



**Committee for the Evaluation of Electrical and Communication
System Engineering
Study Programs**

**The Jerusalem College of Technology - Lev Academic Center
Programs in Electrical and Communication System Engineering
Evaluation Report**

November 2016

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Chapter 1: Background

The Council for Higher Education (CHE) decided to evaluate study programs in the field of Electrical and Communication System Engineering during the academic year of 2016.

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. Alan Oppenheim**- Department of Electrical Engineering and Computer Science – MIT, USA. Committee Chair.
- **Prof. Susan Conry** –Wallace H. Coulter School of Engineering Electrical & Computer Engineering - Clarkson University, USA.
- **Prof. Roch Guerin**- Department Chair and Professor of Computer Science & engineering Department- Washington University in St. Louis, USA.
- **Prof. Ehud Heyman**- School of Electrical Engineering - Department of Physical Electronics- Tel Aviv University, Israel.
- **Prof. Eby G. Friedman**-Electrical and Computer Engineering, Department of Electrical and Computer Engineering- University of Rochester, USA.
- **Prof. Mathukumalli Vidyasagar** - Chair in Systems Biology Science Erik Jonsson School of Engineering & Computer Science - The University of Texas at Dallas, USA.
- **Dr. Orly Yadid-Pecht** - iCORE/ATIF Strategic Chair in Integrated Sensors/Intelligent Systems, Professor and Lab Director - University of Calgary, Canada.
- **Prof. Dr.-Ing. Walter Kellermann**- Chair of Multimedia Communications and Signal Processing- University Erlangen-Nuremberg, Germany.

Ms. Daniella Sandler and Ms. Inbal Haskell-Gordon served as the Coordinators of the Committee on behalf of the CHE.

Within the framework of its activity, the Committee was requested to:¹

1. Examine the self-evaluation reports, submitted by the institutions that provide study programs in Electrical and Communication System Engineering, and to conduct on-site visits at those institutions.
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 September 2013).

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

Chapter 2: Committee Procedures

The Committee held its first meeting on January 6, 2016, during which it discussed fundamental issues concerning higher education in Israel, the quality assessment activity, as well as Electrical and Communication System Engineering Study programs in Israel.

In January 2016, the Committee held its visits of evaluation to 12 programs: Tel-Aviv University, the Technion, Bar-Ilan University, Ben-Gurion University, Shamoon College of Engineering, Ruppin Academic Center, Azrieli - College of Engineering Jerusalem, Lev Academic center, Ort Barude College, Holon Institute of Technology, Ariel University and Afeka College of Engineering. During the visits, the Committee met with various stakeholders at the institutions, including management, faculty, staff, and students.

This report deals with the programs of Electrical and Communication System Engineering Administration at the The Jerusalem College of Technology - Lev Academic Center. The Committee's visit to the University took place on January 11, 2016.

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

The Committee thanks the management of the The Jerusalem College of Technology - Lev Academic Center and the Department of Electronic Engineering for their self-evaluation report and for their hospitality towards the committee during its visit at the institution.

Chapter 3: Evaluation of Electronic Engineering

Study Programs at the Jerusalem College of Technology - Lev Academic Center

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

The Electronic Engineering Department at Jerusalem College of Technology (JCT)-Lev Academic College aims to enable its students to pursue a B.Sc. program while simultaneously carrying out Torah studies. The department has an ageing faculty and needs to induct young faculty on an urgent basis. JCT also needs to enhance its visibility to the Israeli hi-tech industry, most of which is located outside Jerusalem. The curriculum is too rigid and does not offer sufficient flexibility. More electives need to be added. The VLSI area needs to be strengthened. In addition, some desirable recommendations are also included.

2. Mission and Goals

Observations and findings

The mission statement of the institution, as quoted from the student handbook of JCT, is as follows: “To impart knowledge in all fields of science, technology, engineering, education, management, instruction, arts, trades, and all other academic fields of study, whether practical or theoretical, and to impart Jewish values with the purpose of enabling students, faculty and staff to become *bnei Torah* who work in advanced professions from which they can earn a living and who are imbued with Torah, and are inspired by the Torah, and are able to inspire those around them as well, in order to contribute to building our

country and our state, to shape it both spiritually and socially, and to shape its industrial and economic foundations.”

To quote from the self-evaluation report, “The department sees as its mission producing a well-rounded electronics engineer who understands engineering's past and present and is ready to an active participant in its future... Our graduates are ready to either continue their studies at a university or to start working as engineers.”

3. Organizational Structure

Observations and findings

JCT is headed by Prof. Menahem Steiner as Rector. Under him, there are several Schools, including the School of Engineering. The Department of Electrical Engineering is one of five departments within the School of Engineering, and the Head of the department is Prof. Yevgeni Frishman. In the 2007 review, the committee recommended that steps should be taken to reduce the administrative burden on the Department Chair. However, the present review committee did not explore this aspect, nor did the authorities of the JCT raise it.

4. Study Programs

Observations and findings

The Department of Electronics was founded in 1969, along with the rest of the JCT. Until 1977 the College functioned under Bar Ilan University, after which date JCT became an accredited institution. In 1980 the department was authorized to award a Bachelors of Technology and Applied Science degree. The B.Tech degree was upgraded to a B.Sc. degree in 2002.

The department offers just one specialization track, namely Electronic Engineering, although it did start a course of study in power systems and has

the intention to solicit funding for a lab targeted at educating licensed professional engineers in that area. There are two other programs at JCT with an “electrical” flavor, namely, Applied Physics (which specializes in electro-optics) and Computer Engineering. The previous review committee in 2007 had recommended combining all these three streams into one. However, this recommendation was not implemented.

The department offers only an undergraduate degree with relatively few elective courses. During the preceding four years, the department has averaged 40 graduating students per year; this number climbed steeply upward in 2011 from 19 in 2010 to 35 in 2011, and has climbed slightly ever since. Men and women are taught in different campuses.

At the time of the previous review, there was some comment about the fact that the entry requirements were not being strictly enforced. This led to some discontent among faculty members (according to that report). The drop-out rate from the program was also very high. In the interval since that review, the process of internal mentoring has been put into place, whereby students who find it difficult to cope with the Electronics track move to the Computer Engineering track (which was not under the scope of review by the present committee). In this manner, while the drop-out rate from EE might appear to be high, the drop-out rate from JCT as a whole is far lower, as students eventually find themselves in a track that best matches their aptitude.

Some students felt that it would be useful to start studies earlier in the day and maybe have more flexibility in how their studies are split across topics. Many students also asked for more electives, including additional programming classes.

Recommendations

Advisable:

- The committee is of the view that the curriculum is too rigid and does not offer enough flexibility. One way to do this without increasing the total course requirement is to move some of the core courses into the elective section, and adding more elective courses. The committee realizes that such a step would increase the total number of courses offered by the faculty, but this is an imperative for the graduates of JCT to remain contemporary.
- Given that VLSI is a significant part of the Israeli high technology industry, the committee recommends that the VLSI part of the curriculum must be strengthened, for example, by including chip design as a part of the curriculum.

5. Human Resources / Faculty

Observations and findings

The self-evaluation report does not list faculty members by departmental affiliation. Rather, faculty members are grouped by areas of expertise, with the same faculty member possibly being shown under multiple areas of expertise. The report states that there are eight faculty members with expertise in Electronics, which is the program under review. In addition, there are at least five Adjunct faculty.

During the previous review in 2007, the committee suggested that JCT must take steps to counter the ageing of the faculty. However, it does not appear as though any recruitment of full-time faculty has taken place since the time of the last review. As a result, the average of the full-time faculty, which was in the mid-forties at the time of the last review, is now in the mid-fifties. A somewhat troublesome anecdote was that of a former faculty who stayed for

5 years but eventually left for industry, as he could not make ends meet based on his faculty salary.

Recommendations

Essential:

- The average age of the 49 full-time faculty is above 55 years. Clearly, JCT is facing a challenge in recruiting young *full-time* faculty members. While there are some adjunct faculty who are much younger, full-time faculty would be required to maintain continuity in the program, be available to students at all times, and so on. Therefore, JCT must strive to recruit young full-time faculty. The committee recognizes that this is a challenge faced by *all* colleges.

Advisable:

- The Power Systems stream has been started with just one faculty member. This makes the situation very fragile, if this one faculty member were to become unavailable for whatever reason. Either more faculty members in this area must be recruited, or else the stream should be withdrawn and merged with another existing stream.

6. Students

Observations and findings

The student body at JCT contains a mixture of 18 year-olds (who are exempt from Army service) and 22 year-olds, with the majority being 22 years old. Some students from ultra-orthodox background enter the program without any prior formal instruction in mathematics or the physical sciences, and undergo a one-year remedial program. The authorities told the committee that the “success rate” of this remedial program was around 50%. However, this measures only those who succeed in remaining within the EE program, and does not include those who stay at JCT but move to another program that is better-suited to their aptitude. In particular, students mentioned that a

number of students who experienced difficulties switched to Industrial Management or Software Engineering.

Entrance requirements to the program are a matriculation diploma with four units of mathematics with a minimum grade of 80, or five units with a minimum grade of 70; four units of English with a minimum grade of 70, or five units with a minimum grade of 65; and a psychometric score in excess of 600. All candidates for admission undergo a personal interview. The authorities informed the committee that between 10% to 15% of the admitted students do not meet these criteria; however this is a reduction from the past. Students undertaking industrial projects provide both publicity to the outside world about JCT, and also feedback to the authorities at JCT about how contemporary their program is.

The better-performing students of JCT go on to higher studies at universities, or obtain jobs at leading companies. Few students go on to higher studies, as most already have several children by the time they graduate, and need a regular income. However, many students expressed interest in pursuing an MS degree, as it gives access to more positions.

One junior faculty member informed the committee that Intel insists on a minimum of 80% average from universities, and 90% from colleges, but will accept an 80% average from JCT. The committee is not in a position to verify this claim independently.

When asked about interactions with faculty, students felt that faculty were very approachable and willing to offer help. Help is also readily available when a large number of students in a class experience difficulties. In this case, the school allocates more hours from 4th years students to offer help. Students also felt that the school was responsive when students expressed concern with teaching quality.

Most students expressed great satisfaction with their education and felt that they can compete with any student graduating from other colleges and universities. However, they felt that the college's reputation outside of Jerusalem was not what it could be, and this often affected their chances in lining up good jobs. This is in part caused by the fact that top students from the college that go on to pursue advanced degrees, are then associated with their second institution rather than the college where they received their undergraduate education. It is, however, part of a more general visibility problem that the college needs to address.

Recommendations

Essential:

- In the view of the committee, the biggest challenge being faced by JCT is a lack of visibility. While it is well-known in the Jerusalem area, many of the high technology jobs in Israel are in other locations, where JCT is not well-known. This seriously limits the job prospects of JCT graduates, and in turn, lessens the attractiveness of JCT for future students. The committee is not in a position to suggest specific steps; however, the administration *must* address the issue of lack of visibility.

7. Teaching and Learning Outcomes

Observations and findings

Because the students have to balance their studies of engineering subjects with Torah studies, the courses are offered only after mid-morning.

Some of the better students graduating from JCT manage to pursue higher studies at universities. Therefore the fact of their having done their undergraduate degree at JCT was not a handicap (according to the students who met with the committee). However, many of the students conceded that JCT was not well known outside Jerusalem, where most of the Israeli hi-tech

industry is located. Several of them mentioned that while students with high grade point averages were able to get jobs reasonably quickly, those with lower grades faced significant difficulties, especially when seeking hardware-oriented jobs. As a result, many of them ended opting for programming jobs. Some students mentioned that it would be beneficial to improve students' English proficiency. They pointed to the fact that this is important in most jobs.

Recommendations

Essential:

- As mentioned in the previous section, it is critical for the college to better advertise the quality of its graduates in companies outside the Jerusalem area.

Desirable:

- Improving the level of professional English proficiency would likely help students find jobs more easily.

8. Research

Observations and findings

In its own assessment, JCT views itself as being among the best within the college (not university) system in terms of pursuing research. Some of the faculty have published research papers in high-quality journals such as several IEEE Transactions, Automatica etc. The department has received several grants during the previous five years from a variety of sources. However a quantum of support is not readily available to adequately facilitate research. The very high teaching load limits the ability of faculty to carry out research. Also, according to JCT's authorities, the new rules on what constitutes a "full-time" faculty member would require a faculty to spend 32 hours per week of "student-facing time," thus making research impossible. The committee cannot judge the validity of this latter comment.

Recommendations

Advisable:

- Given that JCT is a college and not a university, the emphasis given to research during the promotion process should be reduced, or at least applied in a manner that accounts for the teaching mission of the colleges and the need for a different type of research that supports teaching activities. The committee appreciates that, among the colleges, JCT is doing a very good job when it comes to both promoting research and actually carrying it out. Nevertheless, the committee believes that promotion criteria at JCT must place less emphasis on research. This issue is expanded upon further in the General Report.
- Along similar lines, JCT's administration must make it easier for faculty members to keep themselves up to date by attending conferences in their domains of specialization. Israel is fortunate that a very large number of high-quality conferences are held every year, and travel distances are short. Therefore the JCT administration must set aside adequate funds and release time to enable faculty to take part in scientific meetings.

9. Infrastructure

Observations and findings

In general, the infrastructure is adequate to good. However, in the area of VLSI, the infrastructure could use some improvement.

10. Response to Recommendations of Previous Review

Observations and findings

In paraphrase, the previous review committee made the following recommendations after its review during 2007:

- Combine the three "electrical" options, namely Electronic Engineering, Applied Physics which specializes in Electro-Optics, and Computer Engineering, into a single program.

- Raise the admission thresholds, and end the practice of admitting students who do not meet the admission criteria.
- Reduce the work burden on the Chairman of the department
- Take steps to counter the ageing of the faculty
- Encourage faculty to undertake research, if necessary by permitting the “buying out” of teaching from research grants.

The committee asked the various stakeholders it met for their impressions of how these recommendations were implemented. Here is a summary of the committee's findings:

- The three programs in Electronic Engineering, Electro-Optics and Computer Engineering have not been merged, nor is there any intention to do so. The committee was informed that it is not any more difficult to run three different streams than it is to run one large program, and may in fact be easier. The committee felt that, as only the EE program was under review by both the present as well as the previous committee, it could not go beyond stating that students in EE should be able to take courses from the other streams. This point is indirectly covered in the recommendations under “electives.”
- The JCT authorities informed us that the admission thresholds have indeed been raised. Given the unique situation of their students, who come into the program without any formal training in quantitative science subjects and then undergo a one-year remedial course, they argued that some amount of leeway is essential. They also pointed out that students who are not able to cope with the rigorous demands of the EE program are often transferred into the CS program. Therefore the “dropout rate” from the School of Engineering as a whole is far lower than the dropout rate from the EE program, because the students are moved into a program that is

more in-keeping with their abilities.

- The matter of reducing the load of the Chairman did not directly come up during the committee's discussions or during deliberations.
- The issue of ageing faculty remains as thorny as ever, if not more. There has not been any recruitment of young faculty members since the last review, with the result that the average age of the faculty now is roughly ten years higher than it was in 2007.
- The university authorities have been encouraging faculty members to undertake research, and have made it an important consideration for career advancement. As discussed in the Recommendations, this can conflict with the college's focus on teaching and the correspondingly high teaching load. A more balanced approach that better accounts for the college's teaching mission is needed. This aspect is expanded upon in the General Report.

Chapter 4: Summary of Recommendations

The overall impression of the committee was that the authorities in charge of planning and implementing the program at JCT are very clear about the role of JCT, the challenges in balancing Torah studies and engineering education, and the role of research in a college. Nevertheless, there is room for improvement in some areas, and this section documents some of these.

Essential Recommendations

- In the view of the committee, the biggest challenge being faced by JCT is a lack of visibility. While it is well-known in the Jerusalem area, many of the high technology jobs in Israel are in other locations, where JCT is not well-known. This seriously limits the job prospects of JCT graduates, and in turn, lessens the attractiveness of JCT for future students. The committee is not in a position to suggest specific steps; however, the administration *must* address the issue of lack of visibility.
- The average age of the 49 full-time faculty is above 55 years. Clearly JCT is facing a challenge in recruiting young *full-time* faculty members. While there are some adjunct faculty who are much younger, full-time faculty would be required to maintain continuity in the program, be available to students at all times, and so on. Therefore JCT must strive to recruit young full-time faculty. The committee recognizes that this is a challenge faced by *all* colleges.

Advisable Recommendations

- The committee is of the view that the curriculum is too rigid and does not offer enough flexibility. One way to do this without increasing the total course requirement is to move some of the core courses into the elective section, and adding more elective courses. The committee realizes that such a step would increase the total number of courses offered by the faculty, but this is an imperative for the graduates of JCT to remain contemporary.
- Given that VLSI is a significant part of the Israeli high technology industry, the

committee recommends that the VLSI part of the curriculum must be strengthened, for example, by including chip design as a part of the curriculum.

- Along similar lines, JCT administration must make it easier for faculty members to keep themselves up to date by attending conferences in their domains of specialization. Israel is fortunate that a very large number of high-quality conferences are held every year, and travel distances are short. Therefore the JCT administration must set aside adequate funds and release time to enable faculty to take part in scientific meetings.
- The Power Systems stream has been started with just one faculty member. This makes the situation very fragile, if this one faculty member were to become unavailable for whatever reason. Either more faculty members in this area must be recruited, or else the stream should be withdrawn and merged with another existing stream.
- Given that JCT is a college and not a university, the amount of emphasis given to research given during the promotion process should be reduced. The committee appreciates that, among the colleges, JCT is among the best in terms of both promoting research and actually carrying it out. Nevertheless, the committee believes that the criteria at JCT must place less emphasis on research.

Desirable Recommendations

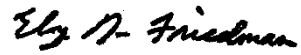
- The students who enter JCT are not always clear about the various tracks being offered, the future prospects for employment in each track, etc. The committee recommends that the process of advising students should be improved so that each student can choose a track that best suits his/her aptitude and aspirations.
- The lack of facility with the English language was mentioned as one of the factors that limits the employability of JCT graduates. The administration should explore methods for enabling students to improve their English.

- The new rules introduced by the Israeli government for determining who is a “full-time” faculty member will adversely affect JCT. According to JCT officials, under the new rules each faculty member would have to spend 32 hours per week of “face time” in order to qualify as full-time. If this is indeed so, then greater flexibility must be shown in this regard.

Signed by:



Prof. Alan Oppenheim - Chair



Prof. Eby G. Friedman



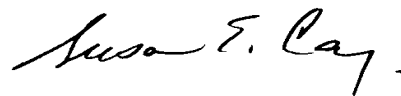
Prof. Ehud Heyman



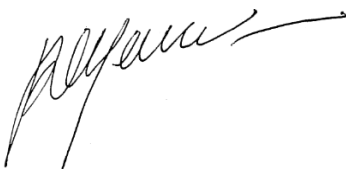
Dr. Orly Yadid-Pecht



Prof. Mathukumalli Vidyasagar



Prof. Susan Conry



Prof. Roch Guerin



Prof. Dr.-Ing. Walter Kellermann

Appendix 1: Letter of Appointment



December 2015

Prof. Alan Oppenheim
Department of Electrical Engineering and Computer Science
MIT
USA

Dear Professor, *Al*

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, to provide the public with information regarding the quality of study programs in institutions of higher education throughout Israel, and to ensure the continued integration of the Israeli system of higher education in the international academic arena.

As part of this important endeavor we reach out to world renowned academicians to help us meet the challenges that confront the Israeli higher education by accepting our invitation to participate in our international evaluation committees. This process establishes a structure for an ongoing consultative process around the globe on common academic dilemmas and prospects.

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

It is with great pleasure that I hereby appoint you to serve as the Chair of the Council for Higher Education's Committee for the Evaluation of the study programs in **Electrical and Communication System Engineering**. In addition to yourself, the composition of the Committee will be as follows: Prof. Susan Conry, Prof. Roch Guerin, Prof. Ehud Heyman, Prof. Mathukumalli Vidyasagar, Dr. Orly Yadid-Pecht, Prof. Eby Gershon Friedman, Prof. Dr.-Ing Walter Kellermann.

Ms. Daniella Sandler and Ms. Inbal Haskell-Gordon will be the coordinators of the Committee.

Details regarding the operation of the committee and its mandate are provided in the enclosed appendix.

I wish you much success in your role as a member of this most important committee.

Sincerely,

Hagit Messer
Prof. Hagit Messer-Yaron
Vice Chair,
The Council for Higher Education (CHE)

Enclosures: Appendix to the Appointment Letter of Evaluation Committees

cc: Dr. Varda Ben-Shaul, Deputy Director-General for QA, CHE
Ms. Daniella Sandler, committee coordinator
Ms. Inbal Haskell-Gordon, committee coordinator

Appendix 2: Site Visit Schedule

Electrical and Electronics Engineering - Tentative schedule of site visit

Lev Academic Center

Monday 11/1/16

Time	Subject	Participants
9:30-10:15	Opening session with the heads of the institution and the senior staff member appointed to deal with quality assessment	Prof. Kenneth Hochberg- Rector Prof. Shlomo Engelberg - Head of the School of Engineering Dr. Menashe Puterkovsky – Head of the Teaching Center
10:15-11:00	Meeting with the academic and administrative heads of the Program of Electrical and Electronic Engineering	Prof. Shlomo Engelberg - Head of the School of Engineering Dr. Evgeni Frishman- Head of the Program of Electrical and Electronic Engineering
11:00-11:45	Meeting with Junior academic staff *	Mr. Macelo David, Mr.Yosef Golovachiov, Mr. Boris Dechovich, Mr. Natan Shteinmetz
11:45-12:00	Break	
12:00-12:45	Meeting with B.Sc. / M.Sc. students	
12:45-13:35	Lunch (in the same room)	Closed-door working meeting of the committee
13:35-14:20	Tour of campus (classes, library, offices of faculty members, computer labs etc.)	
14:20-14:50	Final Project Presentation	
14:50-15:35	Meeting with senior academic staff	Prof. Shlomo Engelberg, Prof. Michael Bank, Dr. Avi Silbiger, Dr. Shimon Mizrahi, Mr. Benyamin Goldberg
15:35-16:10	Meeting with Alumni	
16:10-16:20	Break	
16:20-16:55	Meeting with adjunct lecturers	Prof. Pinchas Mendelbaum, Prof. David Kamon; Dr. Dan Weinstock, Eng. David Gelman,
16:55-17:25	Closed Door Meeting	
17:25-18:00	Summation meeting	Prof. Kenneth Hochberg- Rector Prof. Shlomo Engelberg - Head of the School of Engineering

		Dr. Evgeni Frishman- Head of the Program of Electrical and Electronic Engineering Dr. Menashe Puterkovsky – Head of the Teaching Center
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