



Department of Computer Science and Mathematics
Faculty of Natural Sciences, Ariel University
Response to the Evaluation Report of the Committee for the Evaluation of
Computer Science Study Programs
December 10, 2013

Chapter 3: Evaluation of Computer Science Study Program at Ariel University

1. Executive Summary

The committee is impressed by the dedication of the faculty to undergraduate education, as evidenced by the satisfaction and enthusiasm of the students and the alumni. The students like the collegial atmosphere and the social environment. The involvement of students in research and teaching is also very effective. These are valuable and fragile qualities and the university will have to work hard to maintain them, in the face of the challenges listed below.

Thank you.

The committee is convinced that the transition to a research university is making almost impossible demands on the department. The department is expected to act as a university research department with the resources of a college department. Many of the usual paths for raising funds are closed to the department due to political circumstances. We heard no plan to address this challenge at either the university or the department levels.

This year Dr. Eran Omri succeeded in receiving two Cryptography grants. It is worth mentioning that one of them has been approved by the Israel Science Foundation. With the kind matching received from the Ariel University, this achievement allowed us to establish the Cryptography Laboratory in the framework of the new University Cyber Security Center. In addition, the Department of Computer Science and Mathematics submitted 13 research proposals to the Israel Science Foundation:

- **Computer Science - 6: Prof. Vadim Levit (1); Dr. Lee-Ad Gottlieb (1); Dr. Gabriel Nivasch (2); Dr. Noam Hazon (1); Prof. Dana Shapira (1);**
- **Mathematics - 7: Prof. Alexander Domoshnitsky (1); Dr. Adi Jarden (1); Prof. Assous Frank (1); Dr. Ziv Shami (1); Dr. Gilbert Vainshtein (1); Dr. Svetlana Bunimovich (2).**

Moreover, Dr. Ofir Pele, Dr. Boaz Ben-Moshe, Dr. Dan Ofir, Mr. Roman Shklyar, and Prof. Vadim Levit submitted some more research proposals to various Computer Science oriented grant foundations.

A single department encompassing both mathematics and computer science is an anachronism: every other university in Israel and almost every university in the US has found that the two do not coexist well. Separating mathematics and computer science allows both to flourish in their own ways. Furthermore, there is a fundamental imbalance between the needs of the students, who seem to be overwhelmingly interested in CS, the structure of the program, and the composition of the faculty, which is largely mathematics.

It is necessary to split the current combined degree program into two separate programs, with a major in CS and a major in Math, followed by splitting the department.

The split of the current combined CS&Math degree program into two separate programs (Computer Science and Mathematics) is now being undertaken. The Ariel University Coordinating Committee has strongly supported the department splitting.

Academic staff growth should be in core CS to compensate for the current imbalance and for the current inability to cover core CS courses with senior faculty members.

As far as the situation current at the time of the committee visit to the Ariel University was concerned, only four Computer Science courses had not been covered by faculty members: “Operating Systems”, “Logical Programming”, “Programming Languages”, and “Communications and Computers”. Today’s situation is even better since:

- **Dr. Eran Omri teaches the “Programming Languages”;**
- **Dr. Noam Hazon teaches “Logical Programming”.**

In summary, there are only two uncovered by faculty members of the Department of Computer Science and Mathematics courses left:

- **“Operating Systems”;**
- **“Communications and Computers”.**

Despite the imperative to hire, the focus should be on outstanding quality, while recognizing that the process cannot be rushed.

We agree that new faculty members of the Department of Computer Science and Mathematics will be of outstanding quality only.

A systematic effort is needed to attract new faculty members. The university needs to have an incentive program for new faculty, such as reduced teaching hours, increased research support, or increased salary.

This year the teaching load of all the Computer Science faculty members will be reduced to 8 hours per week. Moreover, laboratory heads and new faculty members during their first academic year will get extra 2 hours per week discount. Further decrease of the teaching load will be a function of publication activities of the faculty members. The extra salary is supposed to be distributed in accordance with the rules and regulations of the Council for Higher Education.

2. Organizational Structure

Observations and findings

A single department encompassing both mathematics and computer science is an anachronism: every other university in Israel and almost every university in the US has found that the two do not coexist well. Separating mathematics and computer science allows both to flourish in their own ways.

We agree with the above recommendation.

There is a fundamental imbalance between the needs of the students, who seem to be overwhelmingly interested in CS, the structure of the program, which is 2/3 CS, and the composition of the faculty, which is 2/3 mathematics.

Our two new separated Computer Science and Mathematics programs will fix the above-mentioned imbalance.

The Self-Evaluation report describes a plan to turn the Math and CS department into a school of Computing Science encompassing Math, CS, and Science Teaching. The committee believes this plan is misguided as it will not be effective in addressing the real challenges of transitioning to a research university. First, mathematics and computer science flourish best independently. Second, building a credible program in science teaching will consume resources better directed to computer science.

We have agreed with the above recommendation. Our plan to turn the Department of Computer Science and Mathematics into a School of Computing Sciences has been canceled.

For the foreseeable future, most of the CS academic staff will be relatively inexperienced and will lack mature mentorship. The department would benefit from hiring a senior academic staff member in computer science to act as mentor and advisor to the younger academic staff.

Next academic year an associate professor in Computer Science Dana Shapira is joining the Department of Computer Science and Mathematics as a faculty member.

The alumni were unaware of any existing alumni relations program.

An alumni relations program will be established during this academic year.

Recommendations

Short term [~ within 1 year]:

- a. Within one year, the university must submit a proposal to CHE to split the degree program into two separate programs: a major in CS and a major in Math.

We agree with the above recommendation. The split of the current combined CS&Math degree program into two separate programs is now being undertaken:

- **The CS&Math Department committee responsible for the new Computer Science Program is comprised of Prof. Vadim Levit, Dr Eran Omri, and Dr. Boaz Ben-Moshe.**
- **The CS&Math Department committee responsible for the new Mathematics Program is comprised of Prof. Yuval Flicker, Dr. Adi Jarden, and Dr. Yuda Askenazi.**

- b. The university should develop an effective alumni relations program to keep regular contact with the alumni.

An alumni relations program will be established during this academic year.

Intermediate term [~ within 2-3 years]:

- a. The university must split the department into separate departments of CS and Math. This plan must be carried out within three years.

We agree with the recommendation to split the Department of Computer Science and Mathematics. The University Coordinating Committee has already decided in favor of the department splitting.

- b. The department should attempt to hire a senior academic staff member in computer science.

Next academic year an associate professor in Computer Science Dana Shapira is joining the Department of Computer Science and Mathematics as a faculty member.

3. Mission and Goals

Observation and findings

The committee is convinced that the transition to a research university is making almost impossible demands on the department. The department is expected to act as a university research department with the resources of a college department. Many of the usual paths for raising funds are closed to the department due to political circumstances. *We heard of no plan to address this challenge*, at either the university level, or the department level.

This year Dr. Eran Omri succeeded in receiving two Cryptography grants. It is worth mentioning that one of them has been approved by the Israel Science Foundation. With the matching kindly received from the Ariel University, this achievement allowed us to establish the Cryptography Laboratory in the framework of the new University Cyber Security Center. In addition, the Department of Computer Science and Mathematics submitted 13 research proposals to the Israel Science Foundation:

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- **Mathematics - 7: Prof. Alexander Domoshnitsky (1); Dr. Adi Jarden (1); Prof. Assous Frank (1); Dr. Ziv Shami (1); Dr. Gilbert Vainshtein (1); Dr. Svetlana Bunimovich (2).**

Moreover, Dr. Ofir Pele, Dr. Boaz Ben-Moshe, Dr. Dan Ofir, Mr. Roman Shklyar, and Prof. Vadim Levit submitted some more research proposals to various Computer Science oriented grant foundations.

Recommendation

Intermediate term [~ within 2-3 years]:

- a. The university must develop a ten-year plan to transition the department into a research-intensive department. This plan must be concrete and detailed and must address resource needs in academic and non-academic staff, space, and budget, and match them to available funding.

We agree with the above recommendation. A ten-year plan is now under construction.

4. **Study Programs**

Observation and findings

The undergraduate program is labeled as CS and Mathematics, but 2/3 of the hours are in CS. The students overwhelmingly are interested in CS. Nevertheless, the program has the following weaknesses as a CS program. The size of the mathematics component of the program limits the ability to provide a rich set of advanced CS courses. Many of the required math courses are not traditionally required by CS programs. These issues can be addressed by separating the program into distinct Math and CS programs.

All the mandatory mathematics courses that are not traditionally required by Computer Science programs will be removed from the new Computer Science program. It will allow us adding a rich family of elective Computer Science courses. Each student will take seven elective courses in order to get his/her B.Sc. degree.

In the judgment of this committee, the department is not ready to launch a CS master's program.

We will not launch a Computer Science M.Sc. program until most of the committee's recommendations are implemented.

In the committee's count, of the 10 academic staff listed in CS for 2013-14, only 7 are research-active computer scientists. These are too few to sustain a university-level undergraduate program.

The current list of our Computer Science faculty members reads as follows:

- **Senior research active faculty members holding Ph.D. in Computer Science:**
 1. **Vadim Levit** - Full Professor (Combinatorial Optimization)
 2. **Dana Shapira** - Associate Professor (Data Compression)
 3. **Boaz Ben-Moshe** - Senior Lecturer (Computational Geometry)
 4. **Dror Tobi** - Senior Lecturer (Bioinformatics)
 5. **David Tankus** - Lecturer (Graph Theory Algorithms)
 6. **Eran Omri** - Lecturer (Cryptography)
 7. **Lee-Ad Gottlieb** - Lecturer (Machine Learning)
 8. **Gabriel Nivasch** - Lecturer (Computational Geometry)
 9. **Mira Gonen** - Lecturer (Algorithms on Networks)
 10. **Ofir Pele** - Lecturer (Computer Vision)
 11. **Noam Hazon** - Lecturer (Artificial Intelligence)

- **Junior faculty members studying towards Ph.D. in Computer Science:**
12. Elizabeth Itskovich - Instructor (Efficient Algorithms)
- **Junior faculty members studying towards Ph.D. in Computational Sciences:**
13. Roman Shklyar - Instructor (Pattern Recognition)
- **In addition, we would like to mention some senior faculty members having Ph.D. in areas closely related to Computer Science:**
- 14. Dan Ophir - Senior Lecturer (Ph.D. in Applied Mathematics from the Weizmann Institute of Science; years after years he teaches only Computer Science courses and very successfully supervise students final projects in a very successful manner).
- 15. Roman Yavich - Lecturer (Ph.D. in Computerized Science Teaching; his rich teaching experience consists of only Computer Science courses; he successfully supervise students final projects as well).

The transition to a research university requires reduced teaching load for academic staff.

This year the teaching load of all the Computer Science faculty members will be reduced to 8 hours per week. Moreover, laboratory heads and new faculty members during their first academic year will get extra 2 hours per week discount. Further decrease of the teaching load will be a function of publication activities of the faculty members.

The department is currently unable to teach all core CS courses with regular academic staff. It is unacceptable to teach so many core computer science courses using part-time staff because it is difficult to guarantee the quality of part-time staff, or to guarantee that courses are taught in a consistent style from one year to the next.

This academic year we employ only two adjunct lecturers. When the committee visited the Ariel University, our faculty members had not covered only four Computer Science courses: “Operating Systems”, “Logical Programming”, “Programming Languages”, and “Communications and Computers”. Today’s situations is even better since:

- **Dr. Eran Omri teaches the “Programming Languages”;**
 - **Dr. Noam Hazon teaches “Logical Programming”.**
- In summary, there exist only two uncovered by faculty members of the Department of Computer Science and Mathematics courses left:**
- **“Operating Systems”;**
 - **“Communications and Computers”.**

Launching a master's program requires the development and teaching of many advanced courses, a task well beyond the current capacity of this department.

Recommendations

Intermediate term [~ within 2-3 years]:

- a. The department must not launch a CS Master's program until the organizational issues and staffing challenges have been addressed.

A Computer Science M.Sc. program will be launched only after implementing the committee's recommendations.

5. Human Resources / Faculty

Observation and findings

The department does not have enough research-grade CS academic staff to teach the CS courses needed for a program comparable with other Israeli research universities.

The current list of our Computer Science faculty members reads as follows:

- **Senior research active faculty members holding Ph.D. in Computer Science:**
 1. Vadim Levit - Full Professor (Combinatorial Optimization)
 2. Dana Shapira - Associate Professor (Data Compression)
 3. Boaz Ben-Moshe - Senior Lecturer (Computational Geometry)
 4. Dror Tobi - Senior Lecturer (Bioinformatics)
 5. David Tankus - Lecturer (Graph Theory Algorithms)
 6. Eran Omri - Lecturer (Cryptography)
 7. Lee-Ad Gottlieb - Lecturer (Machine Learning)
 8. Gabriel Nivasch - Lecturer (Computational Geometry)
 9. Mira Gonen - Lecturer (Algorithms on Networks)
 10. Ofir Pele - Lecturer (Computer Vision)
 11. Noam Hazon - Lecturer (Artificial Intelligence)
- **Junior faculty members studying towards Ph.D. in Computer Science:**
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15. Roman Yavich - Lecturer (Ph.D. in Computerized Science Teaching; his rich teaching experience consists of only Computer Science courses; he successfully supervise students final projects as well).

While mathematics and computer science remain together, the department needs to hire more core CS staff to compensate for the current imbalance between math and CS staff,

We agree with the recommendation to hire more core Computer Science staff.

and for the current inability to cover core CS courses with senior academic staff.

Let us remind you that the Department of Computer Science and Mathematics has only two adjunct lecturers, which teach only two Computer Science courses, i.e., the portion of mandatory courses taught by full-time Computer Science faculty is around 95%. Moreover, every member of our staff holding Ph.D. in Computer Science is capable to deliver almost all mandatory Computer Science courses belonging to the current program of studies.

Despite the imperative to hire, the department should focus on recruiting new CS academic staff of outstanding quality. Rushing the process risks the department's long-term quality. Good departments typically do not hire more than one or two new academic staff members per year.

We agree with the above claim.

While research universities in Israel manage their own personnel promotions, promotions to senior academic ranks in the colleges are managed by CHE. In the Committee's judgment, the Department does not yet have enough senior faculty in computer science, or the academic experience in computer science, to determine its own promotions to senior faculty ranks in computer science.

Next academic year an associate professor in Computer Science Dana Shapira is joining the Department of Computer Science and Mathematics as a faculty member.

Recommendations

Short term [~ within 1 year]:

- a. The CHE must ensure that there is proper oversight over computer science faculty promotions to senior ranks at Ariel University, until the university has sufficient senior faculty members in computer science, with the appropriate experience to make such judgments. This supervision must begin immediately.

If the Council for Higher Education decides to give us a hand in the process of faculty promotions, we will seriously consider its recommendations.

Intermediate term [~ within 2-3 years]:

- b. The department must hire more core, research-capable CS academic staff. In particular, once Computer Science and Math have split into two distinct departments, hiring must focus on core CS faculty.

We totally agree with the recommendation to focus on hiring more outstanding (in research, at least) core Computer Science staff.

6. Students

Observation and findings

The students and the alumni were enthusiastic about the education received in this department, although there were complaints about the math requirements. The students liked the collegial atmosphere and the social environment. The involvement of students in CS research and in teaching is also very effective.

Thank you.

Some of the students appear to have difficulties with English. This is a disadvantage for graduates in the high-tech industry and in graduate school.

Recommendation

Short term [~ within 1 year]:

- a. The department must take immediate steps to ensure that students have an adequate command of technical English.

Our new Computer Science program will include a technical English course.

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.

We will analyze learning outcomes as periodic and systematic as possible.

8. Research

Observation and findings

The committee was impressed by the research presented in the lab visit. Conducting empirical research in an emerging area is a good strategic choice for a new university, and the level of student involvement is both effective as education, and should help attract high-quality students.

Thank you for your encouragement. As an immediate influence of your support, we already have a number of research laboratories oriented on student involvement being on their way to the Department infrastructure.

As Ariel is now budgeted by the CHE as a university, the institution's management intends to significantly increase the resources granted to faculty for research purposes.

9. Infrastructure

Observation and findings

The equipment in the labs is outdated. The wireless network is inadequate. Given the ubiquity of personal mobile computers, the focus on desktop equipped labs is outdated and expensive.

We agree with your criticism.

Recommendations

Short term [~ within 1 year]:

- a. Within the next year, the college must set up a process where infrastructure needs are regularly reviewed and improvements are prioritized. The university should change the infrastructure to emphasize wireless networks, servers, and virtualization, technologies more effective, and cheaper in the long run, than the current equipment.

We agree with the above recommendation. The university should change the infrastructure. A one-year plan is now under construction.

10. Self-Evaluation Process

The committee was impressed with the quality of the self-evaluation report.

Thank you!

Chapter 4: Summary of Recommendations and Timetable Short term [~ within 1 year]:

1. Within one year, the university must submit a proposal to CHE to split the *degree program* into two separate programs: a major in CS and a major in Math.

The split of the current combined CS&Math degree program into two separate (Computer Science and Mathematics) programs is now being undertaken. The University Coordinating Committee has strongly supported the program splitting. All the mandatory mathematics courses that are not traditionally required by Computer Science programs will be removed from the new Computer Science program. It will allow us adding a rich family of elective Computer Science courses. Each student will take seven elective courses in order to get his/her B.Sc. degree.

2. The university should develop an effective alumni relations program to keep regular contact with the alumni.

An alumni relations program will be established during this academic year.

3. The CHE must ensure that there is proper oversight over computer science faculty promotions to senior ranks at Ariel University, until the university has sufficient senior faculty members in computer science, with the appropriate experience to make such judgments. This supervision must begin immediately.

If the Council for Higher Education decides to give us a hand in the process of faculty promotions, we will seriously consider its recommendations.

4. The department must take immediate steps to ensure that students have an adequate command of technical English.

Our new Computer Science program will include a technical English course.

5. Within the next year, the college must set up a process where infrastructure needs are regularly reviewed and improvements are prioritized. The university should change the infrastructure to emphasize wireless networks, servers, and virtualization, technologies more effective, and cheaper in the long run, than the current equipment.

We agree with the above recommendation. The university should change the infrastructure. A one-year plan is now under construction.

Intermediate term [~ within 2-3 years]:

6. The university must split the department into separate departments of CS and Math. This plan must be carried out within three years.

We agree with the recommendation to split the Department of Computer Science and Mathematics into two following departments:

- **The Computer Science Department;**
- **The Mathematics Department.**

The Ariel University Coordinating Committee has already decided in favor of the splitting, and that this task will be carried out not later than in three years.

7. The department should attempt to hire a senior academic staff member in computer science.

Next academic year an associate professor in Computer Science Dana Shapira is joining the Department of Computer Science and Mathematics as a faculty member.

8. The university must develop a ten-year plan to transition the department into a research-intensive department. This plan must be concrete and detailed and must address resource needs in academic and non-academic staff, space, and budget, and match them to available funding.

We agree with the above recommendation. A ten-year plan is now under construction.

9. The department must not launch a CS Master's program until the organizational issues and staffing challenges have been addressed.

A Computer Science M.Sc. program will be launched only after implementing the committee's recommendations.

10. The department must hire more core, research-capable CS academic staff. In particular, once Computer Science and Math have split into two distinct departments, hiring must focus on core CS faculty.

We agree that all new faculty members of the Department of Computer Science and Mathematics must be of outstanding quality only. Moreover, we overwhelmingly agree with the recommendation to focus on hiring more core



Computer Science staff, once the Department of Computer Science and Mathematics has been split into two following distinct departments:

- **The Department of Computer Science;**
- **The Mathematics Department.**

**Thank you,
Prof. Vadim Levit
Head of the department of Computer Science and Mathematics
Ariel University**