



MECHANICAL ENGINEERING - GENERAL EVALUATION REPORT

COMMITTEE FOR THE EVALUATION OF MECHANICAL
ENGINEERING STUDY PROGRAMS IN ISRAEL

JUNE 25, 2018

Section 1: Background and Procedures

1.1 In the academic year 2017-18 the Council for Higher Education [CHE] put in place arrangements for the evaluation of study programmes in the field of Mechanical Engineering [ME] in Israel.

1.2 The Higher Education Institutions [HEIs] participating in the evaluation process were:

- Afeka Academic College of Engineering
- Ariel University
- Ben-Gurion University
- Ort Braude Academic College of Engineering
- Shamon Academic College of Engineering
- Technion – Israel Institute of Technology
- Tel Aviv University

1.3 To undertake the evaluation, the Vice Chair of the CHE appointed a Committee consisting of:¹

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| • Prof. David Norris, Committee Chair | ETH Zurich, Switzerland |
| • Prof. Leslie Banks-Sills ² | Tel Aviv University, Israel |
| • Prof. Patricia Brackin | Rose-Hulman Institute of Technology, USA (ABET representative) |
| • Prof. David Clarke | Harvard, USA |
| • Prof. Kon-Well Wang | University of Michigan, USA |
| • Prof. William Wepfer | Georgia Tech, USA |

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

1.4 The evaluation process was conducted in accordance with the CHE's Guidelines for Self-Evaluation (June 2017). Within this framework the evaluation committee was required to:

- examine the self-evaluation reports submitted by the institutions that provide study programs in ME
- conduct on-site visits at those institutions participating in the evaluation process
- submit to the CHE an individual report on each of the academic units and study programs participating in the evaluation
- set out the Committee's findings and recommendations for each study programme
- submit to the CHE a general report regarding the evaluated field of study within the Israeli system of higher education including recommendations for standards in the evaluated field of study

1.5 The evaluation committee examined only the evidence provided by each participating institution — considering this alongside the distinctive mission set

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

²Prof. Banks-Sills did not participate in the visit to Tel Aviv University or in the panel's discussions concerning the evaluation of this institution.

out by each institution in terms of its own aims and objectives. This material was further elaborated and explained in discussions with senior management, lecturers, students, and alumni during the course of each one-day visit to each of the institutions.³

- 1.6** A separate meeting was convened between the Committee and seven of the eight Department Heads of the ME programs under evaluation. This served to contextualize the Committee's discussions and to identify common issues between the departments.
- 1.7** The Committee also met with the Chair of the Association of Mechanical and Aerospace Engineering. This assisted the Committee to better understand the perspective and needs of ME-related industry in Israel.
- 1.8** In undertaking this work, the Committee considered matters of both quality assurance and quality enhancement — applying its collective knowledge of developments and good practices in the delivery of higher education in ME (mainly from the USA and from European countries) to the evaluation of such provision in Israel.

Section 2: International Context

- 2.1** The eight ME departments that were reviewed in this QA process are geographically distributed, with distinct missions and student experiences. Taken together, the programs provide a healthy range of opportunities for ME studies in Israel. The graduates of these programs are in demand by Israeli industry.
- 2.2** During the course of this evaluation, many issues were identified in Israeli Higher Education and ME. Some of these issues are also present in other countries.
- 2.3** During this QA process the Committee distinguished between threshold and excellent performance. Its overall conclusion was that the majority of the provision for ME HEIs in Israel was meeting the minimum threshold standard. Beyond this, the Committee was further encouraged by evidence of excellence in some areas. This report, therefore, focuses on those adjustments and refinements that will further encourage excellence. The goal is for Israel to realize its potential to be a global leader in the areas covered by this evaluation.

Section 3: Quality Enhancement

- 3.1** The purpose of this section of the report is to identify areas where continuous enhancement of various elements in the HEIs provision is important for promoting excellence and essential where the minimum threshold may not have been met.
- 3.2 Ongoing Institutional/Departmental QA and Evaluation Process**
 - 3.2.1** Although some institutions/departments were more self-critical and introspective than others during the QA process (as noted in the individual

³The Committee's evaluation of the ME Faculty at the Technion was based on a half-day visit due to their own internal evaluation process (with international evaluation committee) performed in 2016.

reports), the evaluated programs overall have responded to the CHE request with serious efforts to analyze and improve their programs.

3.2.2 Because the Technion follows its own internal self-assessment process, which involves an international review panel, the current evaluation primarily focused on whether this internal process is adequate for the department's QA needs. The Committee affirmed this process and concluded that in the future CHE should evaluate the reports generated by the Technion's internal process. It was felt that a second evaluation committee for the Technion ME program is not needed.

3.2.3 Due to the importance of ongoing self-evaluation and QA of departments and study programs, the institution should play a critical role in taking ownership of its own evaluation process. In this respect, the Committee recommends that institutions move towards internal QA processes (similar to those performed at the Technion), rather than depending on CHE to evaluate performance.

3.3 Conflict within Colleges in Israeli Higher Education

3.3.1 As the CHE is aware, an inherent contradiction exists for faculty at engineering colleges. While promotions are largely dependent on research output, faculty receive limited research funding and teach heavy loads. These two factors restrict their ability to perform research.

3.3.2 Because this situation occurs due to constraints that CHE has defined, the Committee urges the CHE to resolve this issue with a clear policy decision.

3.3.3 The Committee does not believe that the solution is to increase research funding for colleges or expand their graduate programs. Rather, the CHE should consider implementing a parallel track for the faculty hierarchy at colleges, *e.g.* teaching lecturer, teaching senior lecturer, teaching professor, or some equivalent names. This track should value primarily teaching.

Section 4: Quality Assurance

4.1 The purpose of this section of the report is to describe key areas where issues have been identified in the respective programs during the CHE quality assurance process.

4.2 M.Sc. with Thesis Programs

The Committee strongly recommends that no additional M.Sc. programs in Mechanical Engineering should be approved at the present time. Rather, the issue with colleges (Section 3.3) should first be resolved as it is driving growth in ME graduate programs. In addition, it was not clear whether additional ME programs are required in Israel as the existing ME graduate programs are not operating at full capacity.

4.3 Shortage of ME Faculty in Israel

The Committee concluded that a shortage of faculty exists country wide in ME. This is critical as the industrial need for ME graduates in Israel remains strong. The underlying reasons for this shortage differ at universities and colleges. Universities struggle to hire due to an increasingly competitive international marketplace for top academic talent in engineering. Colleges struggle to recruit academics into environments that require research output but do not provide research support. The Committee notes that to address this issue, Israeli HEIs have already become extremely proactive in identifying potential talent. For example, many programs track potential hires that are Israeli/Jewish while they are abroad and then encourage them to return. Consequently, additional mechanisms may be needed, including: (1) enhanced salary measures for specific high-caliber hires, (2) easier integration of foreign talent in Israel, and (3) ME programs with more teaching in English. These mechanisms could also help with the international reputation/ranking of Israeli ME programs through increased internationalization. In any event, the Committee strongly urges CHE/PBC to help bolster ME hiring efforts in Israeli HEIs.

4.4 Communication and Cooperation between ME Departments

The Committee held a joint meeting with 7 of the 8 Department Heads of the ME programs under evaluation. It was surprising that very little communication currently exists between Department Heads. The Committee strongly urges these Heads to meet periodically, perhaps with representatives from industry, to discuss Israel-wide issues for the discipline of ME. In particular, the Committee felt that such meetings could help coordinate efforts related to curriculum development, hiring, and industrial relations.

4.5 Curriculum

The Committee concluded that the evaluated ME programs have made significant progress in going beyond frontal lectures in their teaching. However, the Committee encourages these programs to continue to develop and expand efforts in innovative teaching and learning. Such efforts might require the programs to analyse/adapt their grading structure as well as student expectations. In addition, many alumni encouraged programs to enhance their efforts to teach self-learning and soft skills, particularly English speaking and writing. Finally, the Committee felt that the strong tendency of Israeli students to work during their undergraduate studies is having a negative effect on their education. Industry offers students jobs to exploit their talent while also vetting them for potential permanent employment. Students seek positions because they need the financial support and believe that work experience is required to find an engineering position after graduation. The Committee believes that CHE, or the group of Heads discussed in the previous section, should discuss this issue with representatives of industry. Perhaps creative solutions can be found to accommodate the needs of industry while not hurting the education of the students. We note that many students are clearly struggling with balancing their studies with significant employment.

4.6 Undergraduate Students

Most of the evaluated ME Departments are making efforts to increase diversity in their programs. Some of these efforts are more successful than others. The Committee urges programs to share best practices to improve outreach activities for women, Arabs, Bedouin, Ethiopians, and underprivileged populations. Moreover, the Committee recommends that HEIs monitor student progress, especially those entering with lower admission criteria.

Section 5: Recommendations

CHE/PBC

- The Committee recommends that institutions move towards their own internal QA processes (similar to those performed at the Technion).
- The Committee recommends that CHE resolve the inherent contradiction between the high teaching loads and required research output for faculty at engineering colleges.
- The Committee recommends that no additional M.Sc. programs in Mechanical Engineering be approved by CHE at the present time.
- The Committee recommends that PBC help bolster ME faculty hiring efforts at Israeli HEIs.
- The Committee recommends that the CHE, or representatives from the evaluated programs/institutions, discuss the tendency of students to work during their studies with representatives of industry to seek creative solutions that avoid hurting students' education.

HEIs

- The Committee recommends that institutions move towards their own internal QA processes (similar to those performed at the Technion).
- The Committee recommends that HEIs monitor student progress, especially those entering with lower admission criteria.

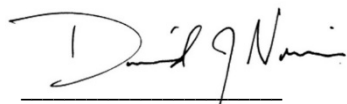
ME Departments

- The Committee recommends that the Departments Heads in Israeli ME programs meet periodically, perhaps with representatives from industry, to discuss Israel-wide issues for the discipline of ME.
- The Committee recommends that the evaluated ME programs continue to develop and expand efforts in innovative teaching and learning, and enhance their efforts to teach self-learning and soft skills, particularly English speaking and writing.
- The Committee recommends that the CHE, and/or representatives from the evaluated programs/institutions, discuss the tendency of students to

work during their studies with representatives of industry to seek creative solutions that avoid hurting students' education.

- The Committee recommends that outreach activities for women, Arabs, Bedouin, Ethiopians, and underprivileged populations be continued and strengthened.


Signed By:



Prof. David Norris
Committee Chair



Prof. Leslie Banks-Sills



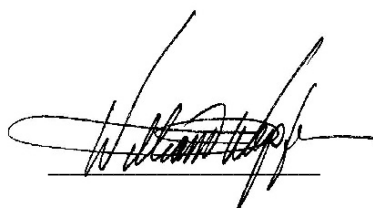
Prof. Patricia (Patsy) Brackin



Prof. David Clarke



Prof. Kon-Well Wang



Prof. William Wepfer

Appendix 1: Letter of Appointment



January 2018

Prof. David Norris
Department of Mechanical and Process Engineering
ETH Zurich
Switzerland

Dear Professor,

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 chair of the Council for Higher Education's Committee for the Evaluation of the study programs in **Mechanical Engineering**. In addition to yourself, the composition of the Committee will be as follows: Prof. Leslie Banks Sills, prof. Patricia Brackin, prof. David Clarke, prof. Kon-Well Wang and prof. William Wepfer.

Ms. Maria Levinson-Or will be the coordinator 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 chair of this most important committee.

Sincerely,

Prof. Ido Perlman 
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. Maria Levinson-Or, Committee Coordinator