

Response:

**The Report of the International Evaluation Committee
(Biotechnology and Biotechnology Engineering)
The Council for Higher Education**

The report of the Committee for the Evaluation of Biotechnology & Biotechnology Engineering Study Programs (Committee Report) relates to the Self-Evaluation Report written by the Department of Biotechnology Engineering, ORT Braude College in November, 2011 (Self-Evaluation Report) and the visit of the Committee to the College in March of 2012. We wish to express our gratitude to the Committee and the Council for Higher Education for the opportunity to respond to the Committee's report.

The Committee commented on five subjects that embody the philosophy and practices of the College: (1) Mission of the College/Department, (2) Internship Program, (3) M.Sc. program, (4) Faculty Promotion, (5) Admission Criteria. The following is the Department's response to these specific subjects.

(1) Mission of College/Department

"The mission statement of the department of BTE (DBTE) is consistent with the overall mission of the college however the committee holds the opinion that it is too broad and lacks focus on specific aims of the program. The committee holds the opinion that a concise and focused mission statement, reflecting the collective vision of the program's faculty members and aligned with the mission statement of the College is needed" (3.3 Missions, Goals and Aims, p8)

The Mission Statement (Self-Evaluation Report, 3.1.2, p7), following intense debate and discussion to ensure precise expression of the Department's vision, was formulated by the faculty of the Department of Biotechnology Engineering and in keeping with the opinion held by the Committee, reflects the collective vision of the Department. Endorsed by the Management of the College, the Mission Statement is aligned with that of the College. Expressed in a single sentence, it is the concise expression of the Department's vision as required by the Committee.

"... the committee strongly believes that the DBTE has to identify the specific fields in biotechnology engineering where its strength and competitive edge can be successfully highlighted. ...It has to be noted that the areas of focus and strength should also reflect the manner in which the BTEP addresses specific biotechnology-related needs in the Galilee and general needs of the biotechnology and related industries in Israel." (3.3 Missions, Goals and Aims, page8)

The aim of the B.Sc. program is to educate and train students to be biotechnology engineers qualified to work in all areas of Biotechnology. This approach both serves the diverse interests of the students and equips them to adapt to the changing demands of the biotechnology industry. Analyses of the professional activities of the Department's graduates in the Self-Evaluation Report (Fig 3.4.2d.1, p40; Tables 3.4.10c, p54) demonstrate the unequivocal success of the approach.

Diversification is especially important in a small country like Israel with a relatively small number of Biotechnology companies in each field and an unstable Biotech Industry. The opinion that the Department should identify a "specific field" in which to be strong and competitive is, with respect to teaching, misguided and possibly reckless.

With respect to specific biotechnology-related needs in the Galilee, attention to the contents of the Self-Evaluation Report (Place of Residence, p53), informs the reader that in 2011 seventy percent of the Department's graduates were to be found in northern Israel. This data, combined with the employment statistics of graduates referred to in the preceding paragraph, attest to the fact that the Biotechnology Engineering program succeeds in educating engineers with skills that address the needs of biotechnology-related industry in the Galilee.

The B.Sc. program is also designed to qualify graduates for higher degree programs in Israel and abroad. More than thirty percent of the Department's graduates (1996 – 2006) enrolled in higher degree programs (Self-Evaluation Report, Higher Degrees, p55). Undergraduate students carry out full-time research of seven months duration at Israeli research universities, and at the Universities of Pittsburg, Rochester and MIT, USA. Research of this nature by Israeli undergraduates is unique to the College.

(2) Internship Program

"The 4-year curriculum of the BTEP includes a 7-month long internship project (16 CP) where students are engaged in full time research at different off-campus facilities (laboratories or industries). The committee recognizes the value and merit of including a compulsory research project in the curriculum however, it holds the opinion that the length of the internship and the number of CP designated to it are excessive.

The committee holds the opinion that a 3-4 months research internship (with an appropriate adjustment of the CP), preferably in the summer between the 3rd and the 4th year, or after completion of all other required CP, will allow strengthening the curriculum and enhancing the course structure of the different tracks. It will also allow, to a certain extent, a better distribution of the course load throughout four years. The committee also holds the opinion that the extent to which the students are monitored and supervised

during the internship by the program's faculty has to be enhanced." (3.4 The Study Program, page13)

The internship program is considered a success by students, by academic and industrial supervisors and by graduates. It is a major contributing factor to the outstanding graduate employment statistics (Self-Evaluation Report, Fig 3.4.2d.1, p40; Tables 3.4.10c, p54) and has significant academic merit, affording the students the opportunity to integrate their theoretical studies in applied projects. Internship training gives graduates a competitive edge in the job market and facilitates their integration into the biotechnology industry in Israel and abroad. The internship and its benefits, emphasized in marketing campaigns, is the distinguishing factor of the Department and its study program.

The internship enables faculty of the Department to interact continuously and constructively with leading research laboratories and industry throughout Israel. The Self-Evaluation Report provides hard data on the mutual benefit of the Internship program to the Department, its students, graduates and the industry-research community of Israel.

The alternative to the internship, a short term project (3-4 months) in a research university, does not meet the requirements of academic supervisors who stipulate that internships be of at least six months duration. Shorter projects yield limited results and are of little value to student or researcher. In point of fact, the Department was requested by the collaborating laboratory of MIT to extend the internship to one year. In addition, a short duration project would preclude most students from carrying out internships in industry.

Internship projects are not carried out in the Department because of a lack of research projects. Research projects initiated by faculty are available but it is the policy of the Department to encourage students to pursue internships that interest them and serve their future plans. It should be noted that the internship, close to the time of graduation, gives the students an advantage in being employed by the laboratory or industry where the internship was done.

A number of students (a minority) postpone completion of the internship requirements (written report) and in this way extend their studies beyond the statutory four years. If they find employment without graduating, they may postpone completing the degree until years after finishing their formal higher education. The Department is considering, and has already implemented, measures to prevent prolongation of the study period and to minimize the number of uncompleted degrees.

(3) M.Sc. Program

Our reading of the report suggests that there was a major misunderstanding between the Committee and the CHE and the Committee and the Department on the subject of the M.Sc. (Biotechnology) program. Faculty responsible for carrying out the Self-Evaluation Report were given explicit instruction not to relate to the M.Sc. (Biotechnology) program. The mandate of the Committee reviewing the study program of the Biotechnology Engineering Department did not include the M.Sc. (Biotechnology) program. In the interim the M.Sc. program, closely supervised and evaluated by a committee appointed by the CHE, was accredited by the CHE. We have chosen, therefore, not to relate to comment on the program. *(3.4.2 The M.Sc. Program)*

(4) Faculty Promotion

"..., the lack of research laboratories at the program's facilities and the overall heavy teaching load do not allow faculty members to enjoy this opportunity in a productive manner. In light of the afore-discussed difficulties and challenges, the committee strongly believes that the way in which faculty members are assessed for their accomplishments and, consequently, promoted, has to be modified significantly. The committee's opinion is that promotion of faculty members should be based on assessing their success in meeting objectives defined by an individual-specific job description."(3.6 Human Resources, page19)

It is generally believed that to maintain high academic standards, faculty should carry out research. The College currently bases faculty promotion on three criteria: excellence in teaching, contribution to the department and college activities, and research. The criteria for promotion proposed by the Committee are not employed by Israeli academic institutions. Management of the College is opposed to promoting faculty on the basis of an individual-specific job description.

(5) Admissions Criteria

"The committee believes that the program has to re-assess its admission criteria and, as described earlier in this report, introduce a mandatory preparatory program to significantly enhance the academic level of academically challenged incoming students, especially in Math, Eng. Chem. and Phys." (3.6.2 Students, page22)

The policy of the Department with respect to admission criteria is elaborated in the Self-Evaluation Report and the Committee is on record acknowledging the motives, advantages and benefits of that policy in its Report. Re-assessment of the admission criteria will be carried out but an increase in their level is liable to compromise the

principle of providing educational opportunity to disadvantaged groups and an ethnically diverse population. Physics is not a condition for admission to other Biotechnology programs in Israel therefore we are not considering a change in the current admission criteria.

Students without matriculation-level physics are obliged to study a preliminary course (Introduction to academic physics) that provides them with the basic concepts prior to the academic-level physics courses. A similar course in mathematics is obligatory to students with low grades in mathematics and optional for students who want to refresh their knowledge in mathematics.

The Committee's report contains recommendations relating to the content and execution of the study program that the Department will adopt in part or in whole: (1) Strategic Plan, (2) Specialization and Elective Courses, (3) Student enrollment/attrition, (4) Research, (5) Learning Outcomes.

(1) Strategic Plan

"Currently, the BTP does not have a strategic plan aimed at meeting its goals. The committee has identified a critical need for the program to develop a tangible strategic plan with specific long- and short-term objectives, addressing all of the academic- and infrastructural-related aspects of the program. (3.3 Mission, goals and aims, page 8)

A "tangible strategic plan" is a welcome and constructive recommendation. Although the mandate of the CHE for the Self-Evaluation did not include a strategic plan *per se*, the subject was given systematic and detailed attention in the Self-Evaluation Report (3.2.6, "future development plans", p19; 5.3, "future treatment of weaknesses", p86, Table 5.3, p87). Short and long-term objectives, the basis of a strategic plan, were defined in the report and will be used to produce a strategic plan. Following the Committee's recommendation the Department's Industrial Advisory Board will be consulted more frequently and invited to make a more meaningful contribution to the strategic planning of the Department.

(2) Specialization and Elective Courses

"The total CP allocated to elective courses is 10-11 and the committee holds the opinion that the number and scope of the elective courses that are offered by the program is limited and that a broader range of topics, relevant to the field of modern biotechnology engineering, is missing from the curriculum." (3.4 The Study Program, page 10)

Reference to the number of CPs for elective courses (10-11) is a misrepresentation of the number and scope of topics offered by the program. Students choose one of five different specializations, each requiring the accumulation of 22.5 specialization-

related CPs, in addition to the elective courses. The impression that the program is narrow in scope may have resulted from a specious distinction between specialization-related elective courses and general electives.

The number and scope of elective courses that can be provided is a function of the number of students, the size of the College in general and the Department in particular. In view of declining student numbers, the Department was required to withdraw courses from the curriculum.

"The committee has recognized deficiencies in course paths that constitute the different tracks. In some cases, such as the food biotechnology study track, the curriculum consists of some basic courses and falls short of introducing the proper breadth and depth that is required in modern Food Biotechnology study track. For example: a course in Food Chemistry is not offered; Food microbiology and Food analysis are instructed without any laboratory components" (3.4 The Study Program, page 11)

Reference to the Self-Evaluation Report and Appendices to the Report shows that criticism of course paths, in particular that of Food Biotechnology, is unwarranted. Food Microbiology and Analysis, for example, are taught in the laboratory courses, Food Microbiology (course 41673, Self-Evaluation Report, Appendix 6.1, Table 1.B) and Food Analysis (41675, Self-Evaluation Report, Appendix 6.1, Table 1.C), respectively. Although the Committee makes numerous erroneous claims, of which reference to food biotechnology is an example, we do see the value of reviewing the study tracks and consistent with recommendations of the Committee, we are considering a consolidation of the specialization tracks and an increase in the number and range of elective courses.

A course in Nanotechnology, as recommended by the Committee, would be a valuable addition to the Department's curriculum.

With respect to the Committee's comment on Specialization and Elective courses, students with appropriate course pre-requisites can take courses offered by other departments, as do students in the "Excellence" program. A number of outstanding students have been accommodated by the Departments of Mechanical Engineering and Programming Engineering in studying Biotechnology Engineering in parallel with one of these two disciplines.

With reference to the study program, the Department acknowledges the Committee's comment on the practice of "clustered" laboratory sessions (3.4 The Study Program (page12)). The clustered laboratories were established to provide an academic and learning advantage and to allow a series of time consuming sequential operations and procedures, consistent with the recommendation of the Committee. The caveat that students be provided with time to process data and prepare laboratory reports is understood and will be applied where possible.

(3) Student enrollment/attrition

"The committee is not convinced that either the college or the BTEP fully understand what has led to this declined enrollment. The committee suggests that this trend will be thoroughly investigated and appropriate remedies will be introduced, if needed." (3.4 The Study Program, page 15)

Fluctuations in student enrollment in the Biotechnology Engineering program reflect fluctuations in the fortunes of the Biotechnology Industry. In 2006 Biotechnology was perceived to be the "future gold mine", received favorable media coverage and student enrolment soared. The subsequent closure of biotech companies in Israel and abroad, the amalgamation of pharmaceutical giants in the USA and Europe and a global economic crisis changed the image of Biotechnology for the worse and student enrolment dropped. In 2012 the Department implemented a marketing strategy to increase the student numbers. A nineteen percent increase in admissions was recorded for the first semester of the academic year, 2012-2013.

"The committee holds the opinion that the current attrition rate is excessive and that an immediate effort (by the BTEP), aimed at significantly reducing this rate, is needed. ...The committee thus has identified a need for the BTEP to establish a mandatory preparatory course sequence, aimed at closing the identified knowledge gap of the incoming students. The committee believes that a successful completion of the preparatory program (passing grade of 75-80) should become a pre-requisite for admission." (3.4 The Study Program, page 14)

The College's policy with respect to admission criteria is to facilitate the enrollment of motivated but marginally qualified students. The motivation is to give greater opportunity to ethnically heterogeneous and disadvantaged populations who may be discriminated against by the admissions criteria of universities. As mentioned earlier, the College does have mandatory preparatory courses in physics and mathematics for students with low admission grades. Despite a lenient admissions policy, the College does not compromise on academic demands and standards. Most of the students succeed in attaining the required academic level but some of them, in spite of all efforts, cannot cope with the requirements. It should be noted that we did not find a correlation between the qualifications of students on admission and student attrition from the program. The College provides extensive support for the diverse needs of the students (Self-Evaluation Report, 3.4.5, page 47).

The Department is designing a flexible first semester to reduce student attrition. The proposed flexible semester will allow students to study less than the standard number of courses in order to concentrate on mathematics and physics that pose the greatest difficulties. In addition and in compliance with the Committee's recommendation ("*Seminar in Biotechnology Engineering*", page 15), the Department intends to increase student understanding and preparation for the Engineering element of the program by instituting an introductory course in

Biotechnology Engineering in the first semester.

(4) Research

"No core infrastructure that can support even a limited-scope research program of the faculty members of the BTEP exists at the program's facilities, and thus involvement of faculty members in research is critically dependent on collaborations with researchers from other institutes." (3.7 Research, page 25)

Despite the lack of research-designated laboratories, faculty to date have carried out research, albeit limited in scope, in the College or in collaboration with scientists in other departments and institutions, have published their results and presented their research in international and national conferences. The College supports faculty with seed money for research and by allowing the conversion of teaching hours to research time (Self-Evaluation Report, 4.14, p81; 3.5.1.4, p58). A number of internship students and students in the "Excellence" program participate in faculty research projects.

The cost of biotechnology research and the personal investment required of researchers exceed the resources, institutional and individual, at the disposal of faculty. While the demands of faculty are comparable with those in research universities, the means of fulfilling them are sorely wanting. The Committee was informed during its visit to the College that the College management was supporting the establishment of a core infrastructure for research. Laboratories have been allocated to the Department for research, a budget has been earmarked for furnishing and equipping laboratories, and a qualified laboratory manager (PhD) appointed.

The Department embraces the recommendation that research and infrastructural objectives of the Department's program relate to specific fields in biotechnology (3.3 Missions, Goals and Aims (page 8)), while respecting the academic freedom of researchers in pursuing their own research interests. The diverse expertise and experience of faculty should be exploited in an integrated, multidisciplinary approach to specific academic and industrial research issues. To this end, a number of academic-industrial collaborations are being considered to exploit the collective knowledge and skills of food biotechnology engineers, environmental scientists, chemical engineers, chemists and microbiologists of the Department. Implementation of the project will provide additional opportunity for students to carry out research projects in the Department and for faculty of other departments to collaborate in a truly multi-disciplinary project.

(5) Learning Outcomes

"Introduce and implement the Learning Outcomes Assessment concept as the main tool for evaluating the learning outcomes of all the courses and other instructional activities that are offered by the study program" (3.5 Teaching and Learning Outcomes, p18)

Learning Outcome Assessment is an integral part of the College's recently inaugurated Strategy. Departments of the College will be instructed in the concept, assisted in incorporating the concept in courses and syllabi and taught how to put the concept into practice.

Final Remarks

Whereas criticism and recommendations of the Committee were well received, we are left with the impression that insufficient reference was made to the Self-Evaluation Report. Indeed, most of our responses to the Committee's remarks rest firmly on the contents of the Evaluation Report. In this context, there is a marked absence of reference to the Department's success in giving unprecedented academic and professional opportunity (ninety percent graduate employment, six years in succession) to a disadvantaged and ethnically diverse population; and a lack of acknowledgement of the academic and professional achievements of the Department's graduates and disregard of the satisfaction recorded by graduates of the Department.

A steering committee, chaired by the Head of Department, will give due consideration to the Committee's recommendations and will oversee their implementation.