



Committee for the Evaluation of Computer Science Study Programs

Holon Institute of Technology
Department of Computer Science
Evaluation Report

April 2014

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Chapter 1: Background

The Council for Higher Education (CHE) decided to evaluate study programs in the field of Computer Science during the academic year of 2012-2013.

Following the decision of the CHE, the Minister of Education, who serves ex officio as Chairperson of the CHE, appointed a Committee consisting of:

- Prof. Maurice Herlihy - Computer Science Department, Brown University, USA - Committee Chair
- Prof. Robert L. Constable - Computer Science Department, Cornell University, USA¹
- Prof. David Dobkin - Department of Computer Science, Princeton University, USA²
- Prof. Sarit Kraus - Department of Computer Science, Bar Ilan University, Israel³
- Prof. Dmitry Feichtner-Kozlov - Department of Mathematics, Bremen University, Germany
- Prof. Joe Turner, Jr. - (Emeritus) - Department of Computer Science, Clemson University, USA - ABET Representative
- Prof. Moshe Vardi - Department of Computer Science, Rice University, USA

Ms. Maria Levinson-Or served as the Coordinator of the Committee on behalf of the CHE.

Within the framework of its activity, the Committee was requested to:⁴

1. Examine the self-evaluation reports, submitted by the institutions that provide study programs in Computer Science, and to conduct on-site visits at those institutions.

¹ In accordance with the CHE's policy, Prof. Robert L. Constable did not participate in the evaluation of the Computer Science department at Ben Gurion University to prevent the appearance of a conflict of interests.

² Due to scheduling constraints, Prof. David Dobkin did not participate in the site visits to the Jerusalem College of Technology, Hadassah Academic College, Ariel University, the Weizmann Institute of Science, The College of Management Academic Studies, and the Holon Institute of Technology.

³ In accordance with the CHE's policy, Prof. Sarit Kraus did not participate in the evaluation of the Computer Science department at Bar Ilan University to prevent the appearance of a conflict of interests.

⁴ The Committee's letter of appointment is attached as **Appendix 1**.

2. Submit to the CHE an individual report on each of the evaluated academic units and study programs, including the Committee's findings and recommendations.
3. Submit to the CHE a general report regarding the examined field of study within the Israeli system of higher education including recommendations for standards in the evaluated field of study.

The entire process was conducted in accordance with the CHE's Guidelines for Self-Evaluation of (October 2011).

Chapter 2: Committee Procedures

The Committee held its first meeting on May 21, 2013, during which it discussed fundamental issues concerning higher education in Israel, the quality assessment activity, as well as Computer Science Study programs in Israel.

In May - June 2013, the Committee held its first round of visits of evaluation, and visited the Hadassah Academic College, Jerusalem College of Technology, Ariel University, Tel Aviv University and Bar-Ilan University. During the visits, the Committee met with various stakeholders at the institutions, including management, faculty, staff, and students. In January 2014, the committee held its second round of visits of evaluation, and visited Ben-Gurion of the Negev, the Open University of Israel, the Interdisciplinary Center Herzliya, Tel-Aviv Yaffo Academic College, Netanya Academic College, the Weizmann Institute of Science, the College of Management Academic Studies, and the Holon Institute of Technology.

This report deals with the department of Computer Science at the Holon Institute of Technology. The Committee's visit to the Institute took place on January 16, 2014.

The schedule of the visit is attached as **Appendix 2**.

As part of the evaluation process, the committee appraised the compliance of Computer Science departments to the CHE standards for studies in Computer Science, set in 2008. The CHE standards are attached as **Appendix 3**.

The Committee thanks the management of Holon Institute of Technology and the Computer Science Department for their self-evaluation report and for their hospitality towards the committee during its visit at the institution.

Chapter 3: Evaluation of Computer Science Study Program at Holon Institute of Technology

This Report relates to the situation current at the time of the visit to the institution, and does not take account of any subsequent changes. The Report records the conclusions reached by the Evaluation Committee based on the documentation provided by the institution, information gained through interviews, discussion and observation as well as other information available to the Committee.

1. Executive Summary

Computer science is central to the Israeli economy and even to its security. Among winners of the Turing Award (generally considered as the “Nobel Prize” for computer scientists), Israel has more recipients than all but one other country.

Computer science students at Holon Institute of Technology feel well served by the school and the academic staff is committed to delivering the type of education that the college provides. While the committee found the teaching strength in mathematics laudable, the teaching of core computer science courses suffers from the lack of appropriate computer science faculty.

The dedication of the academic staff is remarkable. They are available for consultation and students feel comfortable calling with questions. The academic staff is involved with students and keep in contact even after graduation.

A critical issue that needs to be addressed is leadership and strategy of the computer science department. The department needs a strong, reputable leader from mainstream computer science.

There is a lack of clear standards for promotion. The committee found the promotion process is not transparent, and there are no appropriate guidelines for evaluating computer science faculty. This situation causes poor morale among the academic staff.

The number of the senior academic staff members in mainstream computer science is insufficient to sustain the department's educational mission. Moreover, the student-faculty ratio is above the CHE standard of 50:1⁵.

There are not enough teaching assistants and graders for computer science courses, creating an excessive grading burden for senior academic staff members.

We discussed only very briefly the pending application for a joint Masters program with Applied Mathematics and Computer Science. It is clear that the Institute is not yet ready for such a program because it does not have an adequate number of teaching staff.

Overall, the college did a good job addressing and implementing the previous committee's recommendations.

2. Organizational Structure

Observations and findings

The Faculty of Science does not have a mechanism to allocate resources such as teaching assistants, administrative and technical staff, and the like on a fair and transparent basis. Based on information provided to the committee, the current distribution does not appear to be fair and equitable.

There is insufficient representation of computer science academic staff in the appointments committee.

⁵ As stated in the CHE standards for studies in Computer Science, attached as Appendix 3.

Recommendations

Short term [~ within 1 year]:

- a) The Faculty of Science must make the basis for resource allocation fully transparent, and allocate resources across departments in a fair and equitable manner.
- b) The Faculty of Science must appoint representation from the computer science academic staff to the appointments committee.

3. Mission and Goals

Observations and findings

The institute went through a period of turmoil that has resulted in apprehension, uncertainty, and doubt among personnel at all levels. The institute lacks a strategic plan for moving forward.

Students feel well served by the department and the faculty are committed to delivering education suitable for employment in the high tech industry.

Recommendation

Short term [~ within 1 year]:

The institute, in consultation with the academic staff of the computer science department, and outside experts from computer science, must draw up a strategic plan.

4. Study Programs

Observation and findings

While the committee found the teaching strength in mathematics laudable, the teaching of core computer science courses suffers from the lack of appropriate computer science faculty.

The undergraduate study program is reasonable and comparable to the programs at other colleges, although somewhat inflexible. It is unclear the extent to which the curriculum designers were aware of internationally-accepted models such as the ACM / IEEE-CS curricula.

We discussed only very briefly the pending application for a joint Masters program with Applied Mathematics and Computer Science. It is clear that the Institute is not yet ready for such a program because it does not have an adequate number of teaching staff.

5. Human Resources / Faculty

Observations and findings

A critical issue that needs to be addressed is leadership and strategy of the computer science department. The department needs a strong, reputable leader from the core of computer science.

At every level of the HIT administration, the leaders were not able to articulate a clear vision for the department nor explain major events under the previous administration such as closing of both research labs in computer science. This left the committee with inadequate information to judge the commitment of HIT senior leadership to the Department of Computer Science and its mission, role, and standing in the institute.

This highly unusual situation may also explain the fact that the only research laboratories shown to the committee were in physics. It also led to a complete lack of data for the committee to judge whether resources are being allocated to the department commensurate with its contributions and value to the Institute.

There is a lack of clear standards for promotion. The committee found the promotion process is not transparent, and there are no appropriate subject-

specific guidelines for evaluating computer science faculty. There is no appropriate representation of computer science academic staff on promotion and appointment committees. This situation causes poor morale among the academic staff.

There is an insufficient number of the senior academic staff members in mainstream computer science to sustain the department's educational mission. Moreover, the student-faculty ratio is above the CHE standard of 50:1.

There are not enough teaching assistants and graders for computer science courses, creating an excessive grading burden for senior academic staff members.

Recommendations

Short term [~ within 1 year]:

- a) The Institute must hire an effective department leader from mainstream computer science.
- b) The Faculty of Science must review the academic staff for possible promotions and provide advice, clear procedures, and guidance for their timely advancement.
- c) The department must hire at least two more senior academic staff from mainstream computer science
- d) The department must bring the student-faculty ratio into compliance with the CHE standard of 50:1.
- e) The department must hire more teaching assistants to help the computer science academic staff.

6. Students

Observations and findings

The students who graduate the program appear to do well in the job market.

7. Teaching and Learning Outcomes

Observation and findings

The teaching and learning outcomes stated are appropriate, but no systematic effort has been made to determine whether they have been achieved.

The department should set in place a process to reflect on the attainment of outcomes in a planned, periodic manner.

Recommendation

Short term [~ within 1 year]:

The department should set in place a process to reflect on the attainment of outcomes in a planned, periodic manner.

8. Research

Observations and findings

The research level is appropriate for a college, but not yet strong enough to support a master's degree in computer science.

9. Infrastructure

Observations and findings

The infrastructure appears to be adequate.

10. Self-Evaluation Process

Observations and findings

The committee was impressed with the quality of the self-evaluation report and the response to the previous report.

Chapter 4: Summary of Recommendations and Timetable

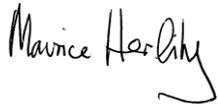
Short term [~ within 1 year]:

- 1) **Major Recommendation:** The Institute must hire an effective department leader from mainstream computer science.
- 2) **Major Recommendation:** The faculty of science must review the academic staff for possible promotions and provide advice, clear procedures, and guidance for their timely advancement.
- 3) The institute, in consultation with the academic staff of the computer science department, and outside experts from computer science, must draw up a strategic plan.
- 4) The department must hire more teaching assistants to help the computer science academic staff.
- 5) The department should set in place a process to reflect on the attainment of teaching and learning outcomes in a planned, periodic manner.
- 6) The Faculty of Science must make the basis for resource allocation fully transparent, and allocate resources across departments in a fair and equitable manner.
- 7) The Faculty of Science must appoint representation from the computer science academic staff to the appointments committee.

Intermediate term [~ within 2-4 years]:

- 1) **Major Recommendation:** The department must hire at least two more senior academic staff from mainstream computer science.
- 2) The department must bring the student-faculty ratio into compliance with the CHE standard of 50:1.

Signed by:



Prof. Maurice Herlihy
Committee Chair



Prof. Robert L. Constable



Prof. Dmitry Feichtner-Kozlov



Prof. Kraus Sarit



Prof. Joe Turner, Jr.



Prof. Moshe Vardi

Appendix 1: Letter of Appointment



הוועדה לתכנון ותקצוב | Planning & Budgeting Committee

12.5.2013
Jerusalem

Professor Maurice Herlihy
Computer Science Department
Brown University
USA

Dear Professor Herlihy,

The Israeli Council for Higher Education (CHE) strives to ensure the continuing excellence and quality of Israeli higher education through a systematic evaluation process. By engaging upon this mission, the CHE seeks to enhance and ensure the quality of academic studies, provide the public with information regarding the quality of study programs in institutions of higher education throughout Israel, as well as ensure the continued integration of the Israeli system of higher education in the international academic arena.

As part of this most important endeavor we reach out to world-renowned scientists to help us meet the critical challenges confronting Israeli higher education by extending our invitation to participate in an international evaluation committee. This process represents an opportunity to assess the current state of the field and plan for the future. This systematic process of quality assessment also establishes a framework for the interactive consultative process taking place between scientists around the globe regarding common academic dilemmas.

It is with great pleasure that I hereby appoint you to serve as chair of the Council for Higher Education's Committee for the Evaluation of Computer Science. The composition of the Committee will be as follows: Professor Maurice Herlihy, Committee Chair, Professor Moshe Vardi, Professor (Emeritus) Joe Turner Jr., Professor Robert L. Constable, Professor Sarit Kraus, Professor David Dobkin, and Professor Dmitry Feichtner-Kozlov.

Ms. Yael Herzstein will coordinate the Committee's activities.

In your capacity as Chair of the Evaluation Committee, you will be requested to function in accordance with the enclosed appendix.

I deeply appreciate your willingness to join us in this crucial enterprise.

I wish you much success in your role as the Chair of this most important committee.

Sincerely,


Dr. Avital Stein
Director General,
The Council for Higher Education

Enclosures: Appendix to the Appointment Letter of Evaluation Committees

cc: Ms. Michal Neumann, The Quality Assessment Division
Ms. Yael Herzstein, Committee Coordinator

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Appendix 2: Site Visit Schedule

Dept. of Computer Sciences –Schedule of Committee Visit
HIT-Holon Institute of Technology

Thursday, January 16, 2014 (conference hall, 2nd floor, building no. 3)

Time	Subject	Participants
09:00-09:30	Opening session with HIT President and Vice President for Academic Affairs.	Prof. Eduard Yakubov, Prof. Moti Frank
09:30-10:00	Meeting with Faculty Dean	Prof. Lev Rappoport
10:00-10:30	Meeting with the Head of the Department	Dr. Alex Spivak
10:30-11:15	Meeting with CS department senior academic staff	All senior members of the CS department: Dr. Eugen Mandrescu, Dr. Vladimir Nodelman, Dr. Bruria Haberman, Prof. Alex Bochman, Dr. Mark Trakhtenbrot, Dr. Jeremy Kaminsky, Dr. Mark Korenblit, Dr. Ayelet Butman, Dr. Yulia Kempner, Dr. Nisim Harel, Dr. Yair Weisman
11:15-12:00	Meeting with Junior academic staff *	Ms. Luisa Malaev, Mr. Ohad Gurfinkel, Mr. Moti Ruso.
12:00-12:45	Meeting with Adjunct academic staff *	Dr. Roman Finkelshtein, Dr. Tammy Izak English , Dr. Shmaria Toaff, Mr. Gay Ronen
12:45-13:30	Lunch (closed door meeting of the committee)	At the same room
13:30-14:15	Tour	Prof. Moti Frank, Dr. Alex Spivak, Dr. Mark Trakhtenbrot
14:15-15:00	Meeting with B.Sc. Students **	
15:00-15:45	Meeting with Alumni	
15:45-16:00	Closed door meeting of the Committee	
16:00-16:30	Summation meeting with heads of institution and Faculty	Prof. Eduard Yakubov, Prof. Moti Frank, Prof. Lev Rapoport, Dr. Alex Spivak, Dr. Mark Trakhtenbrot, Dr. Ayelet Butman

* The heads of the institution and academic unit or their representatives will not attend these meetings.

** The visit will be conducted in English with the exception of students who may speak in Hebrew and anyone else who feels unable to converse in English

Appendix 3: CHE standards for studies in computer science

CHE decision of 17.7.08 regarding standards for Computer Science Studies

Bachelor's Degree Programs

A. Graduates

1. In determining these criteria, the committee felt that it would be beneficial to define the "final product", or the ideal graduate of a Computer Science bachelor's degree program:
 2. A graduate has an in-depth understanding of Computer Science Theory, Computational Theory, Computational Mathematics, and staunch mathematical knowledge.
 3. A graduate has broad knowledge in Computer Science applications (programming languages, software engineering, operations systems and computer design).
 4. A graduate is capable of joining development teams in computer-related high-tech industries.
 5. A graduate is able to carry out computer-based industrial projects.
 6. A graduate is competent in applied analytics, and is capable of developing and integrating effective algorithms in software systems.
 7. A graduate has independent study skills and can prepare Computer Science presentations.
 8. A graduate is aware of the effects of computerization on individuals, organizations and on society, as well as its ethical, legislative and political ramifications.
 9. Excellent graduates are capable of continuing their studies in master's degree programs.
 10. To assure that their graduates attain these capabilities, bachelor's degree programs must adhere to the following criteria:
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B. Curricula

Programs must include required courses as well as an adequate selection of elective courses.

1. Required (core) courses should include:
 - Advanced-level mathematics courses, taught by experienced Ph.D.-level mathematics professors. These should include: Discrete Mathematics, Calculus, Algebra and Introduction to Probability.
 - Courses in Computer Science Theory, including: Automata Theory (or a similar subject), Data Structure, Algorithmic Theory and Computational Theory.
 - At least one seminar and one applications project that includes accepted industry development processes.
 - Applied Computer Science courses in Programming Languages, Software Engineering, Operating Systems, Computer Design and Logical Content.
2. The program should offer as many elective courses as possible in Computer Science and related fields (Economics, Management, Mathematics), as well as Humanities courses, to provide a well-rounded education.
3. The programs should encourage independent study.

C. Students, Teaching and Learning

1. Institutions must adhere to the CHE admissions regulation requiring a matriculation certificate.
 2. Students who matriculated in mathematics at a 3-unit level will not be admitted unless they complete (passing a final exam) a preparatory course at the 4 or 5-unit level.
 3. "Conditional" admissions should not comprise more than 10% of all admissions.
 4. Departments will present detailed support programs for weak students admitted on special terms.
 5. Departments will determine rigorous requirements for continuing studies, and coherent diploma eligibility guidelines.
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6. Departments will maintain adequate teaching assistant staff, and present detailed programs for providing students with feedback and appropriate laboratory experience.
7. At least 80% of required courses will be taught by full-time faculty.

D. Faculty

1. New programs will require at least six senior Ph.D.-level faculty members; three at the program's inception and an additional two to three before the program start its third "cycle" of admissions and as a condition for final/permanent accreditation.
2. Programs will not get final/permanent accreditation if they lack the requisite number of full-time faculty members to teach at least 80% of the required courses.
3. The student-to-faculty ratio will not exceed 50:1 at colleges and 25:1 at research universities.

D. Infrastructure

The institutions must provide adequate facilities for all programs and faculty research – laboratories, appropriate computers, adequate technical support, up-to-date libraries, fully equipped classrooms, secretarial staff and adequate, fully-equipped faculty office space.

Master's Degree Programs

A. Graduates - General

1. Demonstrates good Self Study Abilities.
2. Has depth and systematic understanding of knowledge in academic discipline.
3. Has comprehensive theoretical and applied knowledge in a wide range of Computer Science topics.

B. Graduates – Research-based Master's Degree

1. Able to undertake independent research and present outcomes in writing.
2. Able to use full range of learning resources relevant to the research topic.
3. Has depth and systematic understanding of knowledge in academic discipline.
4. Excellent graduates should be able to continue their studies toward doctoral degrees.

C. Non-Research Master's Degrees

These programs will be offered predominantly at colleges, while universities will offer non-research master's degree programs only to students who can not complete their research projects, or to excellent students whose research results permit continuing directly to doctoral degree programs.

Non-research master's degree programs "produce" graduates with a broad knowledge base and a high level of applications experience, who are increasingly in demand in today's complex computer science market.

The committee found that the grade average in master's degree programs (research and non-research) at all of the universities is exceedingly high. To solve this problem, the committee recommends that at least 50% of required courses in master's degree programs should be advanced graduate-level courses.

The Council for Higher Education approved detailed requirements for accreditation of non-research master's degree programs (the decision taken on July 15, 2003 is attached). All these in addition to the following criteria:

1. Programs should include a major (year-long) applications project.
2. Master's degree students will be required to submit a final paper and/or pass a qualifying exam, to cover all of the Computer Science subjects studied.
3. At least 70% of the required courses in master's degree programs will be advanced graduate-level courses.

D. Research-based Master's Degree Programs

The Council for Higher Education approved detailed requirements for accreditation of research-based master's degree programs at non-university institutions of higher education (the decision taken on October 10, 2004 is attached). All these in addition to the following criteria:

1. Research-based master's degree programs at academic institutions will not be approved unless the faculty includes, at colleges - at least ten full-time senior faculty members at Ph.D. level and involved in active research, and at universities, twenty faculty members with these qualifications.
2. Departments will establish academically acceptable approval procedures for research proposals, and follow-up and final approval procedures.
3. Thesis advisors will be Ph.D.-level faculty members at the rank of Lecturer at least.
4. The total number of advisees (master's and doctoral candidates) per faculty member will be limited to 5-7. Exceptional cases must be approved by special committee.
5. At least 70% of the required courses in master's degree programs will be advanced graduate-level courses.