Committee for the Evaluation of
Biotechnology & Biotechnology Engineering Study Programs

Inter-Faculty Biotechnology Program

The Hebrew University of Jerusalem

Evaluation Report

December 2012

Contents

Chapter 1: Background……3

Chapter 2: Committee Procedures……4

Chapter 3: Evaluation of the Inter-Faculty Biotechnology Program at the Hebrew University of Jerusalem……5

Appendices: Appendix 1 – Letter of Appointment

Appendix 2 - Schedule of the visit

Chapter 1: General Background

At its meeting on July 25, 2010, the Council for Higher Education (CHE) decided to evaluate study programs in the field of Biotechnology and Biotechnology Engineering during the academic year 2012.

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

- **Prof. Moshe Rosenberg,** Department of Food Science & Technology, UC Davis, USA, Committee Chair[1]
- **Prof. Gad Galili**, Department of Plant Sciences, Weizmann Institute of Science, Israel
- **Prof. Milica Radisic**, Institute of Biomaterials and Biomedical Engineering ,Department of Chemical Engineering and Applied Chemistry, University of Toronto, Canada[2]
- **Prof. Joseph Shiloach**, Biotechnology Core Lab, NIH- National Institutes of Health, USA

- *Ms. Yael Elbocher* - Coordinator of the Committee on behalf of the CHE.

Within the framework of its activity, the Committee was requested to:[3]

1. Examine the self-evaluation reports, submitted by the institutions that provide study programs in Nutritional Sciences, and to conduct on-site visits at those institutions.
2. Submit to to CHE an individual report on each of the evaluated academic units and study programs, including the Committee's findings and recommendations.
3. Submit to the CHE a general report regarding the examined field of study within the Israeli system of higher education including recommendations for standards in the evaluated field of study.

The entire process was conducted in accordance with the CHE's Guidelines for Self-Evaluation (of October 2010).

[1] During the first round of visits Prof. Carl Batt of Cornell University was Committee Chair. During the period between the two rounds of visits Prof. Batt resigned due to incomparable disagreements

[2] Prof Radisic joined the committee for its second round of visits, thus did not take part in the evaluation of Tel Hai College, ORT Braude College and The Hebrew University of Jerusalem

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

Chapter 2- Committee Procedures

The Committee held its first meetings on March 14, 2012, during which it discussed fundamental issues concerning higher education in Israel, the quality assessment activity, as well as Biotechnology and Biotechnology Engineering Study programs.

In March 2012, the Committee held its first round of visits of evaluation, and visited Tel Hai College, ORT Braude College and the Hebrew University of Jerusalem. In June 2012 the Committee conducted its second evaluation cycle, and visited Ben-Gurion University of the Negev, Hadassah Academic College Jerusalem, Tel Aviv University and The Technion. During the visits, the Committee met with various stakeholders at the institutions, including management, faculty, staff, and students.

This report deals with the visit of the committee to The Inter-Faculty Biotechnology Program (IFBP) at the Hebrew University of Jerusalem.
The committee visited the program on March 21, 2012

The schedule of the visit is attached as **Appendix 2**.

The Committee thanks the management of Hebrew University of Jerusalem and the Inter-Faculty Biotechnology Program for their self-evaluation report and for their hospitality towards the Committee during its visit at the institution.

Chapter 3: Evaluation of Inter-Faculty Biotechnology Program at the Hebrew University of Jerusalem

* *This Report relates to the situation current at the time of the visit to the institution, and does not take account of any subsequent changes. The Report records the conclusions reached by the Evaluation Committee based on the documentation provided by the institution, information gained through interviews, discussion and observation as well as other information available to the Committee.*

3.1 Executive Summary

The Interfaculty Biotechnology Program (IFBP) at the Hebrew University of Jerusalem is a graduate studies program (M.Sc.) that is jointly operated by the Faculties of Science, Agriculture and Medicine. The IFBP does not have a "street address", does not have its own faculty members, attracts (annually) only less than 2% of the graduate students that are enrolled in its constituent faculties and its curriculum consists of courses that, in most cases, are owned by other programs. Faculty members that are affiliated with the program are of a high caliber and their respective research programs (at the constituent faculties) are competitive, well funded and well published. Students of the program are talented, dedicated, and enthusiastic about their studies and research. The program is housed in a highly competitive university that is ranked among the best in the world yet it has fallen short of reaching its full potential. The program has suffered, during recent years, from a dramatic decline in the financial support it receives from the University's administration and its attractiveness and competitiveness have been significantly compromised. Overall, the curriculum allows training graduate students in concepts pertaining to modern biotechnology yet it has to be strengthened and improved. Faculty members that are affiliated with the program are very frustrated with the very limited support and recognition that is provided to the program by the university. The quality assessment committee has concluded that the program has reached a very critical cross-road, where its mere existence and the extent to which faculty members will maintain interest in the program are challenged. The committee has recognized the potential of the program to assume a leadership position in the field of modern biotechnology. However, without a dramatic change in the extent to which the program is supported by the university and a series of significant curricular, organizational and operational changes, the future of the program is not secured. The program needs to become much more structured, its affiliated faculty members have to develop some sense of ownership over the program,

and the attractiveness and competitive edge of the program, both internally and externally, has to be enhanced.

The committee has identified several curricular, personnel and infrastructural needs that have to be addressed.

Major recommendations are:

- Appoint an *ad hoc* committee charged with the task of developing a concise and focused mission statement and a clear strategic plan for the program.
- Establish an Industry Advisory Board to the IFBP.
- Define the role of the program's director; appoint a deputy to the program director; establish a steering committee, a research committee and an industry relationships committee.
- Hold a series of town hall meetings to discuss the future of the program.
- Establish study tracks in the IFBP and appoint, for each track, a senior faculty member to lead it.
- Establish a Ph.D. program in biotechnology and offer it in each of the study tracks.
- Significantly revise and enhance the curriculum along the specific recommendations that are detailed in this report.
- House all of the agricultural-biotechnology study programs (B.Sc., M.Sc. and Ph.D.) in the Faculty of Agriculture (FOA) home campus; Establish capabilities to "attend" classes offered at different campuses via a satellite link.
- The university should increase, very significantly and without delay, its financial support (to IFBP) to allow supporting 15 new students every year. This level has to be then increased, proportionally to the growth of the program.
- Establish interfaculty and multidisciplinary research groups of faculty members.
- The IFBP should be provided with a designated facility, a Center for Biotechnology, to house a seminar/conference hall, the offices of the program's director and secretary and an advanced instrumentation laboratory.

3.2 Background

The cornerstone of the Hebrew University was laid in Jerusalem in 1918 and on April 1, 1925, the university was officially opened on Mount Scopus where it conducted its teaching and research activities until 1948. During the War of Independence the university was forced into exile, and continued conducting its activities in rented facilities scattered throughout various parts of Jerusalem. In 1955, the Israeli government allocated land in the Givat Ram neighborhood and in Ein Kerem where new Hebrew University campuses were established. The Hebrew University in Jerusalem was accredited as an institution of higher education August 1962. In 1967, the road to Mount Scopus was reopened, and in the early 1970s, academic activities were restored on Mount Scopus campus.

Currently, the Hebrew University of Jerusalem (HUJ) operates on five campuses: Mount Scopus campus, Edmund J. Safra campus in Givat Ram, Ein Kerem campus, Rehovot campus and Beit Dagan campus. An additional site is the Inter-university Institute for Marine Science in Eilat, operated by the Hebrew University for the benefit of all institutions of higher learning in Israel.

The Interfaculty Biotechnology Program (IFBP) is a graduate studies program that is jointly operated by the Faculty of Science (FOS), the Faculty of Agriculture (FOA) and the Faculty of Medicine (FOM).

The FOS consists of five research institutes (located on the Edmond J. Safra Campus):

- Mathematics
- Physics
- Life Sciences
- Chemistry and Earth Sciences
- School of Engineering and Computer Science

The constituent departments and study programs of the FOS offer 18 different B.Sc. degrees and 23 different M.Sc. and Ph.D. degrees. During the academic years 2006-2011, the

number of undergraduate students enrolled in the FOS ranged from 1945 to 2299; the number of students studying towards M.Sc, degree with and without thesis ranged from 619 to 651 and from 66 to 84, respectively; and the number of Ph.D. students ranged from 605 to 677. During these academic years, the number of students that graduated the FOS with a B.Sc. degree ranged from 476 to 542; the number of those completed their studies towards M.Sc. with and without thesis ranged from 129 to 175 and from 10 to 36, respectively; the number of those completed their doctorate studies ranged from 68 to 105 and the number of those graduated the direct Ph.D. track ranged from 16 to 26.

The faculty of Medicine (FOM) consists of five schools: Medical School, Schools of Pharmacy, Nursing, Occupational Therapy, and Public Health and Community Medicine. In the academic years 2011, more than 3000 students, consisting of 2024 undergraduate and about 1060 graduate students were enrolled in the various programs of the FOM.

The Faculty of Agriculture (FOA) offers academic programs leading to B.Sc., M.Sc. and Ph.D. degrees in Agriculture, B.Sc. and M.Sc. degrees in Nutrition, and a Doctor of Veterinary Medicine. During the academic years 2006-2011, the number of undergraduate students enrolled in FOA ranged from 1216 to 1369 and the number of graduate students (M.Sc. and Ph.D) ranged from 761 to 871. The FOA offers undergraduate degree with specialization in biotechnology.

The charge of the Biotechnology/Biotechnology Engineering Quality Assessment Committee did not include assessment of the undergraduate study program of the FOA and the committee did not visit this faculty. This report will thus address this program only to a limited extent, reflecting its link to the IFBP.

The IFBP was established in the late1980's, and 315 students have graduated this program since 1991. The IFBP does not have a Ph.D. track however, since 2005, 17 students of the program have pursued a "direct" Ph.D. degree track offered by some of the constituent faculties of the program. In 2011 27 students were enrolled in the IFBP.

3.3 Mission, Structure, Goals and Aims

3.3.1 – general

The IFBP is jointly operated by the FOS, FOA and the FOM. The program is academically and administratively controlled by the University's office of the Rector however, this responsibility is delegated to the home faculty of the program director. The director of the program is appointed by the Rector of the university for a period of three years and this appointment is rotated among the constituent faculties. The program's budget is shared by the Rector's office and the host faculty. The program does not have a "street address" and does not have its own faculty members. Teaching and research activities of the program are thus conducted by faculty members of the three constituent faculties. The program is "housed" in a highly reputable academic institution and its constituent faculties have gained national and international recognition of excellence. The faculty members that are involved in the program are highly capable instructors, mentors and researchers and many of them have been awarded with prestigious national and international awards.

The IFBP is very small, does not enjoy an adequate tangible support from the top administration of the university and has gained only limited visibility. The total number of M.Sc. students in the constituent faculties ranged, during the academic years 2006-2011, from 1432 to 1764, however, only 25-30 students (less than 2%) out of this population were associated (in a given year) with the IFBP.

Housed in a university that has been ranked to be among the best in the world, the IFBP has the potential to assume a leading role in the field of biotechnology, both nationally and internationally, however, this has not yet materialized. Similar to concerns expressed by faculty member with whom it met while visiting the program, the committee is very concerned about the program's current state and holds the opinion that it has significantly fallen short of reaching its full potential.

After reviewing the state of the program during the academic years 2006-2011 and after visiting the program and holding on-site meetings with the administration, faculty members and students of the program, the committee has reached the conclusion that the

IFBP is at a very critical cross-roads, where its mere existence has to be seriously addressed by both its constituent faculties and top administration of the university.

The committee has identified several major causes that have lead to the current state of the program:

- The program has a very complicated and fragmented structure; its operational mode is loosely defined.
- The program suffers from a very significant decline in the level of financial support it receives from the administration of the university.
- The program suffers from a lack of focus and sense of clear well planned direction.
- The program offers only a Master (M.Sc.) degree.
- The loyalty of the faculty members associated with the program is to their home faculty rather than to the program.
- The program has limited visibility and has not developed serious and binding interactions with the biotechnology industry.

3.2.2. Mission, Goals and Aims

The mission of the IFBP is to educate and train students, at the M.Sc. level, by providing them with opportunities to develop their skills as researchers (at the bench) and with the theoretical background pertinent to some of the disciplines associated with modern biotechnology. The program has been designed to prepare its graduates to become successful professionals in the biotechnology industry or to pursue a Ph.D. degree (that is not offered by the program).

The mission statement of the IFBP is generic and it lacks focus. The committee is concerned about the lack of a clear direction for the program and holds the opinion that developing a concise and focused mission statement is of prime importance to the viability and future of the program. Such mission statement should reflect the collective vision of the faculty members associated with the program and rather than being broad it should be focused on developing and promoting specific inherent strengths and biotechnology-related

areas that the program would like promote. The committee believes that building the program in a way that specifically highlights the unique and competitive strength and excellence of the constituent faculties and their researchers is critically important to the success, competitive edge and attractiveness of the program.

The IFBP does not have a detailed strategic plan aimed at meeting its goals. At present, the scope of the program and the extent to which the top administration of the university and the constituent faculty are committed to the program is unclear and loosely defined. A detailed strategic plan, that is carefully design and aimed at meeting the mission statement of the program, is of critical importance. This plan has to consist of tangible and specific long- and short-term objectives addressing all of the academic- , organizational- and infrastructur-al- aspects of the program.

The IFBP maintains some relationships with different sectors of the Biotechnology industry in Israel and invites speakers from this industry to deliver presentations in some of the program's courses. It seems that, in general, the program values the interactions with the industry but the limited scope of these interactions is of concern. The committee strongly believes that establishing serious, binding and meaningful interactions with the industry is of essential importance to the success and future of the program.

An Industry Advisory Board (IAB) to the program has not been established yet and the committee in convinced that the program can benefit immensely from establishing and interacting, on a regular basis, with an effective and committed IAB. An efficient IAB can provide the IFBP with a comprehensive feedback about its relevance and adequacy and can partner with the program in shaping its scope and growth. The IAB can assist the program in assessing and enhancing its success in meeting current and future needs of the Biotechnology Industry in Israel. Building meaningful relationships with the industry has also to be directed at enhancing the extent to which the industry is committed to the success and wellbeing of the program. The latter has to ultimately be reflected in industry-funded scholarships, equipment grants, etc. It has to be noted that such boards are common at similar programs in Northern America and have been proven to be a powerful and effective means that allows establishing meaningful dialogues with stakeholders.

The committee is convinced that current challenges to the program require a very strong and committed leadership that is capable of launching a structured and focused effort aimed at elevating the program from its current state to a full manifestation of its potential. The committee strongly believes that essential to success in meeting this goal is a serious commitment of the top administration of the university to provide the program with means that are needed in order to enhance its competitiveness and allow its growth. The committee also believes that a full commitment of the constituent faculties and the faculty members associated with the program is imperative to the success of the program. The future and viability of the program is critically dependent on breaking the interfaculty boundaries in a way that will allow the instructors and researchers that are associated with the program to develop a true sense of loyalty and ownership of the program.

Recommendation:

Immediate (full implementation within one year)

- Appoint, without delay, an *ad hoc* committee, consisting of senior faculty members from the constituent faculties, charged with the task of developing a concise and focused mission statement and a clear strategic plan for the program.
- Establish and install an Industry Advisory Board to the IFBP, consisting of industry leaders and alumni

3.3 - The Study Program

The IFBP awards only one degree, M.Sc. with thesis, and is instructed with no designated specializations or study tracks. The course work component of the study program requires students to acquire 34 credit points (CP) from a combination of compulsory courses (13 CP), Compulsory/elective courses (9-11 CP) and elective courses (10-12 CP). The program does not have its own instructors and the courses of its curriculum are instructed by faculty members from the three constituent faculties and by external instructors (from the industry or related entities). The distribution of instructors among the three constituent faculties is uneven and consists of 12, 11 ad 5 faculty members from the FOM, FOA and FOS, respectively.

The IFBP does not “own” most of the courses included in its curriculum and except for some general biotechnology-specific compulsory courses, the curriculum consists of courses that are offered by other study programs. The extent to which these courses address current issues related to modern biotechnology varies. The curriculum has a broad scope, does not address all of the major disciplines that constitute modern biotechnology and does not include laboratory courses. Practical training in both basic and advanced analytical and research techniques is critically important to graduate students in a biotechnology program. Students that are admitted to the program come from different scientific disciplines and different academic institutions and not necessarily have had opportunities to acquire the practical skills that are needed in order to successfully meet their research challenges. Building theses skills cannot be the sole responsibility of the laboratories where students conduct their respective thesis research but rather has to also be integrated into the course work component of the program. The committee considers the lack of laboratory courses a deficiency of the curriculum.

The study program is instructed as a single rather than in several, well defined study tracks, and the curriculum does not consist of course clusters of that have been designed to meet needs of a focused and structured graduate studies program in modern biotechnology. The committee recognizes this aspect of the program as weakness and strongly believes that clear, well defined, and planned study tracks have to be developed. For each of the study tracks, a sequence of compulsory and elective courses has to be defined.

The committee recognizes the fact that the program does not own the courses included in its curriculum and the fact that the loyalty of the course instructors is to their home program/faculty rather than to the IFBP. However, these aspects cannot and should not be allowed to prevent developing a first-rate, highly focused and relevant study program in biotechnology. The committee sees a critical need to significantly revise and enhance the curriculum. There is an urgent need to develop a structured and competitive curriculum consisting of several study tracks. These study tracks have to evolve around 3-4 specific fields in biotechnology where the unique strength and competitive edge of the constituent faculties can be highlighted. The committee strongly believes that in addition to courses that are

"available" and offered by other study programs, specific courses, designed to meet the needs of the IFBP, in general, and specific needs of each of the study tracks, in particular, have to be developed. In addition to the very broad and general compulsory courses, such as "Biotechnology in Israel", Biotechnology seminar", "Biotechnology and Intellectual Property", a series of compulsory courses, at the level of a highly competitive graduate studies program, has to be developed and instructed on a regular basis. These courses have to address the different scientific disciplines and concepts associated with modern biotechnology. Some of such courses already exist in the form of "compulsory/elective" courses offered by the program. However, a thorough revision and enhancement of the courses that are already offered, along the principles that have been described above, is critically needed. This significant curricular revisions and enhancement has to be developed after the "strength and excellence" directions and the study tracks have been identified by the program. In addition to the afore-mentioned laboratory courses and the field- and discipline-specific courses, the committee has recognized a need to include in the curriculum a compulsory course in "Ethics in Biotechnology" and a course in "Experimental design and advanced statistical methods". The revised and enhanced curriculum has to consist of several compulsory courses that are important to all of study tracks, a few study-track-specific compulsory courses, and a broad selection of elective courses. The committee believes that courses included in the curriculum of the IFBP can also be offered to students from other study programs, provided that enrollment priority is provided to the students of the IFBP and that course-specific re-requisites are met. The latter may enhance the visibility of the program and can attract students, after they have been introduced to some concepts in biotechnology, to join the program.

Comparing the extent to which biotechnology-related directions have been integrated into the academic structure of the three constituent faculties reveals an inherent asymmetry. The FOA offers four biotechnology-related specialization areas, at the B.Sc. degree level: Plant Sciences; Biochemistry, Food Science and Nutrition; Animal Sciences; Plant Protection. This program is an integral part of the undergraduate study program of the FOA, located in the Rehovot Campus. The FOS and FOM (that are located in Jerusalem) do not offer any B.Sc. level study tracks or specialization in biotechnology.

The committee agrees with and supports the rationale about the importance of a

strong program in Agricultural Biotechnology. The committee strongly believes that, building on the current academic infrastructure and accomplishments of the biotechnology specialization tracks at the FOA, a graduate study program, (M.Sc. and Ph.D) in Agricultural Biotechnology has to be developed and housed at the FOA in Rehovot. Although this program can maintain association with the IFBP, it has to offer a specific curriculum, at the graduate studies level, instructed by the faculty members of the FOA, in Rehovot. This program can be defined by the IFBP as one of its study tracks but the committee strongly believes that it has to be developed and instructed by the FOA. The committee holds the opinion that the latter will highlight the excellence and competitive edge of the FOA and will allow developing competitive curriculum for the other study tracks in biotechnology where the excellence and competitiveness of the FOS and FOM are successfully highlighted.

The committee recognizes the fact that some of the more general compulsory courses of the curriculum are important to all students, regardless of their specific study tracks. These courses can be instructed at the home faculty of the course instructor however, students of the IFBP from other campuses should be able to "attend" the course via a satellite link. The committee believes that the current practice of "shuttling" students between the three campuses is wasteful, unnecessary, and works against the best interests of the students.

The field of biotechnology is uniquely driven by a very aggressive and fast pace inter- and multi-disciplinary research. The competitive nature and success of an academic program in biotechnology is thus critically dependent on the scientific merit, level, and success of its research programs. A major part of a research program in an academic institute is its Ph.D. program, where highly motivated and skilled young researchers are committed to the process of developing new, cutting edge knowledge and discovering new horizons. The committee has identified the fact that the IFBP offers only a Master degree as a significant weakness of the program and holds the opinion that developing a Ph.D. program in biotechnology (in each of the study tracks) is imperative and critically important to the competitiveness and success of the IFBP.

The committee reviewed a sample of five Master theses (2 from the FOM and 3 from the FOA). Although limited in scope, this sample indicated high scientific merit and research quality. In all cases, the research addressed relevant topics and knowledge challenges and in

most cases the research was hypothesis-driven. The committee holds the opinion that the academic and intellectual challenge, experimental approaches, relevance and the scientific depth that are reflected in these theses indicate the high caliber of the research component of program in general, and of its faculty members and graduate students in particular. The technical details of these theses indicate adequate application of advanced methodologies, current analytical tools and approaches and thus reflect on the high quality of the research program.

The study program has a low attrition rate, <5%, and in most cases, students that left the program simply changed direction and joined a different Master program.

Recommendations:

Immediate (full implementation within one year)

- Establish study tracks in the IFBP study program.
- For each of the study tracks appoint a senior faculty member whose responsibility will be to lead the track.

Intermediate (full implementation within 2-3 years)

- Establish a Ph.D. program in biotechnology and offer it in each of the study tracks.
- Significantly revise and enhance the curriculum along the guidelines and specific recommendations that are detailed in this report.
- House all of the agricultural-biotechnology study programs (B.Sc., M.Sc. and Ph.D.) in the FOA home campus.
- Establish capabilities to allow students that are located at the different campuses that associated with the IFBP "attending" classes via a satellite link.

3.4 - Teaching & Learning Outcomes

The committee has not been provided with sufficient and relevant information that is needed in order to evaluate the quality of instruction and learning outcomes. The lack of data was attributed (by the IFBP) to the fact that the program does not own the courses included in its curriculum, has no control over the testing mechanisms and tools as well as to the fact

that, in most cases, the program "has no say" when the courses are considered. The committee has a great concern about the lack of tangible tools aimed at assessing the teaching and learning outcomes in a manner that is meaningful and relevant to the IFBP. The very limited information that has been made available to the committee indicated that quality of teaching is assessed by students however, no course- or instructor-specific information and data has been provided to the committee. The committee therefore cannot discuss the teaching quality at the IFBP.

Currently, student grades are used, as a sole tool, in assessing the learning outcomes of the curriculum and its constituent courses. In recent years it has been recognized that grades alone cannot serve as effective tools in assessing learning outcomes. Institutions of higher education all over the world have recognized that a full commitment to teaching and learning must be based on assessing and documenting what and how much students are learning and on using this information to improve the educational experiences. A detailed implementation of this Learning Outcome Assessment has been developed and introduced in numerous academic programs. This concept allows defining desired learning outcomes (for each course) and quantifying the success with which these outcomes has been acquired by students.

The committee is satisfied by the fact that the IFBP has established a list of some desired learning outcomes. However, this list is too general and does not relate to course-specific details. The limited scope of the desired learning outcomes and the inability to directly measure and assess teaching and learning outcomes are of a significant concern to the committee that has identified theses difficulties as weakness of the program. The committee strongly believes that although the IFBP does not "own" the courses attended by its students, it is its direct responsibility to assess the quality of the instruction in these courses and to evaluate, assess and quantify the learning outcomes of these learning experiences. Regardless of the fact that in many courses the IFBP students account for only a small fraction of the total student population enrolled in the course, it is the direct responsibility of the IFBP to assess the effectiveness of instruction and the learning outcomes in all these courses. The IFBP has to assess the quality of teaching in all of the courses taken by its students, regardless of and separate from the assessment that is carried out by the program

that owns each of these courses.

Recommendation:

Immediate (full implementation within one year)

- Establish implement IFBP-specific tools to assess the quality and effectiveness of instruction in all of the courses attended by the students of the IFBP.

Intermediate (full implementation within 3-4 years)

- Introduce and implement a Learning Outcome Assessment as the main tool for assessing the learning outcomes of all of the courses and learning experiences included in the curriculum of the study program.

3.5 Human Resources

3.5.1 Faculty members

The IFBP does not have its own faculty members and is dependent on the participation and involvement of faculty members from its constituent faculties. The program has identified a group of 146 faculty members that are defined as "members of the IFBP". This group consists of 61, 51, and 34 faculty members from the FOM, FOA and FOS, respectively. Out of this group, only 28, 34 and 22 faculty members from the FOM, FOA and FOS, respectively, are actively involved in the program. Reviewing the C.Vs. of faculty members affiliated with the program has made it clear that the program enjoys the participation of well trained, highly capable, and highly productive faculty members. Many of these faculty members have gained the status of internationally recognized authority in their field and many of them have been awarded with prestigious awards.

The loyalty of the faculty members that are affiliated with the IFBP is (first) to their home faculty, where their main interest lays. The latter reflects the way the program is structured and the committee has identified this aspect of the program as weakness that adversely affects the competitiveness and attractiveness of the IFBP.

The committee met during its visit with a group of faculty members affiliated with the program. This group expressed deep frustration and dissatisfaction from the way the

program is organized and from the lack of support and understanding from the top administration of the university. Members of this group questioned their intent to continue participating in the program and some indicated that their future involvement is contingent upon a dramatic change in the manner in which the university supports and appreciates the IFBP. Without exception, the faculty members with whom the committee met expressed a strong conviction about the great potential of the program and about the critical need to develop a strong, high quality and competitive biotechnology-related programs at the Hebrew University.

It has to be recognized that the success and well being of the individual research programs of the affiliated faculty members and their academic career are not dependent on the existence of the IFBP. The latter presents a great challenge to the university, in general, and to the IFBP, in particular, when the future of the IFBP is considered. The committee has reached the conclusions that unless a dramatic change in the way the program is organized and supported by the university is made, the program is likely to lose the interest of a significant number of its actively involved faculty members.

The committee strongly believes that although faculty members that are affiliated with the program come from different faculties, a very clear and visible link to the IFBP has to be established. The lack of such tangible link is among the weaknesses of the program and compromises its strength and competitiveness. The committee strongly believes that once the study tracks and the specific strength and excellence fields and directions have been identified and agreed upon, a Center for Biotechnology has to be established and serve as the home of the IFBP. The center should have a street address (as discussed later in this report) and its affiliated faculty members should consist of those who are actively involved (instruction and/or research) with the IFBP. These affiliated faculty members should be organized in several research / area groups, according to their teaching/research interests, and aligned with the study tracks of the program.

3.5.2 Students

The IFBP recruits highly qualified and capable students with a B.Sc. (or equivalent) degree from a recognized institute of higher learning in Israel or abroad, in a relevant field of

study. A minimum grade average of 85 is required in order to be accepted to the program however, over the 2007-2011 academic years the grade average of the students admitted to the program ranged from 87.3 to 90.6 (average – 89.6). During the years 2008-2011, the number of students that applied to the program ranged from 19 to 21, the number of accepted applicants ranged from 12 to 17 and the number of students that actually started their studies ranged from 11 to 13. The majority of students that join the program come from the undergraduate study programs of Hebrew University followed by those who graduated the Tel Hai or Ariel academic colleges.

The Average final grade, of students that graduated the program during the years 2007-2011, ranged from 90.9 to 93.3 and the average Master thesis grade of theses completed during the years 2008-2011 was 92.9.

The committee met with a group of student of the program and was impressed by their maturity and dedication to their studies and research. In general, the students expressed satisfaction with the quality of instruction, both in the class and at the bench. However, the students expressed deep concerns about the lack of adequate financial support from the university and about the fact that the IFBP does not offer TA positions.

The competitiveness of the program and its ability to attract highly capable students is critically dependant on the level of financial support that is provided to the students by the university. The number of financially supported students dropped from 20 (in 2007) to 4 (in 2011). The latter represented a very steep decrease from a total of 200 equivalents of monthly support to only about 30. This deterioration has placed the program at an unfortunate inferior position and adversely affected its competitiveness and attractiveness.

The committee holds the opinion that securing the existence and growth of the program is critically dependent on a strong commitment of the top administration of the university to the program. This commitment has to be reflected in a very significant increase in the number of financially supported students.

The program has established and maintained only a limited contact with its alumni. During 2010 and 2011 survey among 300 of the program's alumni was conducted however, only 20% of the surveyed alumni returned the questionnaire. Results of the survey indicated that 26% of those who returned the survey would not have chosen the program had they had

the opportunity to do so again. Results also indicated that only 69% of those who returned the questionnaire have a biotechnology-related job. Although limited in scope, these results raise concerns and highlight the need for a thorough analysis of graduates satisfaction and employment. The latter will provide the program with directions that are needed in order to enhance its performance.

Recommendation:

Immediate (full implementation within one year)

- The committee strongly recommends that the university will increase, very significantly and without delay, the number of fellowships provided to the program. The committee strongly recommends that, as the first and immediate step in this direction, the university will support 15 new students every year and will increase this level of support, proportionally to the growth of the program.

Intermediate (full implementation within 2-3 years)

- Establish and maintain a dialogue with alumni and introduce tools to allow effective evaluation of graduate satisfaction and alumni employment.

3.6. Research

The IFBP does not have its own researchers, and its collective research program consists of research activities conducted by its students and affiliated faculty members, at their respective home programs. The committee has been provided with the C.Vs. and accomplishment record of a selected group of faculty members affiliated with the program. The information provided to the committee indicated that researchers affiliated with the program have been engaged, during the assessed period of time (2006-2011), in a competitive, cutting edge research addressing a very broad and diverse relevant and current biotechnology-related research objectives and challenges. Researchers affiliated with IFBP have successfully secured significant research funds from a broad spectrum of national and international competitive funding agencies and programs and have established meaningful and productive collabora-

tions with researchers all over the world.

The IFBP submitted to the evaluation committee C.Vs. of 26 faculty members however, research grant information for only 21 was provided. The total research grants awarded to these faculty members, during the academic years 2006-2011, amounted to almost $15.5 million and the amount of research funds awarded per faculty member ranged from about $282,000 to $1,660,000.

Research, conducted by the 21 faculty members, for whom research budget information has been provided, and their students yielded 484 peer reviewed research publications in highly reputable journal. The amount of research funds invested in each publication ranged from about $ 4,000 to about $ 94,000.

Overall, the reported 26 faculty members published, during the evaluated five years, 626 publications. The number of peer-reviewed publications per faculty member ranged (during 2006-2011) from 5 to 88. Seven of the faculty members published 5-10 publications, 12 faculty members published 11-30 publications and 7 faculty members published more than 31 publications. The number of peer-reviewed publications produced annually per faculty member ranged from 1 to 18.

The committee holds the opinion that, overall, researchers affiliated with the FBP have developed a very high quality, relevant and competitive research program, and it would like to congratulate the IFBP and its constituent faculties on this accomplishment.

As has been discussed in Chapter 3.3 of this report, the committee recognizes as weakness the fact that the IFBP does not offer a Ph.D. degree and strongly recommends establishing this track. The committee is convinced that the latter will enhance the competitiveness of the research program.

The committee strongly believes that the IFBP can benefit from establishing several research groups, consisting of its affiliated faculty members, where their respective research interests and strength are highlighted in a collectively focused manner. These interfaculty and multi-disciplinary research groups should reflect the areas in biotechnology where the collective excellence, strength and uniqueness of the IFBP can be competitively highlighted. Aligning these research groups with the study tracks of the program is likely to add to the strength of the program.

Recommendation:

Immediate (full implementation within a year)

- Establish interfaculty and multidisciplinary research groups of faculty members where the excellence and strength of the IFBP can be highlighted and align these groups with the study tracks of the program.

3.7 Infrastructure

The IFBP does not own teaching and research facilities and its programs and activities are carried out at the facilities of the constituent faculties. The committee has only a very limited opportunity to visit facilities that are used by the program. The committee visited the library of the FOS and has found it to be adequate and appropriate to meet the needs of the program's students and faculty members. The library provides adequate accessibility to published knowledge and data bases both in print and on line. The committee has found the utilization of information technology to be appropriate.

The committee did not visit the teaching infrastructure of the constituent faculties and was provided with the opportunity to visit the research laboratories of one faculty member who is affiliated with the program. The committee has found the research infrastructure in these laboratories to be adequate in providing the researchers with the state-of-the art research tools that are needed in order to conduct competitive research.

The IFBP does not have a "physical address" and has no facilities of its own. The committee holds the opinion that the latter adversely affects the visibility of the program and places it in a position inferior to that of other interdisciplinary programs of the university.

***Recommendation*:**

Immediate (full implementation within 1-2 years)

- The committee strongly recommends that the IFBP will be provided with a designated facility to house the Center for Biotechnology. The facility should allow housing a seminar/conference hall, the offices of the program's director and secretary and an ad-

vanced instrumentation laboratory to be shared by researchers and students affiliated with the program.

3.8 Quality assessment

The committee would like to thank the faculty members and staff of the program that have been involved in producing the Self Assessment Report. The committee recognizes the difficulties the IFBP had to deal with while preparing this document, due to the unusual structure of the program. Overall, it seems that the IFBP has demonstrated capabilities to identify areas of weakness that needed attention or revision. The committee holds the opinion that, due to its complex structure, the IFBP needs a Program Quality Assessment and Improvement committee that will continuously assess the different aspects of the program in order to identify challenges that have to be addressed and will recommend about approaches to meet these difficulties.

Recommendation:

Immediate (full implementation within one year)

- Establish a Program Quality Assessment and Improvement committee.

3.9 – Organization

The IFBP needs a strong and committed leadership that can navigate and lead it through the significant changes that are needed in order to elevate it from its current state to a leading and competitive position. The committee is very concerned by the fact that there are no guidelines defining the credentials, role, and duties of the program's director. The committee holds the opinion that in order to effectively lead and direct the program, a steering committee, consisting of 3-4 committed faculty members, representing the constituent faculties and the leaders of the study tracks, has to be appointed. This committee has to be actively involved in re-designing the different aspects of the program. The committee also holds the opinion that a deputy program director is needed and that in addition to the existing curriculum committee, the program has to establish a research committee and an industry relationship committee.

A continuous and open dialogue among all of the faculty members that are associated with the program is important to the future of the program, especially at present, when significant revisions are needed. A structured series of "town hall" meetings, where the directions the program would like to pursue are discussed, has to be held.

***Recommendations*:**

Immediate (full implementation within one year)

- Define the role of the program's director.
- Appoint a deputy to the program director.
- Establish a steering committee, a research committee and an industry relationships committee.
- Hold a series of town hall meetings to discuss the future of the program.

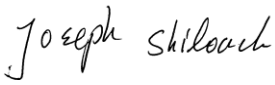
Signed by:

_____

Prof., Moshe Rosenberg,
Chair

_____

Prof. Gad Galili



_____

Prof. Joseph Shiloach

Appendix 1: Copy of Letter of Appointment

May, 2012

שר החינוך
Minister of Education
وزير التربية والتعليم

Prof. Moshe Rosenberg
Department of Food Science & Technology
University of California, Davis
USA

Dear Professor Rosenberg,

The State of Israel undertook an ambitious project when the Israeli Council for Higher Education (CHE) established a quality assessment and assurance system for Israeli higher education. Its stated goals are: 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. Involvement of world-renowned academicians in this process is essential.

This most important initiative reaches out to scientists in the international arena in a national effort to meet the critical challenges that confront the Israeli higher educational system today. The formulation of international evaluation committees represents an opportunity to express our common sense of concern and to assess the current and future status of education in the 21st century and beyond. It also establishes a structure for an ongoing consultative process among scientists around the globe on common academic dilemmas and prospects.

I therefore deeply appreciate your willingness to join us in this crucial endeavor.

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 Biotechnology and Biotechnology Engineering Studies.

The composition of the Committee will be as follows: Prof. Moshe Rosenberg (Chair), Prof. Gad Galili, Prof. Milica Radisic, Prof. Joseph Shiloach.

Ms. Yael Elbocher will coordinate the Committee's activities.

In your capacity as Chair of the Evaluation Committee, you will be requested to function in accordance with the enclosed appendix.

I wish you much success in your role as Chair of this most important committee.

Sincerely,

Gideon Sa'ar

Gideon Sa'ar
Minister of Education,
Chairperson, The Council for Higher Education

Enclosures: Appendix to the Appointment Letter of Evaluation Committees

cc: Ms. Michal Neumann, The Quality Assessment Division
Ms. Yael Elbocher, Committee Coordinator

רח' שבטי ישראל 34 ירושלים מיקוד 91911 • טל' 02-5602330 • פקסמיליה 02-5602246
34 Shivtei Israel St' 91911 Jerusalem. Tel. 02-5602330. Fax 02-5602246
شارع شبطي يسرائيل 34 . اورشليم القدس 91911 . هاتف 02-5602330 فاكس 02-5602246
כתובת אתר ממשל זמין: http://gov.il
כתובת אתר המשרד: http://www.education.gov.il

Appendix 2: Site Visit Schedule

Biotechnology and Biotechnology Engineering –Schedule of site visit- Hebrew University

Wednesday, March 21, 2012

Time	Subject	Participants
08:45-09:30	Opening session with the heads of the institution and the senior staff member appointed to deal with quality assessment	Menahem Ben Sasson- President Sarah Stroumsa- Rector Yaacov Schul- Vice rector
09:30-10:00	Meeting with the Dean of the Faculty of Mathematics & Science	Prof. Gad Marom
10:00-10:30	Meeting with the Head of the Biotechnology study program	Prof. Shimshon Belkin
10:30-11:15	Meeting with senior & Junior faculty and representatives of the teaching committees*	Prof. Itamar Willner Prof. Joseph Hirschberg Prof. Berta Sivan Prof. Oded Yarden Prof. Yitzhak Hadar Prof. Doron Steinberg Dr. Stefan Rokem
11:15-12:00	Meeting with Masters Students* ***	
12:00-12:45	Lunch – closed meeting	In the same room
12:45-13:30	Tour of campus (classes, library, offices of faculty members, labs etc.)	Tour of Harmon Library
13:30-14:00	Summation meeting with heads of the study program & Faculty	Prof. Gad Marom Prof. Shimshon Belkin
14:00-14:45	*Travel time to Mt. Scopus Faculty*	
14:45-15:15	Summation meeting with heads of the institution	Menahem Ben Sasson- President Sarah Stroumsa- Rector Yaacov Schul- Vice rector

* 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.