



# **Committee for the Evaluation of Medical and Biomedical Engineering Study Programs**

**Ben Gurion University of the Negev**

Evaluation Report

**January 2017**

Contents

**Chapter 1:** Background.....3  
**Chapter 2:** Committee Procedures.....4  
**Chapter 3:** Evaluation of Medical and Biomedical Engineering at  
Ben Gurion University .....5  
  
**Chapter 4:** General Recommendations .....20

**Appendices:** Appendix 1 – Letter of Appointment  
Appendix 2 - Schedule of the visit

## **Chapter 1- Background**

The Council for Higher Education (CHE) decided to evaluate study programs in the field of Medical and Biomedical Engineering during the academic year of 2016.

Following the decision of the CHE, Vice Chair of the Council of Higher Education on behalf of the Minister of Education, appointed a Committee consisting of:

- Prof. C. Ross Ethier- Department of Biomedical Engineering at Georgia Institute of Technology & Emory University School of Medicine, USA committee Chair
- Prof. James Moore- Faculty of Engineering, Department of Bioengineering, London Imperial College, UK
- Prof. Milica Radisic- Faculty of Applied Sciences and Engineering, University of Toronto, Canada
- Prof. Amit Gefen<sup>1</sup>- Department of Biomedical Engineering, Tel Aviv University, Israel

**Ms. Alex Buslovich Bilik** was the coordinator of the Committee on behalf of the CHE.

Within the framework of its activity, the Committee was requested to:<sup>2</sup>

1. Examine the self-evaluation reports, submitted by the institutions that provide study programs in Medical and Biomedical Engineering and to conduct on-site visits at those institutions.
2. Submit to the 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 2015).

---

<sup>1</sup> Prof. Amit Gefen was unable to attend the Technion visit and take part in the report writing due to a potential perceived conflict of interest.

<sup>2</sup> The Committee's letter of appointment is attached as **Appendix 1**.

## **Chapter 2-Committee Procedures**

The Committee held its first meetings on November 27<sup>th</sup> during which it discussed fundamental issues concerning higher education in Israel, the quality assessment activity, as well as Medical and Biomedical programs in Israel.

During November and December 2016, the Committee held its visits of evaluation, and visited, Tel Aviv University, Ben Gurion University, the Technion and Afeka academic college. During the visits, the Committee met with various stakeholders at the institutions, including management, faculty, staff, and students.

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

The Committee thanks the management of Ben Gurion University and the Department of Biomedical Engineering for their self-evaluation report and for their hospitality towards the committee during its visit at the institution.

### **Chapter 3: Evaluation of Medical and Biomedical Engineering Study Programs at Technion**

*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.*

#### **1. Executive Summary**

The Committee was pleased and impressed with the level of organization apparent in the department as demonstrated by the quality of preparation for the site visit. The self-study report was also well organized and presented. Based on our interactions with faculty, students and alumni, it is clear that the Department maintains a positive and collegial environment.

The research strengths of the department are mainly in the area of motor control and signal processing (including imaging). These are excellent niche areas for a program of this size to pursue. The faculty demonstrate a good, consistent level of funding and publication numbers.

The department historically has also had research and education activity in biomechanics. Due to impending faculty retirements, this area is in danger of losing critical mass. A departmental strategic planning exercise is required to determine if future hiring should be targeted at restoring critical mass. If sufficient hiring is not feasible, then the department will have to enlist additional adjunct teaching to maintain the undergraduate track.

The quality of instruction provided to students at all levels by the Department is excellent. The department makes good use of faculty from other departments and from industry to round out their programs. In particular, the Committee was impressed with the instruction provided in the area of medical device regulation. It was also apparent that there is a good relationship with the medical school, including provision of teaching. There are some concerns, however, about the consistency and quality of instruction provided for math and physics in years 1 and 2 of the undergraduate program.

The educational programs would be strengthened significantly by quality interaction with industry. It appears that this has waned in recent years for a variety of reasons. The curricula at all levels should encourage students to interact with industry, and courses designed to provide relevant training. This includes making training in medical device regulation and soft skills required for all students. The departmental and course-specific learning outcomes need to be established, and reflective of targeting industry-relevant training.

Going forward, the department would be greatly strengthened by an overall strategic planning process conducted collaboratively and inclusive of senior university officials. The process must include proper shaping of the departmental mission statement and plans for future growth. There is also a need for the department to be housed within one building to enhance cohesion and encourage further collaboration. The department should also enhance the technology transfer activity with informal and formal training in university procedures and best practices for PhD students and faculty.

## **2. Mission and Goals**

### **Observations and findings**

The Medical and Biomedical Engineering Department at BGU has a clearly-articulated mission statement which is supported by several strategic goals. The mission statement is somewhat generic and mentions teaching before research (in both the mission statement and articulation of goals), which is perhaps unusual for a research university. Overall the Committee feels the mission statement is anodyne and did not give a clear indication of the major thrust(s) of the Department.

One of the strategic goals is to enlarge the number of faculty members. The Committee heard divergent views about this matter from the Rector, the Dean of Engineering and the Head of Department. This divergence was surprising to the Committee and indicated that more discussion among leadership is needed on this important point.

The issue of Departmental growth (number of faculty) is one of the key structural matters facing the Department and is intimately bound up with the research and teaching missions of the Department. As described in more detail in the relevant sections below, we found that the Department has critical mass and is producing strong research in the area of motor control and signal processing, which aligns with the Signal Processing track within the undergraduate degree. On the other hand, there is less strength in the area of biomechanics. This was reflected by the comments of the students and alumni, who felt that the Biomechanics teaching track was fragile and less desirable. In view of the impending-retirement of faculty members in the biomechanics area, we see the entire biomechanics activity (research and teaching) within the Department as being at risk. The Committee is of the view that it will be difficult to achieve critical mass in this area and therefore a decision must be made:

(a) either the Department abandons this area of research and delivers the UG Biomechanics track using adjunct faculty; or

(b) The Department concentrates significant hiring activity in this space. It appears to us that it would be necessary to hire at least 5 faculty members in this area (accounting for retirements) to have critical mass.

Of these two options, we favor the first. We were generally impressed by the quality of adjunct lecturers whom we met, which indicates that it is possible to deliver good-quality teaching through the use of adjuncts. The Department has real research strength in motor control and signal processing, and could occupy an important and unique niche within Israel and the world if they further strengthened this area.

It is important for the BGU Department to have links with industry. There are various ways that this can occur; one important way is through 4<sup>th</sup> year student projects, and this was a stated priority for the Department in the self-study report. However, the Committee found that the reality fell far short of the vision in this area and that this aspect of the UG curriculum needs to be strengthened. We are aware of the challenges of industrial linkage for institutions in the periphery, but this matter is structurally important and must be addressed, as outlined in more detail in Section 4.

Another important aspect of industrial linkage is technology transfer. There was little experience with the Tech Transfer office at the university, at least among the people we spoke with. Notably, the Head of Department

was not familiar with this process and we were surprised that he did not have more knowledge in this area, at least knowledge of university policies. We note that the environment in the Department is good. Faculty, students and alumni spoke of the intimate family-like atmosphere within the Department and students particularly appreciated the ability to approach staff and faculty with concerns and questions. The Head of Department appeared to be providing good leadership and was an effective ambassador for the Department.

### Recommendations

#### **Essential:**

- In advance of the 2017/18 faculty hiring cycle, the Department and University leadership make a decision on whether to: (a) largely abandon biomechanics as a hiring area within the Department; or (b) focus significant hiring (c. 5 faculty members) in this area. The Committee suggests that the first of these two options is preferred for reasons articulated above.
- Once the above issue of the biomechanics track is resolved, within 4 months, senior leadership must meet and formulate a plan for departmental growth such that all levels of leadership agree on the target number of faculty members and the timeline for achieving this growth.

#### **Important/advisable:**

- Within one year, better inform faculty and PhD students about the technology transfer activity within the University, perhaps by inviting a representative from this office to visit the Department and give a seminar on the activities of the technology transfer office.

### **3. Organizational Structure**

#### Observations and findings

Although the Department is wholly within the Faculty of Engineering, the delivery of the teaching program relies very much on personnel from both the Faculty of Engineering and the Faculty of Health Sciences. We were pleased that Deans from both faculties met the Committee and had the impression that this arrangement was supported by both Faculties and was generally working effectively.

The Head of Department reports to a Departmental Council. He appears to take this reporting structure seriously, and consults this Council (to the extent possible) on major matters.

Purchasing was mentioned as a problem. The process appears to be overly bureaucratic and extremely slow.

### Recommendations

#### **Essential:**

- The University not change the dual Faculty structure (Engineering and Health Sciences) for supporting the Department, which appears to be working well.

**Important/advisable:**

- Address deficiencies in purchasing procedures by changes in the procedures. If changes are not possible, within 12 months the Department should be provided with 0.3 FTE administrative person who will handle these issues for all faculty.

**4. Study Programs**

Observations and findings

The undergraduate program has two specialization tracks: Signal Processing and Biomechanics. These tracks require students to take two required courses and two electives, plus a laboratory course. The Signal Processing track seems well established and aligned with the research expertise. The Biomechanics track is weaker, as noted by students, alumni, faculty and the Committee. This will be further impacted by impending retirements. Indeed, looking at the curriculum and considering the specialization of the existing faculty, the Committee thinks that the department does not have the critical mass for a biomechanics concentration. Across the few existing core faculty – none is focused on the hardcore/backbone of biomechanics (e.g. tissue biomechanics, biomechanics of the human body, or the more modern fields of mechanobiology and cell biomechanics) and there is no experimental research in the department in this regard.

Most students appreciated the breadth of the undergraduate program, and the Committee recognizes the strength of this approach, which is inherent to the field of biomedical engineering. A few students commented that they would have appreciated more depth of training. The Committee similarly recognizes that this is a constant source of tension in the design of biomedical engineering curricula. Many students indicated that specialization courses should be offered earlier in the undergraduate program. Some of the input from graduate students who went through the undergraduate program and alumni indicated a deficiency in training for computer programming.

The student numbers in the undergraduate program have been flat in recent years. The reasons for this include the number of applications, the desire to keep admission standards high, and a feeling that the department should not dilute their limited teaching resources. Graduate student numbers have increased recently: 17 PhD students and 13 MS students. Most graduate students come from the department's undergraduate program, although there are some foreign students. PhD students are supported 50% by the department, and new faculty get some students supported at 100%. There was a consistently held opinion that further growth in student numbers would depend on hiring additional faculty. The undergraduate student population would benefit from better marketing to recruit more highly qualified students.

The majority of students and alumni expressed concern with the degree to which they were taught soft skills. There is no specific course content, but some reinforcement of writing skills in the laboratory and project courses. One of the alumni stated that training in Design Thinking and creativity would be a good addition to the program, enhancing the transferable skills for industry.



The Masters program was mainly populated by undergraduate students continuing for the combined program. These students pointed out that the course content was mainly provided by other departments, e.g., Electrical Engineering. While this provides additional depth of expertise, it did not provide much contact between the students and the department's faculty.

Industry interaction was minimal or non-existent in the programs, despite statements in the self-study report that this is something the Department emphasizes. The report indicated a high level of industry participation in 4<sup>th</sup> year projects, but discussions with current and former students revealed a very different situation. Some students commented that this activity had diminished to negligible levels in recent years. This appeared to be in part due to past experience with students being used for menial tasks rather than quality supervision of an appropriate project. Equally important, there is little course content aimed at industry. The Committee has the impression that the educational experience is designed by the faculty to clone themselves and produce researchers. This is not well aligned with the stated goals of the department, nor what the Committee feels are the department's strengths.

The department expressed frustration with the training provided by the math and physics departments. On the other hand, the students and alumni seemed satisfied that they had good math skills. This is likely explained by the overall high quality of the students and the math content of the 3<sup>rd</sup> and 4<sup>th</sup> year departmental courses.

The Committee was impressed by the laboratory modules embedded in the frontal teaching, and felt that this was an elegant approach for interlinking theory and practice, especially as related to the robotics course.

The Committee inquired about the similarities and differences with the Biotechnology Engineering program, since it seemed that there might be an opportunity to exploit curriculum overlap. During the visit, it became clear that this is not the case. The Biomedical Engineering program is much more rigorous in its engineering content, so the potential for sharing teaching load is negligible.

Because of its small size, the department has to be creative in its provisioning of the teaching program. It makes good use of adjunct instructors and faculty from other departments, and the Committee was impressed with the quality of these instructors. The department's biology course is currently being taught by a graduate student, with oversight from a junior faculty member. Chemistry was taught within the department but is now outsourced. In many cases, the adjunct instructors come from industry, which can enhance the quality of the education. Notably, the course on medical device regulation is taught by a consultant working actively in this area. He makes good use of case studies of currently marketed devices. Most students take this course but it is not required. The Committee thinks that it should be, and the alumnis' comments support this. The Department provides some instruction in English at the graduate level, including seminars.

## Recommendations

### **Essential:**

- Devote substantial strategic planning efforts to the biomechanics track. Within two years, if appropriate FTEs cannot be devoted, phase out this specialization area.
- Within eight months, complete a strategic planning process to redesign and update the curriculum so that students are better prepared for industry. Incorporate course content relevant to industry (Design Thinking, entrepreneurship, etc.) and establish appropriate goals for industry participation in student projects. Plan for annual updates.
- Undertake marketing targeted to improve undergraduate applicant quality, in preparation for possible increase in numbers. The marketing materials indicate the breadth of training provided by the program, and why that is a strength.
- Make the *Entrepreneurship and Regulation in Development of Biomedical Products* course required for all undergraduate students.
- Establish a course in communication skills and require it for all undergraduate and graduate students.

### **Important/advisable:**

- Continue to push other departments to provide high quality teaching for service courses.

## **5. Human Resources / Faculty**

### Observations and findings

The number of faculty is small and this is a major issue for the Department (see Section 2). The Committee felt that the level of faculty performance was uneven: some were very productive and others were less so.

The support staff within the Department appeared competent and we felt that the provision of Departmental support services was adequate and suitable.

### Recommendations

#### **Essential:**

- Continue to be attentive to the significant value that support staff bring to the Department and maintain this level of support.

## **6. Students**

### Observations and findings

While BGU is geographically located in the Negev to serve the population in the south of Israel, in practice the students enrolled in the BME program also come from the center and the north of the country, which is encouraging as it indicates that BGU is not a 'local' university but rather, a national university at the Israeli scale. While interviewing the students the Committee had concerns that some fundamental knowledge aspects, particularly in biomechanics (at the whole body as well as the cell scales) were not as strong as they should be, as students were unable to answer simple questions such as what the area under the stress-strain curve indicates (strain energy density) or what the order of magnitude of length of a fibroblast is (30-100 microns). Appreciating that the interviewed group of

students may not be a statistical sample of all BME undergrads at BGU, we asked these questions since we suspected that biomechanics topics are not adequately covered in the curriculum, given the too-few faculty who manage the program and the lack of faculty with a strong biomechanics research track (as opposed to motor control and mass transport).

The Committee was concerned to hear from students that the menu of courses is poor (particularly with regard to electives), from the faculty that they are overstretched in teaching duties (on top of administration) and cannot take any more teaching, and from management (Dean, Rector) who described a situation of a department which has not grown recently, and where retirements are expected soon. Departmental strategic planning must address how to augment the department, particularly with regard to its teaching resources which are spread thin and do not cover all basic requirements of a conventional BME curriculum, particularly in biomechanics.

The Committee was surprised to hear from management that there is a plan to grow the number of students, but no solid plans to grow the number of faculty. This indicates a lack of strategic planning for the department that, since the sad passing away of its previous chair Prof. Amir Karniel, appears to not be expanding strategically. Though the Department has successfully recruited faculty lately, the recently recruited faculty do not even appear to cover the expected number of retirements or the gaps in the undergraduate curriculum. One example of existing gaps in teaching is that cell biology – a fundamental course in BME undergrad studies – is currently being given by a doctoral student who, as good as he may be, cannot substitute for an experienced teacher in this area. If the department had core faculty in say, cell mechanics or tissue engineering, with a strong biology background, this problem would be solved.

The Committee was told that the department needs to grow the number of students but at the same time cannot lower thresholds of acceptance, as even today, dropout rates are substantial. While there is perhaps room for better marketing of the BME department to recruit better students, this observation again points to the need to have a richer curriculum – taught by more core faculty.

At the graduate level the Committee observed a substantial presence of foreign students, especially from India, and while appreciating the aspiration of the department to excel at an international level, the Committee felt that there should be more focus on investing in Israeli BME undergrads from BGU but also from Tel Aviv University and the Technion. Top BGU undergrad students should be encouraged to stay in the department as graduate students. The Committee appreciates that there is competition over the best graduate students with institutes such as Tel Aviv University and the Technion, however students also commended the intimacy of the Department at BGU, and the Committee feels that these rather unique strengths of the department should not be compromised. Hence, rather than trying to stretch beyond the capacity and physical size of the department – in both personnel and physical resources, the Department should prioritize Israeli graduate students, with emphasis on students who completed their undergrad studies at BGU.

The program appears to be not sufficiently connected to industry. The number of undergraduate students who did their 4<sup>th</sup>-year project in a company is small, and students as well as alumni commented that they sometimes seem to lack a sufficient depth and breadth of soft skills (such as communication and report writing, training in regulation and ethics, etc.) that is needed in daily industry work.

### Recommendations

#### **Essential:**

- Within two years, recruit new adjunct faculty to strengthen the biomechanics concentration in the curriculum, or alternatively, focus only on signal processing and motor control in the BME undergrad and grad programs (see Section 2).
- Increase the number of students after, and not before, the gaps in core faculty have been minimized or closed.
- Prioritize recruitment of Israeli Masters and PhD students over foreign students.
- Within two years, the cell biology course be given by a faculty member, either internal to the department or as a service course from another department/faculty.
- Strengthen ties with the biomedical industry by offering more undergrad 4<sup>th</sup>-year projects directly co-supervised by industry, and by bringing in industry key opinion leaders to teach guest lectures and courses on relevant topics such as clinical trials, regulation and ethics.

## **7. Teaching and Learning Outcomes**

### Observations and findings

The Committee noted that the departmental learning outcomes are vague, and that none of the department courses' syllabi listed learning outcomes.

### Recommendations

#### **Essential:**

- Within 8 months, establish departmental learning outcomes by consensus.
- Within 8 months, list learning outcomes in the syllabi of all departmental courses, and establish mechanisms for reviewing and updating all outcomes regularly.

## **8. Research**

### Observations and findings

During the evaluation process, the Committee learned about the main vision and motivation for establishment of the Ben-Gurion University of the Negev, i.e. “to make the desert bloom”. The Committee found that, indeed, this Department is helping to fulfill the main mission of the University by fostering regional development.

The Committee found that there was a clear distinction between the Department of Biotechnology Engineering and the Department of Biomedical Engineering. Whereas Biotechnology Engineering had a strong focus on drugs, pharmaceuticals, biomaterials and tissue engineering, the Biomedical Engineering Department had a recognizable brand in the development of robotic technologies, biomedical optics, biomedical signal processing and motor-learning in addition to representative faculty that are conducting research in biopharmaceuticals and nanomedicine. As the department is small (only 7 faculty members), it cannot possibly cover the entire breath of biomedical engineering and should strive to make an impact in the focus areas listed above. In some of those areas (e.g. robotics), the department clearly has a significant potential to become competitive at the international scale and may choose to further build in those areas. The Committee finds that the Department can offer unique research content within the BGU as well as within Israel.

Using Google Scholar and Pubmed databases, the Committee found that the faculty members published around 3 research papers or conference proceedings per year (between 2014 and 2016), some in notable journals such as Nature Communications, Nature Nanotechnology and JACS. This output is expected to improve further as research programs of the junior faculty mature. Data provided to the committee in December 2016, indicated that the Department was able to raise individual and team grants of various duration (1-5 years), valued at over \$14 million in total and spanning the period between 2010 and 2019. These data also indicate that the level of funding per faculty was over \$500,000 per faculty member per year. Some of the larger grants included multiple PIs and multiple institutions, thus it was not entirely clear how much funding was allocated directly for the Ben Gurion University BME faculty members, and the amount per faculty member per year may in fact be lower. The Committee found that the new faculty members were ambitious, they were able to win competitive external grants and expand their labs in a significant manner quickly. We thought that the Department found a clever way to share the time of technical staff between the research labs and the teaching labs, and this practice should surely continue. Research labs were well equipped.

The Committee also found that there were no barriers to collaborative research within the University and that interdisciplinary research is encouraged through the establishment of several interdisciplinary research centers. The centers are usually resourced by the faculty research grants, sometime by government help and/or by donations (the university almost never funds research directly due to insufficient funds.) Overall, the Committee found that this Department largely

fulfilled the mission of its University and it had the potential to grow further in the target research areas.

### Recommendations

#### **Essential:**

- Continue with the practice of providing technical staff to the research labs by sharing their time between teaching lab duties and research lab duties.
- Establish effective mechanisms for sharing best practices in grant writing and coaching amongst the faculty members to ensure all are successful in winning competitive research grants.
- Identify target areas that further support the Department's uniqueness for potential new hires (e.g. robotics, biomedical optics, signal processing etc).

## **9. Infrastructure**

### Observations and findings

The Committee was impressed overall with the infrastructure seen during the site visit, including both research and teaching laboratories. The research laboratories were all well-equipped, with nice space and relatively new equipment. They were up-to-date in the different sub-fields of specialization, particularly in the robotics, motor control and the optics laboratories. The central issue in the department's infrastructure is its physical dispersion – a point emphasized by the department chair and the dean. This physical dispersion means that the department is constantly struggling to maintain administrative coherence and to develop a social, intellectual, and professional community which is necessary for research to flourish and students to become intellectually and personally engaged in their research. Bringing the department together under one roof should be a priority to BGU. The Committee was also impressed by the efficient use of technical administrative staff in both research and teaching, which leverages both aspects. The student computer room was noticeably small and not well equipped. When we asked students about this, they said that they just make use of the university facilities elsewhere.

### Recommendations

#### **Essential:**

- Concentrate all faculty members in one building within the next 5 years. Specifically, make all efforts to populate the department – faculty, their research labs and teams, and the administrative staff under one roof, in a dedicated building or floors of a building. The Committee believes this is absolutely essential for research collaborations and efficiency – and should increase the research outcomes when done.

#### **Important/advisable:**

- Within two years, move the department computer facility to a larger space, or eliminate it and convert the current space to a different function.

## **10. Self-Evaluation Process and implementation of previous recommendations**

### **Observations and findings**

The Committee found that there were appropriate departmental mechanisms of self-evaluation. The Committee was very pleased with the organization of the self-evaluation report. Notably, the Department took the self-evaluation exercise to heart and worked collaboratively to identify main strengths/weaknesses in both Department teaching and research activities. At the end of each chapter, a very thorough analysis of both strengths and weaknesses was described. The meeting materials at the site visit were extremely well organized and detailed. The Committee would like to thank the Department for its attention to such details. We were very impressed by the contents of the USB key we received, especially the short movies prepared by the faculty members who were unable to meet with us due to conflicts.

Teaching evaluations are performed for each course and for each instructor at the end of the semester, enabling the instructor to enhance the level of teaching effectiveness the next time the course is offered. At the individual level, each faculty member undergoes a performance review based on the data submitted to the department head. The department head reviews the academic progress of all faculty members every semester. Each junior faculty member receives appropriate mentoring. More detailed evaluations are performed during promotions. In addition, the Departmental Council meets once a month and has opportunities to influence major decisions that are brought up by the department head. Overall, this Committee did not find any deficiencies in the self-evaluation.

### **Recommendations**

#### **Desirable:**

- Since the self-evaluation exercise worked very well for this Department, incorporate elements of departmental self-evaluation into the regular activities by running an abbreviated version of the activity once every 5 years. This will help the Department to benchmark if it is on track or not.

## **Chapter 4: Summary of Recommendations and Timetable**

### **Essential recommendations:**

- In advance of the 2017/18 faculty hiring cycle, the Department and University leadership make a decision on whether to: (a) largely abandon biomechanics as a hiring area within the Department; or (b) focus significant hiring (c. 5 faculty members) in this area. The Committee suggests that the first of these two options is preferred for reasons articulated above.
- Once the above issue of the biomechanics track is resolved, within 4 months, senior leadership must meet and formulate a plan for departmental growth such that all levels of leadership agree on the target number of faculty members and the timeline for achieving this growth.
- The University not change the dual Faculty structure (Engineering and Health Sciences) for supporting the Department, which appears to be working well.
- Devote substantial strategic planning efforts to the biomechanics track. Within two years, if appropriate FTEs cannot be devoted, phase out this specialization area.
- Within eight months, complete a strategic planning process to redesign and update the curriculum so that students are better prepared for industry. Incorporate course content relevant to industry (Design Thinking, entrepreneurship, etc.) and establish appropriate goals for industry participation in student projects. Plan for annual updates.
- Undertake marketing targeted to improve undergraduate applicant quality, in preparation for possible increase in numbers. The marketing materials indicate the breadth of training provided by the program, and why that is a strength.
- Make the *Entrepreneurship and Regulation in Development of Biomedical Products* course required for all undergraduate students.
- Establish a course in communication skills and require it for all undergraduate and graduate students.
- Continue to be attentive to the significant value that support staff bring to the Department and maintain this level of support.
- Within two years, recruit new adjunct faculty to strengthen the biomechanics concentration in the curriculum, or alternatively, focus only on signal processing and motor control in the BME undergrad and grad programs (see Section 2).
- Increase the number of students after, and not before, the gaps in core faculty have been minimized or closed.
- Prioritize recruitment of Israeli Masters and PhD students over foreign students.
- Within two years, the cell biology course be given by a faculty member, either internal to the department or as a service course from another department/faculty.
- Strengthen ties with the biomedical industry by offering more undergrad 4<sup>th</sup>-year projects directly co-supervised by industry, and by



bringing in industry key opinion leaders to teach guest lectures and courses on relevant topics such as clinical trials, regulation and ethics.

- Within 8 months, establish departmental learning outcomes by consensus.
- Within 8 months, list learning outcomes in the syllabi of all departmental courses, and establish mechanisms for reviewing and updating all outcomes regularly.
- Continue with the practice of providing technical staff to the research labs by sharing their time between teaching lab duties and research lab duties.
- Establish effective mechanisms for sharing best practices in grant writing and coaching amongst the faculty members to ensure all are successful in winning competitive research grants.
- Identify target areas that further support the Department's uniqueness for potential new hires (e.g. robotics, biomedical optics, signal processing etc).
- Concentrate all faculty members in one building within the next 5 years. Specifically, make all efforts to populate the department – faculty, their research labs and teams, and the administrative staff under one roof, in a dedicated building or floors of a building. The Committee believes this is absolutely essential for research collaborations and efficiency – and should increase the research outcomes when done.

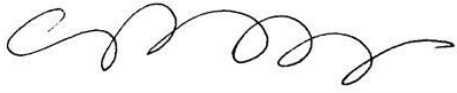
**Important/advisable recommendations:**

- Within one year, better inform faculty and PhD students about the technology transfer activity within the University, perhaps by inviting a representative from this office to visit the Department and give a seminar on the activities of the technology transfer office.
- Address deficiencies in purchasing procedures by changes in the procedures. If changes are not possible, within 12 months the Department should be provided with 0.3 FTE administrative person who will handle these issues for all faculty.
- Continue to push other departments to provide high quality teaching for service courses.
- Within two years, move the department computer facility to a larger space, or eliminate it and convert the current space to a different function.

**Desirable recommendations:**

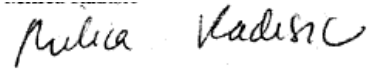
- Since the self-evaluation exercise worked very well for this Department, incorporate elements of departmental self-evaluation into the regular activities by running an abbreviated version of the activity once every 5 years. This will help the Department to benchmark if it is on track or not.

**Signed by:**



---

Prof. Ross Either, Committee Chair



---

Prof. Milica Radisic



---

Prof. Jimmy Moore



---

Prof. Amit Gefen

November 2016

Prof. C. Ross Ethier

Department of Biomedical Engineering  
Georgia Institute of Technology & Emory University School of Medicine  
USA

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 the Chair of the Council for Higher Education's Committee for the Evaluation of the study programs in Medical and Bio-Medical Engineering. In addition to yourself, the composition of the Committee will be as follows: Prof. James Moore, Prof. Milica Radisic and Prof. Amit Gefen.

Ms. Alex Buslovich-Bilik 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 the Chair of this most important committee.

Sincerely,

Dr. Rivka Wadmany  
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. Alex Buslovich-Bilik, committee coordinator

**6/12/2016**

**Medical and Bio Medical Engineering –schedule of site visit**  
**Ben Gurion University Building: 30 Room: 300**

<b>Time</b>	<b>Subject</b>	<b>Participants</b>
09:00-9:30	Opening session with the heads of the institution and the senior staff member appointed to deal with quality assessment	<ul style="list-style-type: none"> <li>• Prof. Zvi Hacothen – Rector</li> <li>• Prof. Gad Rabinowitz – Vice Rector</li> <li>• Ms. Adi Zinger – Quality Assessment Coordinator</li> </ul>
9:30-10:15	Meeting with Deans of Faculty Engineering & Faculty of Health Sciences	<ul style="list-style-type: none"> <li>• Prof. Joseph Kost – Dean, Faculty of Engineering</li> <li>• Prof. Amos Katz – Dean, Faculty of Health Sciences</li> <li>• Prof. Stanley Rottman - Faculty of Engineering, Quality Assessment Coordinator</li> <li>• Prof. Dan Greenberg- of Health Sciences, Quality Assessment Coordinator</li> </ul>
10:15-11:15	Meeting with the academic head of the Department of Bio Medical Engineering	<ul style="list-style-type: none"> <li>• Prof. Opher Donchin – Head</li> <li>• Mrs Dorit Daloya – Administrative Coordinator</li> </ul>
11:15-11:45	Meeting with senior academic staff with tenure (representatives of relevant committees)*	<ul style="list-style-type: none"> <li>• Dr. Giora Enden</li> <li>• Prof. Gal Debotton</li> </ul>
11:45-12:20	Meeting with Junior (untenured) academic staff **	<ul style="list-style-type: none"> <li>• Dr. Ilana Nisky</li> <li>• Dr. Alberto Bilenca</li> </ul>
12:20-13:00	Meeting with Adjunct academic staff	<ul style="list-style-type: none"> <li>• Dr. Ron Shmueli</li> <li>• Dr. Raphael Gonen</li> <li>• Dr. Gur Mittelman</li> <li>• Dr. Elia Paz</li> </ul>
13:00-13:45	Lunch (in the same room)	Closed-door working meeting of the committee
13:45-15:00	Tour of research labs	<ul style="list-style-type: none"> <li>• Prof. Opher Donchin – Head</li> </ul>
15:00-15:45	(Open Slot)- Tour of teaching labs and classrooms	<ul style="list-style-type: none"> <li>• Prof. Opher Donchin – Head</li> </ul>
15:50-16:30	Meeting with B.Sc students and MA students **	<ul style="list-style-type: none"> <li>• Mr. Eitamar Tripto – B.Sc 3<sup>rd</sup> year</li> <li>• Mr. Naor Deri – B.Sc 3<sup>rd</sup> year</li> <li>• Ms. Daniela Shabodiash – B.Sc 4<sup>th</sup> year</li> <li>• Ms. Hadas Lupa – B.Sc 4<sup>th</sup> year</li> <li>• Ms. Danit Itzkovich – B.Sc 4<sup>th</sup> year</li> <li>• Ms. Stav Biton – M.Sc 1<sup>st</sup> year</li> </ul>

		<ul style="list-style-type: none"> <li>• Mr. Shaked Regev – M.Sc 2<sup>nd</sup> year</li> <li>• Ms. Ruby Simply – M.Sc 2<sup>nd</sup> year</li> <li>• Ms. Lianne Maurice – M.Sc 2<sup>nd</sup> year</li> <li>• Ms. Lior Damti – M.Sc 3<sup>rd</sup> year</li> </ul>
16:30-17:10	Meeting with PhD students**	<ul style="list-style-type: none"> <li>• Mr. Nadiv Dharan</li> <li>• Mr. Eliran Dafna</li> <li>• Mr. Itay Remer</li> <li>• Mr. Iftach Nudel</li> <li>• Mr. Amit Milstein</li> <li>• Mr. Tomer Sinai</li> <li>• Mr. Doron Yariv</li> </ul>
17:10-17:50	Meeting with Alumni**	<ul style="list-style-type: none"> <li>• Mr. Stass Gorbozky</li> <li>• Ms. Sharona Bistri</li> <li>• Ms. Yulia Malichov</li> </ul>
17:50-18:10	Closed-door working meeting of the committee	
18:10-18:35	Summation meeting with heads of institution, Dean of the faculty and head of department.	<ul style="list-style-type: none"> <li>• Prof. Gad Rabinowitz – Vice Rector</li> <li>• Prof. Joseph Kost – Dean</li> <li>• Prof. Stanley Rottman – Faculty Quality Assessment Coordinator</li> <li>• Prof. Amos Katz – Dean, Faculty of Health Sciences</li> <li>• Prof. Dan Greenberg – of Health Sciences, Quality Assessment Coordinator</li> <li>• Prof. Opher Donchin – Head</li> <li>• Ms. Adi Zinger – Quality Assessment Coordinator</li> </ul>