



DEPARTMENT OF MECHANICAL
ENGINEERING
ARIEL UNIVERSITY

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 programs 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
 - Shamoon 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 | 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 program
 - 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

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

- 1.5 The evaluation committee examined only the evidence provided by each participating institution — considering this alongside the distinctive mission set 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 alumnae during the course of each one-day visit to each of the institutions.²
- 1.6 This report deals with the Department of Mechanical Engineering at **Ariel University**. The Committee's visit to Ariel University took place on June 13th, 2018. The schedule of the visit is attached as **Appendix 2**.
- 1.7 The Committee thanks the management of Ariel University and the Department of Mechanical Engineering for their self-evaluation report and their hospitality towards the committee during its visit to the university.
- 1.8 N.B. this report will use Faculty, with a capitalized first letter to refer to the Faculty of Engineering and will use faculty with the first letter not capitalized to denote professors and lecturers of the ME Department collectively. This report will use Committee, with a capitalized first letter to refer to the international evaluation committee conducting this review.

Section 2: Executive Summary

The management, administration, vision, QA process, study program, teaching, research, and students of this program met the acceptable threshold level of performance. Its faculty and infrastructure did not. In particular, the Department needs to hire more faculty to support the undergraduate program and achieve critical mass in its research efforts. Office and lab space must be increased and improved to bring the program in line with its recently acquired status of Research University.

Section 3: Observations

3.1 Introduction

Ariel University (AU) is a relatively new Israeli university (since 2012) with ~3900 students in their 5 engineering programs. The Department of Mechanical Engineering has experienced rapid growth, now teaching 563 students (2017-18). The Department continues to adapt to its role within a research university. It is well integrated within the institution. The Committee was confident that AU will be able to sustain and enhance the ME program.

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

3.2 Management and Administration

Senior leadership appears to strongly support the ME Department. The Dean of Engineering is impressive and the Department Chair is dynamic and drives progress. The Department has no autonomy in budget making decisions. The faculty appeared to have input on hiring and curriculum with the Chair exerting influence on final decisions.

The Committee could not find a written policy with regard to diversity, but a female Deputy Dean for special programs worked to advance women in the undergraduate and graduate programs, and among faculty. These initiatives are driven by the Dean's Office.

In this area of evaluation, the Committee determined that AU meets the acceptable threshold level of performance.

3.3 Vision

The Committee learned that the Department, including the untenured faculty, have collectively identified future strategic directions. The Department should document their plan and develop specific mechanisms for implementation. The program plans to recruit two new full professors in addition to their recent hires.

In this area of evaluation, the Committee determined that AU meets the acceptable threshold level of performance.

3.4 QA & Self-Evaluation Process

No official ongoing QA activities appear to exist. However, the AU administration affirmed support for the CHE self-evaluation and the Department was actively involved. The process helped clarify many issues. For example, the study program was changed considerably, according to the faculty. In response to the previous evaluation, ten additional faculty have also been hired. It is less clear if the self-study skills of their students have been sufficiently improved. The strategic plan of the Department has been revised.

In this area of evaluation, the Committee determined that AU clearly meets the expected threshold level of performance.

3.5 Study Program

The study programs are similar to those at other Israeli ME programs, with a heavy emphasis on mathematics and physics in the first three semesters. However, the Committee was pleased that the curriculum includes a topical course, "Introduction to Mechanical Engineering," in the first semester. The curriculum was well structured and coordinated, with the possible exception of the newer *Energy Track*. That track seemed to consist of courses from the more traditional ME curriculum (e.g. heat transfer and thermodynamics) that were combined with newer courses relevant to the oil and gas industry. More

generally, the introductory math courses should be checked for sufficient rigor, and traditional areas such as structures should perhaps be updated.

In this area of evaluation, the Committee determined that AU meets the acceptable threshold level of performance.

3.6 Teaching and Learning

One strategic goal of AU is to “promote academic excellence, innovation, and multidisciplinary teaching and research”³. The teaching within ME is good. Student surveys are conducted at the end of each course. However, because the response appears to be low, the faculty should each emphasize to their students changes that they made in response to previous teaching evaluations.

The Dean reads all course surveys and occasionally sits in faculty members’ classes, which stresses the importance of teaching at AU. Faculty with low evaluations meet with the Chair. If needed, faculty can seek help from the Quality Teaching Unit.

The faculty provide syllabi to students that outline the topics covered in the course. Students find these syllabi helpful; however, the intended learning outcomes (ILOs) are often vague – *e.g.* stated only as “basic thermodynamics.”

The faculty are fully committed to the program and the students. Faculty report use of some problem-based learning (PBL) and active-learning techniques. The faculty should continue these techniques and consider using on-line classes or “flipped-classroom” practices to enhance the student experience.

The final projects are detailed and challenging, and some students reported that they chose AU due to the reputation of the projects. The Committee was pleased that space was provided for final projects, but this space is still inadequate.

In this area of evaluation, the Committee determined that AU meets the acceptable threshold level of performance.

3.7 Faculty

While the Department has recently hired some quality faculty, the Committee believes that the faculty size is still insufficient. This results in a high student-to-faculty ratio and limits growth in strategic research directions without critical mass. The Faculty and the Department wish to increase the faculty size. A major challenge in faculty recruitment is AU’s location. Therefore, more creative and systematic efforts should be established to attract high-quality individuals, including foreign talent. Small startup research packages and inability to obtain EU funds add to the difficulties. In some areas, better lab space may be needed.

³Self-evaluation report, p. 18.

The Department does not have a formal mentoring program. The Department Chair communicates guidelines to the untenured faculty and meets with them periodically to discuss progress. The faculty appear very supportive of new hires. However, the Department should consider a more structured mentoring program, now as they grow in size. Overall, the climate among the faculty is good and adjunct faculty enjoyed working at the Department.

In this area of evaluation, the Committee determined that AU does not meet the acceptable threshold level of performance.

3.8 Research

The specializations in research are: (1) robotics, (2) biomechanics, (3) energy, and (4) nano-optics. The Department has international research collaborations including support for attendance of faculty members at international conferences, student participation in international competitions, supervision of a few foreign post-doctoral and doctoral students, and through personal contacts. Indeed, specific faculty have contacts throughout the world.

For the last three years, faculty members have obtained *ca.* \$1,000,000 in research grants from both external and internal funds. Some faculty perform first-rate research. The Research Authority helps with writing and submitting research grants. Seed funds (*ca.* \$2,000) are given to faculty to obtain preliminary results. Faculty are expected to submit a grant within 18 months. High-level research is inhibited by an insufficient number of doctoral and post-doctoral students. The Department aims to hire 5-6 new faculty in the next two years. This should strengthen its research activities.

In this area of evaluation, the Committee determined that AU meets the acceptable threshold level of performance.

3.9 Students

The Department teaches students with a wide range of abilities. The Department is encouraged to track the students' progress to understand better their drop-out rates. The program should suspend growth in student numbers and focus on student quality.

Students report no difficulties getting a job after graduation and are satisfied with their education. Most students enter industry, while some pursue graduate studies. Students also reported that the ME faculty and the AU administration were supportive and accessible. Alumni stated that the mechatronics program gave them a significant advantage when they entered industry. They appreciated the multi-disciplinary, hands-on approach.

In this area of evaluation, the Committee determined that AU meets the acceptable threshold level of performance.

3.10 Infrastructure

Space was generally adequate, except for offices and for labs for projects and design. In general, the space was in dated buildings. For some subjects, such as robotics, the large open spaces were suitable. For more structured labs, other types of space would be desirable. Unlike at other universities, there appeared to be a co-mingling of teaching and research labs, particularly in the robotics area. A mix of very modern and old equipment existed in the teaching labs.

In this area of evaluation, the Committee determined that AU does not meet the acceptable threshold level of performance.

Section 4: Recommendations

Essential recommendations:

- Suspend growth in student numbers and focus on student quality.
- Increase the faculty size and stabilize the undergraduate program before pursuing additional graduate degrees.

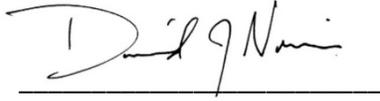
Important recommendations:

- Develop senior leadership that can continue to drive progress after the term of the current Department Chair expires.
- Increase the quantity and quality of lab and office space.
- Add a more structured faculty mentoring program.
- Determine if changes in admissions or student supervision are required to improve the undergraduate drop-out rate.

Desirable recommendations:

- Consider implementing a periodic internal self-evaluation process.
- Consider enhancing the connection between the Department and its alumni.

Signed By:



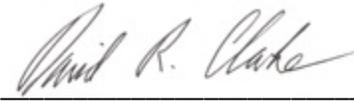
Prof. David Norris
Committee Chair



Prof. Leslie Banks-Sills



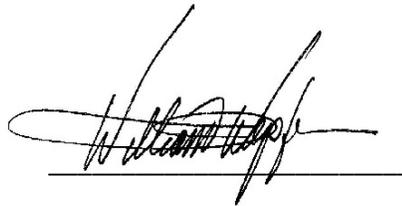
Prof. Patricia (Patsy) Brackin



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 Perlamn 
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

Appendix 2: Visit Schedule

<p style="text-align: center;">Mechanical Engineering - Schedule of site visit</p> <p style="text-align: center;">Ariel University</p> <p style="text-align: center;">Wednesday, June 13 ,2018</p> <p style="text-align: center;">Kiri Meeting room (Administration Building, 2 floor- in the elevator floor 1)</p>		
09:00-09:30	Opening session with the head of the institution	Prof. Yehuda Danon, President, Prof. Michel Zinigrad, Rector, Prof. Mally Shechory-Bitton, Vice Rector. Prof. Nitza Davidovich, Head of quality assessment and academic instruction
09:30-10:00	Meeting with the Dean of the Engineering Faculty	Prof. Shraga Shoval
10:00-11:00	Meeting with the Head of the ME Department	Prof. Zvi Shiller
11:00-11:15	Break	Closed-door meeting of the committee
11:15-12:00	Meeting with senior academic staff – tenured and non-tenured*	Prof. Idit Avrahami, Dr. Yuri Gorodetzki, Dr. Yoel Tenne, Dr. Moshe Brand, Dr. Itsik Sapir, Dr. Oded Medina, Dr. Nir Tsabar
12:00-12:45	Meeting with Adjunct academic staff *	Prof. Yaacov Azulay, Dr. Gabi Avital, Dr. Yaacov Berkowitch, Dr. Shay Danziger, Danny Deutsch, Moshe Kelman
12:45-13:30	Lunch	Closed-door meeting of the committee
13:30-14:45	Tour of facilities: Labs, Library + Final projects presentation	Mechanical Engineering Laboratory, Innovation and Product Development Studio, Robotics and Autonomous Vehicle Laboratory, Biomechanics Center, Nano-optics Laboratory
14:45-15:30	Meeting with BSc students**	
15:30-16:15	Meeting with MSc and PhD students**	
16:15-17:00	Meeting with Alumni**	
17:00-17:15	Break	Closed-door meeting of the committee
17:15-17:45	Closing meeting with heads of institution, Dean of the Faculty and the Head of the ME Department	Prof. Yehuda Dano , Prof. Michel Zinigrad, Prof. Shraga Shoval , Prof. Mally Shechory-Bitton, Prof. Zvi Shiller, Prof. Nitza Davidovich

* 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.