



Committee for the Evaluation of Mechanical Engineering Study Programs

**ORT Braude College  
Department of Mechanical Engineering**

**August 2008**

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## **Chapter 1-Background**

The Council for Higher Education (CHE) decided to evaluate study programs in the field of Mechanical Engineering during the academic year 2007-2008.

Following the decision of the CHE, the Minister of Higher Education, who serves ex officio as the Chairperson of the CHE, appointed a committee consisting of:

- Prof. William J. Wepfer – School of Mechanical Engineering, Georgia Institute of Technology, USA, Committee Chairman
- Prof. Alexander Solan – Department of Mechanical Engineering (Emeritus), Technion – Israel Institute of Technology
- Prof. Steven Dubowsky – Mechanical Engineering Department, Massachusetts Institute of Technology, USA
- Prof. Mordechai Perl – Mechanical Engineering Department, Ben-Gurion University
- Dr. Joseph Sussman, Vice-President North America Information Technology, Bayer Corporate and Business Services, and President-Elect, ABET, Inc., USA

Mr. Moty Bar and Ms. Annie-Claire Pilo served as coordinators of the committee on behalf of the Council for Higher Education.

Within the framework of its activity, the committee was requested to:

1. Examine the self-evaluation reports, which were submitted by the institutions that provide study programs in Mechanical Engineering and hold on-site visits to those institutions.
2. Present CHE with final reports for the evaluated units and study programs - a separate report for each institution, including the committee's findings and recommendations, together with the response of the institutions to the reports.
3. To submit to the CHE a report regarding its opinion of the examined field of study within the Israeli system of higher education. The committee will submit a separate report to the CHE in this matter.
4. To recommend standards for the evaluated field of study.

The committee's Terms of Reference document is attached as Appendix 1.

The first stage of the quality assessment process consisted of self-evaluation by the institutions. This process was conducted in accordance with CHE Guidelines for Self-Evaluation (December 2006).

## **Chapter 2 - Committee Procedures**

The Committee held its first meeting on January 25, 2008 during which it discussed fundamental issues concerning mechanical engineering study programs in Israel and the quality assessment activity of CHE.

The committee members received the self-evaluation reports in January 2008 and the committee conducted two-day visits to each of the institutions offering study programs in the field under examination in March and May 2008. During the visits, the committee met with the relevant officials within the organizational structure of each institution as well as senior and junior academic staff and students.

In order to prevent the appearance of a conflict of interest, committee members did not participate in visits to institutions in which they were faculty members (active or retired).

In accordance with the committee's request, the institution publicized in advance the agenda of the committee's upcoming visit and it invited academic staff members, administrative staff and students to meet with the committee in order to assess their opinions of the mechanical engineering study program offered at each of the institutions. This report deals with the Department of Mechanical Engineering at ORT Braude College. The committee's visit took place on May 28-29, 2008. The schedule of the visit, including a listing of participants representing the institution, is attached as Appendix 2.

The committee thanks the management of the institution and the Department of Mechanical Engineering for their self-evaluation report and for their hospitality towards the committee during its visit.

## **Chapter 3 - Evaluation of the Department of Mechanical Engineering at ORT Braude College**

### **Background**

ORT Braude College (OBC) is an Israeli institution of higher education located in Karmiel in the center of the Galilee. It offers six B.Sc. undergraduate degree programs in the following engineering disciplines: biotechnology engineering, electrical and electronic engineering, industrial engineering and management, information systems engineering, mechanical engineering, and software engineering.

In 1996 OBC became an independent non-profit organization and shortly thereafter received approval to grant the Bachelor of Technology (B.Tech) in mechanical engineering. In 2004 OBC was accredited by the CHE for granting the Bachelor of Science (B.Sc.) degree in mechanical engineering. Currently the program enrolls 450 undergraduate students.

Nearly 2100 students are enrolled in OBC's engineering programs. The college employs approximately 80 full time faculty members and 240 external lecturers for the six engineering programs.

### **Mission of the Program**

The Department of Mechanical Engineering's mission statement for its B.Sc. program is *"To provide students of diverse backgrounds with the highest possible level of instruction in the field of mechanical engineering, in accordance with the requirements of advanced industries."*

The committee finds that the mission statement of the Department of Mechanical Engineering is an appropriate and proper one for this college. The committee finds that the study program reflects this mission statement. The committee noted that there were differing visions among the most-senior college administrators concerning the emphasis to be placed on research in the future.

### **Study Program**

The study program covers topics that are appropriate to mechanical engineering. There is an emphasis on design, manufacturing, and materials processing which reflects the needs of local industry. The committee believes that the study program prepares students for careers as practicing mechanical engineers.

The program of study reflects several noteworthy features. The department maintains meaningful relationships with industry as reflected by their unique and integrated senior project and internship program. The design sequence has been carefully integrated throughout the curriculum and provides students with a strong design education. The department provides its students with opportunities for study abroad with partners such as the University of Rochester and the University of Miami.

The committee also noted the following two concerns. Nearly half of the courses are taught by external teaching staff. It appears that the external faculty members teach a significant number of core courses in the study program. The program would benefit by improved communication between the internal and external faculty with respect to curricular issues. A second concern is that it appears that the program is delivered using too many low-point value courses. Delivering the same content using fewer but higher point-value courses may enhance the educational experience and effectiveness of the program.

The committee noted that the department seeks to obtain approval to offer a non-thesis masters program. Based upon the committee's overall impression of the B,Sc. program in mechanical engineering, it is hard to see how the department has the resources, capacity, or vision to offer a masters degree program.

### **Faculty**

The academic staff is qualified to offer the mechanical engineering study program. The size of the faculty is appropriate and the department chair provides strong and dynamic leadership. As the program evolves, the committee strongly encourages the program to hire young and enthusiastic faculty in modern and emerging areas relevant to OBC's strategic directions such as advanced manufacturing and energy.

The academic staff perception of expectations for promotion is not aligned with OBC's mission and goals. The academic staff believes that successful research is a critical element for advancement. The committee encourages the CHE to develop and promulgate an alternative path for faculty promotion based on professional achievement and demonstrated professional engineering competence. It should be made clear, that given OBC's mission, continuous professional development activities by the staff are no less important than research and should be rewarded. The committee notes that OBC provides a limited number of seed grants for research. The committee encourages OBC to provide a parallel program for faculty member to maintain their professional currency.

### **Teaching and Learning**

OBC's Center for Teaching and Learning provides students with helpful learning tools that decrease the drop-out rate of first-year students. It appears that the Center's activities have reduced the drop-out rate and have improved the retention and graduations rates. The Center also provides lecturers with the necessary support to improve their teaching craft.

The laboratory exercises appear to be highly-directed without giving the students any opportunity to confront open-ended or ambiguous problems. The faculty should consider the possibility of opening-up the laboratory courses in a manner similar to what they have done in their design sequence.

The committee recognizes that the program includes open-ended problems in their design sequence. Self-education, however, must be an important goal of engineering education;

considering the need of practicing engineers to keep pace with the continuous advances in science, technology, and engineering practice. Engineering requires life-long self-education. The committee encourages OBC to continue to enhance and emphasize self-study and open-ended problems to nurture the students' creative skills.

### **Students**

The admission scores of OBC students span a wide range reflecting OBC's mission statement. The program provides necessary remediation for students with lower admission scores and students with inadequate math and physics background.

Students expressed a high-level of satisfaction with their study program. The students appear to be very capable and prepared for careers in industry. They are optimistic about their future prospects.

### **Research**

Since research is not explicitly listed within OBC's mission and vision statement, the committee did not review and evaluate the research component and offers no judgments in the area. The committee notes that research is made difficult by large undergraduate enrollments, the lack of graduate thesis students, and the lack of research support infrastructure.

### **Infrastructure**

The department is housed in modern facilities. The classrooms, laboratories, and library provide a good environment for learning. Additional technician support for the laboratories and computer clusters could enhance the students' learning.

### **Self-Evaluation**

The self-study was prepared by the faculty. The self-study reflected a careful process wherein the faculty asked serious and important questions about the current state and future of the department. In addition, the self-study provided a very detailed summary of these issues. The department is commended for their thoughtful preparation and the committee observes that the OBC report was the most reflective and introspective of all six ME reports.

### **Summary**

The committee finds that the Department of Mechanical Engineering is preparing its students for successful careers as practicing mechanical engineers in Israeli industry.

Nearly half of courses are taught by external teaching staff. It appears that the external faculty members teach a significant number of core courses in the study program. Within the next year the program should improve communication between the internal and external faculty with respect to curricular issues. Consideration should be given to assigning a greater

share of the core courses to full-time faculty. In addition, it appears that the program is delivered using too many low-point value courses. Within the next two years, the program should modify its study program to deliver the same content using fewer but higher point-value courses.

The academic staff is qualified to offer the mechanical engineering study program. The size of the faculty is appropriate and the department chair provides strong and dynamic leadership. As the program evolves, the committee strongly encourages the program to hire young and enthusiastic faculty in modern and emerging areas relevant to OBC's strategic directions such as advanced manufacturing and energy.

The academic staff perception of expectations for promotion is not aligned with OBC's mission and goals. The academic staff believes that successful research is a critical element for advancement. The committee encourages the CHE to develop and promulgate an alternative path for faculty promotion based on professional achievement and demonstrated professional engineering competence. It should be made clear, that given OBC's mission, continuous professional development activities by the staff are no less important than research and should be rewarded. The committee notes that OBC provides a limited number of seed grants for research. The committee encourages OBC to provide a parallel program for faculty member to maintain their professional currency.

The laboratory exercises appear to be highly-directed without giving the students any opportunity to confront open-ended or ambiguous problems. Within the next year, the faculty should "open-up" the laboratory courses in a manner similar to what they have done in their design sequence.

The committee recognizes that the program includes open-ended problems in their design sequence. Self-education, however, must be an important goal of engineering education; considering the need of practicing engineers to keep pace with the continuous advances in science, technology, and engineering practice. Engineering requires life-long self-education. Within the next two years, the committee encourages OBC to continue to enhance and emphasize self-study and open-ended problems to nurture the students' creative skills.

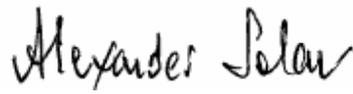
The Committee is aware that all study programs operate under external constraints, in particular budget limitations. Nevertheless, it is the Committee's opinion that many of its recommendations can be implemented within the external constraints, by appropriate action of the authorities of the College and Department.

Respectfully submitted,



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Prof. William J. Wepfer  
Chairperson



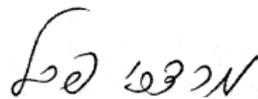
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Prof. Alexander Solan  
Co-Chair



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Prof. Steven Dubowsky



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Prof. Mordechai Perl



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Dr. Joseph Sussman