graduates indicate that this was the case.

While less severe of a problem than the issues with the architecture area, the coverage of programming language concepts in courses required of all students appears to omit topics such as parameter types, static and dynamic binding, and language translation phases. Such topics normally would be expected to be covered in core subjects within this area.

Program Concern

1. Criterion 9, Program Criteria. The criterion requires that the program have a science component that provides some exposure to laboratory work. The program requires five science courses that can be taken from a broad range of disciplines including basic science and engineering science. While most of these choices include laboratory work, some do not. In particular, the introductory biology courses and some of the engineering science courses do not have laboratories. While we know of no student who graduated recently without having a laboratory experience in their science courses, the particular choice of courses appear to allow this possibility.

III. SUMMARY

The following is a summary of this evaluation for Worcester Polytechnic Institute during the 2008-09 cycle:

Computer Science Program

Weaknesses:

- Criterion 2, Program Educational Objectives. The way in which the program's educational objectives are phrased makes it difficult to determine what are the real expected career and professional accomplishments of graduates of the program.
- Criterion 3, Program Outcomes. The way in which several of the program outcomes are phrased, and the inconsistency between the statement of some of the outcomes in the catalog and the statement of the same outcomes on the web site, inhibit an understanding of the skills and knowledge that the program is expecting of all students by the time of graduation.
- Criterion 4, Continuous Improvement. The lack of threshold performance criteria against the program's educational objectives and outcomes limits the ability of the assessment process to determine how well the educational objectives or outcomes are being met. In addition, documented evidence showing that the program is using the data gathered as a result of the assessment toward program improvements is limited.
- Criterion 9, Program Criteria. Because of the unusually flexible manner in which program requirements can be met, a student may graduate without taking courses that cover several core computer organization and architecture topics.

Concern:

- Criterion 9, Program Criteria. The flexible choice of courses available to meet the program's science requirement may not guarantee that a student has exposure to laboratory work in fulfilling this requirement.

ABET
Computing Accreditation Commission
Instructions
for
Distribution of Response to Draft Statement

Please provide one copy of your response to each of the following addressees within 30 days:
(The 30 day Due Process response period starts with the signature date of the postal receipt card.)

Team Chair

Stuart H. Zweben
Chair
Ohio State University
395 Drees Lab
2015 Neil Avenue
Columbus OH 43210
zweben@cse.ohio-state.edu

Editor

Harold Grossman
Computer Science Dept.
Clemson University
212 McAdams Hall
Clemson SC 29634-0974
grossman@cs.clemson.edu

ABET Office

Computing Accreditation Commission
ABET, Inc.
111 Market Place, Suite 1050
Baltimore, MD 21202
Email: CAC@abet.org

Editor

Gayle J. Yaverbaum
Pennsylvania State University
3857 Laraby Drive
Harrisburg PA 17110
gjy1@psu.edu

