



# SCHOOL OF MECHANICAL ENGINEERING AFEKA ACADEMIC COLLEGE FOR ENGINEERING

## 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<sup>1</sup>:
- |                                       |  |
|---------------------------------------|--|
| • 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

---

<sup>1</sup>The 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.<sup>2</sup>
- 1.6 This report deals with the School of Mechanical Engineering at **Afeka Academic College of Engineering**. The Committee's visit to the college took place on June 14<sup>th</sup>, 2018. The schedule of the visit is attached as **Appendix 2**.
- 1.7 The Committee thanks the management of Afeka College and the School of Mechanical Engineering for their self-evaluation report and their hospitality towards the Committee during its visit to the college.
- 1.8 N.B. this report will use Committee, with a capitalized first letter to refer to the international evaluation committee conducting this review.

## Section 2: Executive Summary

Aspects related to the management, administration, vision, QA process, study program, teaching, research, and students of this program met the acceptable threshold level of performance. Aspects related to the faculty and infrastructure did not. In particular, the Department needs to hire more faculty to support its undergraduate program. Office and lab space is insufficient for the size of their program. Growth should be constrained until they move to their new campus.

## Section 3: Observations

### 3.1 Introduction

Afeka College (AC) contains 5 engineering departments that instruct ~2750 students. AC's primary goal is teaching, but it also emphasizes social involvement, learning beyond the classroom, and research. The School of Mechanical Engineering teaches ~800 students (including ~50 students in the Energy Engineering M.Sc. program). It is well integrated within the institution. The Committee was confident that AC will be able to sustain and enhance the ME program.

### 3.2 Management and Administration

AC's senior leadership strongly supports the ME program. The College enjoys a flat administrative structure that is highly collaborative and coordinated. The Head of the School appears to enjoy wide support from the faculty and students.

---

<sup>2</sup>Prof. 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.

The Committee was unable to discern the true extent of departmental decision-making and budget autonomy. The faculty appeared to have input on decisions regarding hiring, curriculum, and future directions, but not necessarily on policy. The College and the School have created a warm and welcoming environment for both students and faculty. The School includes many female faculty.

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

### 3.3 Vision

The Committee encourages the Head of the School and the faculty to develop a common strategic vision so that a collective sense of ownership evolves. This can then help expedite implementation.

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

### 3.4 QA & Self-Evaluation Process

The School has an ongoing internal evaluation process, particularly related to teaching. The Teaching Committee tracks academic weaknesses in the curriculum, with sub-committees addressing specific issues. Administrative weaknesses are addressed by the Management Forum. The long-term strategic plan is evaluated jointly by the administration and schools. The administration embraces the self-evaluation process. As part of the current process, the School Teaching Committee and the faculty meet to discuss academic issues. Faculty evaluated their own courses and those in their area of specialization. The Head of the School was heavily involved. The President reviewed the self-evaluation report and gave input.

In response to the previous evaluation, ten additional full-time faculty were hired. The number of specialization programs in teaching was increased to five: (1) materials, (2) mechatronics and robotics, (3) solid mechanics, (4) flow and energy, and (5) automotive systems. The latter is unique to AC. The faculty has introduced problem-based learning (PBL) and has developed intended learning outcomes (ILOs) and achieved learning outcomes (ALOs) for their courses.

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

### 3.5 Study Program

The curriculum at AC, especially in the first two years, is quite similar to other Israeli ME programs. However, distinguishing characteristics include: (1) more detailed syllabi, (2) classes are also given in the evening to assist students who also work, and (3) an “introduction to engineering” course in the first year to give students an early taste of engineering.

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

### 3.6 Teaching and Learning

AC aims to be a “leader in engineering training and education”<sup>3</sup>. The teaching within ME is very good. Faculty also have many opportunities to improve their teaching. The Center for Promoting Teaching offers different services, including workshops for new faculty. The Head periodically visits lectures of each faculty member. Student surveys are conducted at the end of each course. The Head discusses the results with the faculty.

The faculty provide syllabi that outline the topics and ILOs covered in their courses. The School as a whole has described the desired attributes of their graduates and created ILOs to attain these attributes. The faculty meet and discuss the ALOs each semester and determine if adjustments are needed. In short, the faculty are extremely attentive to the delivery of their curriculum. The faculty are fully committed to the program and the students. Faculty report wide-spread use of problem-based learning (PBL) and active-learning techniques. Students commented on the effectiveness of PBL. We encourage the faculty to continue these techniques and to consider using on-line classes or “flipped-classroom” practices to enhance the student experience.

The final projects are significant. The Committee was pleased that space was provided for final projects, but the space is still inadequate. The Committee did not completely understand how available projects were assigned to students.

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

### 3.7 Faculty

The diversity, inclusion, and comradery among the faculty was impressive. The faculty appear to support each other and enjoy teaching at AC. However, the Committee observed some confusion about the process for promotion and the possibility of tenure, which should be clarified. Mentoring efforts should be strengthened in the future, especially if research activities are enhanced.

The size of the faculty is inadequate, considering the School’s high student to faculty ratio and teaching load. As new faculty slots are being planned, the School should build synergy between ME and other departments.

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

---

<sup>3</sup>Self-evaluation report, p. 5.

### 3.8 Research

The School's research focuses on specific areas: (1) Energy and Heat Transfer and (2) Materials Analysis. In general, the School includes young, enthusiastic faculty that completed strong research during their doctoral work. They wish to continue their efforts at AC. However, their output is limited due to high teaching loads and insufficient funding. Faculty can request reduced teaching to write publications. B.Sc. students who complete research in their final project can also support the faculty's efforts. More cooperation with universities could also be helpful. Moreover, through involvement in advanced research faculty can enrich their teaching. Lab space for research is inadequate (see below).

AC has international collaborations: (1) a few students go abroad for internships, (2) the School participates in an EU project on energy efficiency, (3) cooperation exists with Germany, the Czech Republic, and Bulgaria, and (4) US students perform internships at AC.

The Research Authority at AC helps faculty prepare grant applications and articles for publication. Over the last four years, faculty have raised \$200K in research support. Annual bonuses are given for outstanding projects.

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

### 3.9 Students

Three admission tracks are employed: (1) high-school matriculation, (2) psychometric, and (3) practical engineers. Admission requirements start at a high level but are then lowered until the class is filled. The student quality is variable, but the program maintains standards to ensure graduates can succeed in industry. The drop-out rate is approximately 20% after six years. The School works to give students a good experience, and students were happy with their education. Most students enter industry after graduation with some pursuing graduate studies. Students reported that AC graduates receive jobs despite biases at some companies against graduates from colleges rather than universities.

Alumni were very pleased with the program. They formed a strong network during their studies that continued after graduation. Alumni remain involved with the program, returning for open days, final projects, and teaching.

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

### 3.10 Infrastructure

The School is housed in a building with other engineering programs. Lab and office space is very tight. The Committee notes that this situation has changed little from ten years ago. The library was considered inadequate. Due to these

issues, the entire college plans to move to a larger campus located at Yad Eliyahu in ~4 years. This should help alleviate space problems. Until then, growth in student numbers should be constrained. Consequently, the addition of new MS programs should be delayed.

The present teaching labs were well equipped with modern equipment, generally catering to ~20 students at a time. Lab sessions are then repeated to cover all students. The School is to be commended for providing space for projects and design. However, the space is too small for the number of projects.

No specific rooms were set aside for students. However, many of the open areas at AC were furnished to allow students to work alone or in small groups. In general, the space at AC was welcoming and modernly furnished. The number of administrative and technical staff has grown with the student body and faculty.

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

#### Section 4: Recommendations

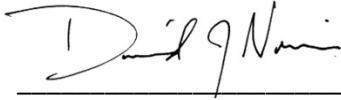
##### Essential recommendations:

- Increase the faculty size and stabilize the undergraduate program before pursuing additional graduate degrees.
- Increase the quantity of lab and office space.

##### Important recommendations:

- Improve professional mentoring of faculty to clarify requirements for promotion and tenure.
- Develop a common strategic vision in the School so that a collective sense of ownership exists in the faculty.

Signed By:



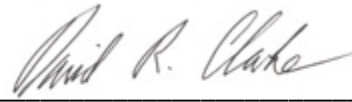
Prof. David Norris  
Committee Chair



Prof. Leslie Banks-Sills



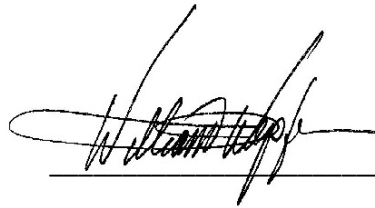
Prof. Patricia (Patsy) Brackin



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

<u>Mechanical Engineering - Schedule of site visit</u>		
<u>Afeka Tel-Aviv Academic College of Engineering</u>		
Thursday, June 14 ,2018		
09:00-09:30	Opening session with the head of the institution	Prof. Ami Moyal
09:30-10:30	Meeting with the Head of the School of Mechanical Engineering	Dr. Moshe Tshuva
10:30-10:45	Break	Closed-door meeting of the committee
10:45-11:45	Meeting with senior academic staff – tenured and non-tenured*	Dr. Netta Omer, Dr. Milad Hamisa, Dr. Tal Alon, Dr. Oz Golan, Dr. Sharon Gat,  Dr. Ludmila Pustyl'nik, Dr. Moran Aviv,  Dr. Uri Albocher
11:45-12:30	Meeting with Adjunct academic staff *	Mr. Dan Hermann, Dr. Ithamar Sharon,  Dr. Rachel Shmuel, Mr. Seth Sommer
12:30-13:15	Lunch (in the same room)	Closed-door meeting of the committee
13:15-14:00	Tour of facilities: Labs, Library	Dr. Moshe Tshuva  Mr. Isaac Kravchinski, Manager of labs & R&D Infrastructure
14:00-14:45	Meeting with BSc students**	
14:45-15:30	Meeting with Alumni**	
15:30-16:00	Final Project Presentation	
16:00-16:30	Closed-door meeting of the committee	
16:30-17:00	Closing meeting with heads of institution and the Head of the School of ME	Prof. Ami Moyal, Dr. Moshe Tshuva

\* 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.