BILKENT STRATEGIC PLAN FOR RESEARCH

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Executive Summary

Consistent with the vision and mission of Bilkent University, the strategic plan for research is a bold and aspirational one. Bilkent has rapidly reached a world-class status and, in the second quarter century since its founding, it aims to be a leading contributor to solutions that address grand challenges Turkey and the world face with high-impact research. The challenges Bilkent faces are both local and global, particularly in competition for talent.

The strategy is to invest in research on selected important problems by either responding to opportunities or creating new opportunities. Part of the strategy is for the University to develop its own processes for selection and investment. The most important element of the strategy is to recruit and to retain faculty and to develop highly productive research groups and infrastructure. Important problems, such as those addressing grand challenges, often require diverse set of research skills and backgrounds and transcend academic territories beyond the traditional departments. The plan proposes establishing infrastructure that provides an environment conducive to innovation and creativity through synergy.

Traditionally, graduate education and doctoral students have been an essential part of the research enterprise in universities. This model needs to be augmented with professional research staff for high-impact, competitive research outcome that can lead to Nobel prizes.

The strategic report also identifies numerous infrastructural needs that need to be created or strengthened. Among these are offices for sponsored research, technology transfer, medical ethics. Also suggested are reconsideration of evaluation processes that involve research productivity measures and faculty performances, which have unintended undesirable consequences.

The challenges that are beyond the University include laws and regulations that govern universities, patent laws, funding for research, and other factors.

1   Preamble

The purpose of our strategic plan for research is to make recommendations for actions by which Bilkent university can be placed in the forefront of research areas it chooses to focus on in the second quarter century of its journey. In this context, this document explores the steps that must be taken to enable Bilkent as a whole and faculty members individually to reach their respective potentials and the means by which to further increase the university's potential in terms of research impact.

We have asked for and received numerous suggestions, views, and ideas from our community of faculty, graduate students and other stake holders.

The view that emerged is that, broadly, there are two essential elements for taking giant steps in research: individuals and the environment in which they perform their tasks. Consequently, the first set of our recommendations addresses how to recruit and retain the best faculty and staff and attract students, post-docs and researchers from around the world. The second part of our recommendations addresses the physical infrastructure as well as processes and other mechanisms that affect research directly and indirectly.

2   Goals and Aspirations

Our ultimate goal is to conduct high-impact research, results of which recognizably benefit humankind. In addition to contributing to the well-being of the world, such successful research also enhances Bilkent's reputation and portfolio, and thus enabling it to do even better by building on its successes.

High-impact research is defined by some as developing solutions to complex problems humanity faces, those that are considered as important by many. In the course of solutions to such complex problems, new science and technology will be developed, for which our faculty and students will be recognized. Others define high-impact research as changing the way scientists have been thinking about an issue or introducing new methods, designs and ideas; Nobel-level research is an example of high-impact research.

By its very nature, this report addresses numerous improvements necessary or desirable that are necessary to carry out higher-level research-oriented goals. In that sense, the range of recommendations include improvement of physical infrastructure as well as recruitment of current and potential Nobel Laureates.

3 External Landscape

3.1 A Brief Overview of S&T in the World and Turkey

Since shortly after the founding of Bilkent, in the wake of the Cold War, the world has experienced a wave of market liberalization that led to the current interconnected economies. Concurrent with these, many of the emerging nations recognized the importance of S&T and R&D to their economies. Investments in infrastructure and research and development have increased across the board. Turkey also started similar investments in recent years but the competition is no longer only the USA, Western Europe and Japan, but includes Asia-9 led by China and followed by South Korea, Taiwan and others. Long terms plans for R&D in countries such as Switzerland to Brazil to South Africa are impressive in their magnitudes and effective use.

Turkey has a strategic goal of becoming one of G-10 economies by 2023. One indicator that sets G-10 countries apart is the percentage of their export of high-technology goods to their total exports. For Turkey to increase this particular indicator from where it is now, targeted strategies are necessary in the high-tech fields.

A seemingly unrelated issue to R&D is the state of S&T in the region and possible role Turkey can have to help in its development. Science and Technology policies, higher education investments and policies are also needed for the countries in our region and Turkey has a role to play.

The changing nature of S&T and the significance of R&D at Universities and by Industry appear in the agenda of the nation and of course form the basis of resource allocation for research in Turkey and in particular at universities.

Against this background, Bilkent has a strategic importance for Turkey and the region and has the potential to become one of the leading research and higher education universities in the world. This part of the strategic report addresses larger goals as well as steps that must be taken for Bilkent to achieve them. These goals should be as bold and visionary as the goal with which Bilkent was formed to carry out its mission set by its founder Hoca Bey, Prof. Ihsan Dogramaci.

3.2 Main Sources of Research Support in Turkey

The main sources of academic research support for Bilkent faculty are TÜBİTAK and EU Framework Programmes. These are:

- TÜBİTAK National Support Programmes
  - 1001 Support Program for Scientific and Technological Research
  - 1002 Short Term R&D Funding Program
  - 1003 Primary Subjects R&D Funding Program

- - - o 1007 Public Institutions Research Funding Program
      - o 1008 Patent Application Promotion and Funding Program
      - o 1011 International Scientific Research Program (UBAP)
      - o 1010 Global Researcher Program (EVRENA)
      - o 3501 National Young Researchers Career Development Program
  - EU Programmes
    - o Framework Programmes
      - ▪ Collaboration programmes
        - Network of Excellence (NoE)
        - Strep projects
        - Integrated projects
      - ▪ Ideas
        - ERC Advanced Grants
        - ERC Starting Grants
      - ▪ People (Marie-Curie Actions)
        - Initial Training
        - Life-Long Training
        - Industry-Academia
        - International Dimension
      - ▪ Capacities
        - Research Infrastructures
        - International Cooperation
    - o COST Actions
    - o ERA-NET

In addition to the above, the following sources are available.

- DPT (State Planning Institute) fund
- SSM (Undersecretariat for Defense Industries) projects
- Ministry of Industry (SANTEZ projects)
- Ministry of Development
- Ministry of Transportation and Communications

4   State of the Research Enterprise at Bilkent

What are some performance indicators that should be monitored in the quest for becoming a better research university? University of Arizona Center for Measuring University Performance (MUP) publishes annual reports that rank top US research universities. They use four categories of criteria.

- Volume of research grants
- Faculty
    - o Number of National Academy Members
    - o Faculty awards
- Advanced training

- - o Number of doctorates granted
    - o Number of post docs
  - Undergraduate education
    - o Median SAT

Although these measures are not directly applicable to Bilkent, they indicate that what distinguishes a research university is excellence across the board. Excellence in research has to be approached as a total quality control problem, across the broad spectrum of all university activities and all departments.

Often performance metrics are designed to measure rote numbers since measuring quality is subjective and difficult. Such measures may foster mediocrity rather than promoting excellence. For example, the number of doctoral degrees granted per year may be doubled in a matter of years by lowering standards. It is only through extraordinary achievements of its faculty and students that Bilkent can distinguish itself and rise in the ranks of top global research universities.

Two basic characteristics of top research universities are:

- They create a culture of excellence that attracts faculty and students from an international pool of highly motivated and talented individuals.

- Promotion and tenure policies are in place to create a safe and stable environment for the faculty. Faculty are encouraged to undertake long-term high-risk research projects with potentially very high impact.

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4.1   Funded Research at Bilkent

A snap-shot view of research funding at Bilkent is given in Figure 1, with details in the Appendix. A glance at the numbers suggest that Defense related funds make up the bulk of funding. It is also striking that the a few large-funds skew the statistics.
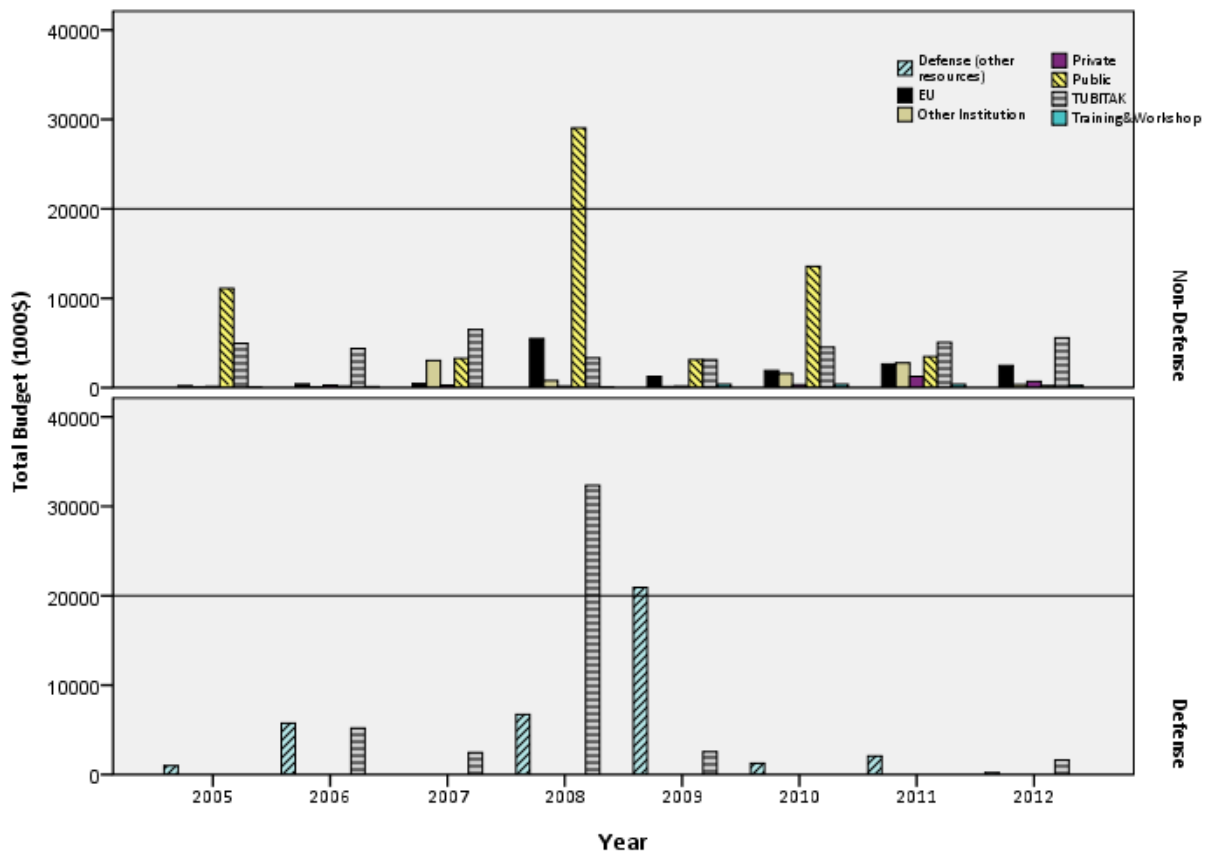

Figure 1: Projects Total Budget (1000$)

Involvement of a large number of researchers in large-budget projects are the norm for research centers and research institutes that produce significant research results that also lead to publications, patents, degrees awarded. Bilkent should strive to embody such centers of excellence on selected topics.

4.2   Graduate Students

One respondent to the Faculty Survey wrote:

"I was Assistant Prof. at U of X when I joined Bilkent. If I stayed at U of X, I would have supervised at least 15 Ph.D. students. As of now, I was able to supervise only 4 Ph.D. students at Bilkent."

One of the major handicaps of Bilkent is to find Ph.D. students in sufficient numbers and quality to participate in and conduct research. While universities in US and Europe attract the best graduate students from around the world, Bilkent is lagging far behind in this regard in S&T disciplines. Top students typically leave as they graduate from Bilkent with a BS degree. A second group of students leave after completing their MS studies. Bilkent's strength lies in its undergraduate program; it attracts top talent from Turkey into its undergraduate program and serves as a "feeder institution" to top US universities. Similar challenges are faced by institutions all around the world, from India to Brazil, Iran to Taiwan.

The lack of graduate students in sufficient number and quality impacts research at Bilkent negatively in a number of ways:

- Creates a gap in human resources to carry out intensive research. This impacts the career development of Bilkent faculty negatively.

- Large-scale research projects cannot be undertaken for lack of PhD students. In existing projects (such as TUBİTAK 1001 projects) much of the money allocated for graduate student support is returned unused because qualified students cannot be recruited.

- The graduate curriculum remains weak; advanced courses cannot be opened due to lack of sufficient number of students. Bilkent graduates fail to develop themselves as much as students at peer institutions.

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To put the situation at Bilkent in perspective, according to *The US News and World Report,* in 2011 there were roughly 2800 students enrolled in the M.I.T. PhD program, with a PhD student to faculty ratio of 4.7:1. This corresponds to an estimated 1 PhD degree per year per faculty. It is also worth noting that each year M.I.T. grants roughly 600 PhDs. Bilkent Graduate Programs in science and engineering is small in size compared to the top US research universities.

Table 1: Master granted by Bilkent Science and Engineering Departments.

Year	CHEM	MATH	PHYS	MBG	MSN	EEE	CS	IE	ME
1987			**1**			**1**	**7**		
1988			**1**			**4**	**7**	**5**	
1989			1			9	3	1	

Year									
1990						7	4	9	
1991	3					7	6	1	
1992		3	1			9	18	12	
1993		5	4			8	8	11	
1994		4	5			6	6	8	
1995		6	7			20	11	6	
1996	2	1	4	6		22	15	21	
1997		1	2	6		12	9	6	
1998		5	7	6		11	10	3	
1999	2	4	7	2		8	8	9	
2000	3	1	4	5		11	18	16	
2001	6	6	4	5		12	22	13	
2002	4	6	10	4		18	9	13	
2003	6	6	7	6		8	18	12	
2004	4	5	3	4		19	6	9	
2005	2	6	5	4		26	11	12	
2006	4	2	2	7		18	20	5	
2007	3	2	7	7	5	16	27	7	
2008	4	4	6	9	9	33	24	16	
2009	6	5	5	7	8	34	29	9	
2010	6	3	1	3	5	26	23	7	2
2011	11	8	6	1	17	21	27	17	4
2012							2		
Total	66	83	98	82	44	361	334	223	6

Table 2: PhDs granted by Bilkent Science and Engineering Departments.

Year	CHEM	MATH	PHYS	MBG	MSN	EEE	CS	IE
2012						1		
2011	4	1	3	4	2	6	2	3
2010			4	6		9	4	3

2009	1	3	4	6		4	5	3
2008	1	5	7	1		4	3	2
2007		1	5				1	2
2006	1	2		2		2		2
2005		1	5	1		3	3	3
2004			2	1		1		1
2003		2		1		3	1	1
2002		3	2	6		3	1	
2001			1	1		3	2	1
2000	1	1	3	2		1	2	
1999		3	3			5	1	1
1998		3	2			2	1	1
1997		2	1			4	1	
1996						1		
1995						3	2	1
1994			1			4	2	1
1993							1	2
1992		1	2			2	2	1
1991						2		2
1990			1					
1989						1		
Total	8	28	46	31	2	64	34	30

Table lists the number of PhD degrees granted by the departments in the faculties of science and engineering of Bilkent University. Table 2 lists the number of full-time faculty members in the same departments.

Table 3: No of faculty members in Bilkent Science and Engineering Departments.

	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Faculty of Science	55	58	55	52	52
Chem	9	10	10	10	10

Math	18	21	19	18	18
Phys	17	16	15	14	14
MBG	11	11	11	10	10
MSN					
Faculty of Engineering	63	67	67	64	60
CS	17	19	20	18	16
EEE	26	27	26	26	25
IE	20	21	21	20	19

These tables show that the ratio of number of PhD degrees to the number of faculty members is roughly 3 for the EEE Department over a 20 year time span. The same ratio for CS is roughly 1.5. Number of PhD's per year is roughly 3 for EEE and 1.5 for CS. These numbers verify that the quote in the beginning of this section represents the typical situation across many departments. In fact, on closer inspection, one sees that some faculty members have not yet graduated a single doctoral student.

5   Strategies for Recruiting and Retaining Faculty

Recruitment and retention of faculty have several different dimensions, particularly when considered as a global competition for talent. The primary factors in recruitment and retention are somewhat different for younger researchers than more senior ones, but center around the perceived ability to reach individual's research potential combined with living conditions that take into account families. Accordingly, infrastructure and research environment become important in competition for talent.

Bilkent would benefit from having more senior researchers who are well recognized and established, who can bring additional talent and experience and attract others. Similarly, attracting younger researchers and retaining younger ones who are here also require attention to their needs. Some of these are outlined below.

1. **Mentoring** is an instrument that can be effective in retaining promising faculty. Relatively established and junior researchers exhibit different kinds of needs in terms of mentoring. While an effective mentoring procedure may be difficult to establish, given difficulties involved in weighing the advantages and disadvantages of choosing mentors from the same field/department/school versus a somewhat/totally different field/department/school, one such procedure may be relatively easy to establish: mentoring for new junior faculty about the 'nuts and bolts' of the annual, biannual evaluation and promotion processes of the University. This would be helpful in demystifying all three processes and removing demoralizing 'rumors' from circulation. While all three procedures are well set up and clear, survey results have once again have shown that they are not always well communicated to faculty. Accordingly appointing a

mentor to each new faculty would be helpful in retention. These mentors could be selected from former high-level administrative staff of the University or staff who have previously served on the promotion committee. Since their task would be to disseminate information on the 'nuts and bolts' of the aforementioned three procedures, they need not be in the same field/department/school as the faculty member.

2. **Performance feedback** is another instrument that could be more effectively utilized in faculty retention. Performance evaluation and performance feedback are very different tools and are used toward different ends. When the two are conflated, faculty who do poorly in performance evaluations are deprived of guidance and resources that would help him/her succeed. Faculty who do well in the performance evaluations also express need for performance feedback to find out ways of excelling in their field. Institutions which are effective in showing that 'they care' in the form of performance feedback have proven successful in faculty retention even as they impose stringent faculty evaluation criteria.

3. Performance feedback programs could be coupled with **faculty development programs**. While Bilkent University recruits top-level researchers, even top-level researchers cannot always keep up with the latest developments (new software, new research techniques, new research communication conduct techniques and strategies, etc.). Furthermore, all faculty need honing their research skills in the form of 'continuous learning' programs for faculty, top-of-the-range software provision and support, myriad IT skills and workshops (on paper/grant writing, time management, dealing with rejection of manuscripts/project proposals etc.). Such workshops and teaching sessions may be offered by professionals form outside Bilkent. They may also be offered by Bilkent faculty who have devoted the time and effort to acquire and/or perfect such new skills. The latter may also be utilized to reward such faculty by promoting the leadership they exhibited when acquiring such skills.

4. **Start-up funds and teaching relief for newly appointed faculty** has proven to be high on the agenda of surveyed Bilkent Faculty. Best practice of top level research universities in the world also point in this direction. While TUBITAK offers some start-up funds for junior faculty, they are not available to all new hires. In a similar fashion, TUBA GEBIP funds are offered competitively and are awarded to young researchers to have demonstrated 'promise to excel' in their field. Such funds could potentially allow new hires to write more ambitious research grant proposals and aim for higher-level journals than they would otherwise do.

5. Depending on the field, undergraduate and postgraduate teaching needs of a Department and its potential for excellence in research may or may not overlap. In the absence of such overlap, Departments could be allowed to have a dual tier career structure: teaching track faculty and research track faculty. The need for

dual tier career structure was another finding of the survey conducted by the group. Offering dual tier career options at the moment of hiring or after the first couple of years at Bilkent University would allow faculty to decide where to excel: teaching or research. Of course faculty in any of these two categories must be valued and respected equally.

6. Those faculty members who excel in research could be allowed **flexibility in terms of organizing their teaching load** in an institutionalized (as opposed to ad hoc) manner. Faculty members who (for research reasons) express a desire for rearranging their teaching load in 1+3 or 1+2+1(Summer) could be allowed to do so as long as they apply early to their respective departments. Alternatively, they could be given the option to organize their own weekly schedule, for example by concentrating their classes on two days. The University's current commitment to offer many of the must courses both semesters may be helped through such an arrangement. Teaching buy outs may also be offered somewhat more liberally depending on the kind of resources and/or prestige faculty members are able to bring to Bilkent.

7. **Small-scale research funds** could be made available to researchers whose research needs are not met by TUBITAK funds. These funds could be offered competitively and only to those researchers who can demonstrate that their research design does not allow for applying for other funds.

6   Strategies for Advanced Training

6.1   Recruiting and Retaining highly qualified PhD Students and Post-Docs

Can Bilkent realistically hope to match the top US research universities in terms of the effectiveness of its graduate program? For example, what can be done to increase the number of PhD degrees granted per faculty per year from its very low levels to a reasonable number such as 0.5 in a 5-year time horizon? This is an issue with many facets and some of the key factors (mostly financial) that will eventually determine success lie outside Bilkent's control. A large scale and coordinated effort is necessary on many fronts. On the graduate students' front, some minimal measures that appear necessary may be listed as follows:

- Invest in the graduate program. Hire more faculty so that graduate courses can be opened regularly and at more advanced levels.

- Improve the living conditions for graduate students to attract a greater number of students and retain them. Pay them better salaries. Provide better housing.

- Conduct regular surveys among graduate students to understand their needs, motivation, how they rate their own research work and future prospects.

- Provide funds for graduate students to travel to top-tier conferences abroad when they have a paper accepted.

- Give better orientation to graduate students to help them chart their career path.

Demonstrated ability to recruit and retain good PhDs is considered to be one of those areas where the success of a good research university is evaluated. Bilkent University has a great potential in recruiting good PhD students by virtue of the generous tuition fee waivers it provides. The University also has an excellent reputation as a research institution, which spills over into PhD education as a high premium placed upon the value of postgraduate degrees offered. That said, different schools and departments within the University have had different degrees of success in attracting and retaining highly qualified PhD students.

Best practices adopted by other research universities in the world focus on putting together attractive packages for PhD recruitment. Such packages include

a. **Competitive salaries:** a strong national economy may be a disadvantage for recruiting good PhD students in those areas where well-paid jobs are readily available in the private sector. In such fields, offering competitive salaries may be crucial for recruiting and retaining highly qualified PhD students.

b. In those cases where competitive salaries are not readily available, offering named fellowships may also increase the value of what is already on offer. One way of doing this may be to create two categories of fellowships: 'Ihsan Dogramaci fellowships' that include tuition fee waiver, salary and book/travel allowance per year; 'Bilkent fellowships' that include tuition fee waiver and salary, 'departmental fellowships' that include tuition fee waiver alone. Some or all of these fellowships could be renewed annually (for 4- years) upon demonstrated success in research progress). Introducing named travel/research funds offered on university-wide and competitive terms for students on the latter two kinds of fellowships may also help with both recruitment and retention of good PhDs. All of these allow students to include another line in their CV and potentially increase their degree of satisfaction without significantly increasing the material amount committed by the University.

c. **Better housing** (and other benefits including health care): A PhD dormitory or a postgraduate village.

d. **More challenging research environment**: PhD training across departments could be reviewed to enhance interdisciplinary training and encourage interdisciplinary research. Alternatively, Schools and departments may be encouraged to pick areas of excellence and offer PhD degrees focusing on those fields where a Bilkent degree would be easily distinguishable from other Universities' degrees. The former could be organized under a Graduate School of Interdisciplinary Studies that cuts

across Schools and departments. The latter could be offered under the existing system of Graduate Institutes. Our peers in the United States and Europe have a separate Dean of Graduate Study to oversee such energetic strategies and their implementation. Identifying areas of excellence may also help with attracting international highly qualified post-docs and PhD candidates.

e. **More sustained supervision**: One common complaint of PhD students is limited 'quality time' offered by their supervisors. Best practices of research universities include setting up a system of dual supervisor, whereby two faculty members fill in for and complement each other in PhD supervision. Such arrangements not only enrich the experiences of PhDs but also allow a junior faculty to get involved in PhD supervision and learn by doing from the more senior faculty members.

f. **Better future career preparation**: the University already offers teaching and other career seminars on an annual basis. Such seminars could be made more frequent and cover on a larger range of subjects including grant writing, journal submissions, conference presentations, networking, IT skills, and other more field-specific 'nuts and bolts' seminars. Schools and/or departments may be encouraged to run one-day workshops for PhD students open to all PG students and staff for presenting work and receiving feedback An alternative way of organizing such sessions could be to introduce 'open days' where research experiences and progress may be shared with peers and faculty. More focused training could be provided on a variety of aspects of 'teaching' including lecturing skills, conducting seminars, grading, providing students feedback, etc.

g. **Better provision of information** on available scholarships, post-doctoral fellowships, grants, and future career options may be included in the job description of a future 'project office'.

6.2   Involving Undergraduates in Research

One of Bilkent's greatest assets is the very select group of undergraduate students. Bilkent attracts the top talent from across the country to its undergraduate programs. These students usually leave Bilkent as they graduate with a BS degree, mostly going to the US to pursue graduate degrees. For many of these students whose eventual goal is to go to top US schools, maintaining a near-perfect CGPA at Bilkent is a top priority. They refrain from taking advanced courses for fear of getting low grades. As a result, they are unable to develop their potential to the extent possible. What can be done to help undergraduate students develop their potential to a greater extent? Also, what can we do to make Bilkent an attractive alternative to some of the best universities in the world to which our undergraduates go? One remedy for this could be to engage undergraduates in the research activities at Bilkent. There are many benefits to doing this for the student, the faculty, and the university.

- Gives students a chance to connect with the faculty. Students get acquainted with research at an early stage in their career. They become familiar with their potential majors and discover areas of interest to chart a better career path for

themselves. Students can get better recommendation letters and have improved chances of being admitted to top US universities.

- Bilkent faculty taps on the talent of undergraduates in carrying out research. Bilkent faculty may retain some of its most talented undergraduates for graduate study at Bilkent.

- Bilkent's reputation improves as its graduates display greater research and presentation skills wherever they go.

There are many such undergraduate research programs in US universities. Two examples are the SURF (Summer Undergraduate Research Fellowships) at Caltech and UROP (Undergraduate Research Opportunities Program) at MIT.

The SURF program is modeled on the grant-seeking process: Students write a project proposal with potential mentors; a faculty committee reviews the proposals; those proposals that receive support are carried out over a 10-week period and concludes with a technical paper and an oral presentation on a seminar day.

The UROP program is integrated into the curriculum. Students receive credit for the project work they do. They write proposals, conduct research, analyze data, write reports, and make oral presentations. They may get paid by their supervisor or by UROP funds, as well as working on a voluntary basis.

In each case, there is a university office that connects students and faculty and coordinates the activities.

Bilkent may establish such a program with the target of having 5-10% of its students take advantage of such undergraduate research opportunities.

7   High-Impact Research at Bilkent

Although Bilkent University aims to excel in all relevant areas of science and technology, there is still a need to focus the university's efforts and resources on certain areas where maximum impact can be made. Such a focused effort on select, potentially high-impact areas will increase the university's visibility at both national and global levels.

The university has a number of research centers dedicated to various "high-impact" areas. These research centers were initiated and founded by individual efforts of a few faculty members. However, some of the existing research centers seem to lack the necessary resources and the impetus needed to generate "high-impact" results, placing them well behind the initial expectations. Therefore, there is a need for a university-based effort to define and coordinate the existing and upcoming high-impact areas and then establish new research centers/institutes on these areas.

Bilkent may be well-served to consider conducting Nobel-level research; highly fundamental and cutting-edge research, results of which may not be appreciated widely for many years.

7.1　Recommendations to Improve the Research Culture at Bilkent

⚐ *Remove the barriers, real or perceived, that are discouraging interdisciplinary and collaborative work*. Many of the survey respondents indicate that they are concerned that collaborative and interdisciplinary research could harm their promotion and negatively affect their performance evaluations. Whether real or perceived, this view hinders collaboration across fields and disciplines. Incorporating new rules encouraging interdisciplinary research in the promotion and evaluation process could more easily pave the way to such studies.

⚐ *Institutionalize support for interdisciplinary research/projects*. Another common concern is the lack of available funds for interdisciplinary research. Particularly if the collaboration is at its nascent state and need seed money to conduct initial research before applying for large scale national or international research grants. Therefore there should be mechanisms to fund interdisciplinary research at its early stages.

⚐ *Coordinate hiring for interdisciplinary positions*. Hiring new faculty that conduct research bridging disciplines should be coordinated between departments.

⚐ *Organize University-wide colloquiums to give chance to exchanging ideas between diverse fields*. Gathering of researchers and exchanging ideas is the start of collaborative work. This can be effectively achieved through weekly university-wide colloquiums. Library talks are a good example for how this can be done during a period of no classes. Such a program would not only let people know about the research of the speaker, but also serve as a social event for faculty to mingle, which is regarded as highly important in successful research centers . For example, in Janelia Farm research campus the restaurant serves hundreds of researchers three meals a day for seven days. But for each meal it is open for only 90 minutes. Moreover each table seats 8 people, whereas individual research groups have at most 6 researchers. Therefore people have to mingle with different groups in the crowded restaurant. In another canteen, free coffee is served all day to encourage people to come out of their offices instead of brewing coffee on their own.

⚐ *Establish model thematic interdisciplinary programs/centers*. This could give the loudest and strongest support to interdisciplinary research initiatives in Bilkent University. An area that is strategically important could be identified and a research center or a graduate program around it could be established by the University.

⚐ *Offer interdisciplinary courses*.

⚞ *Allow inter-departmental undergraduate theses or project studies.*

7.2   Collaboration across Fields and Disciplines

We make no apologies for making these excursions into other fields, because the separation of fields, as we have emphasized, is merely a human convenience, and an unnatural thing. Nature is not interested in our separations, and many of the interesting phenomena bridge the gaps between fields.

Richard Feynman

Collaboration and cross-fertilization of ideas between researchers from different fields and disciplines has the potential to more effectively address the challenges currently facing humanity. Therefore it is no surprise that many fields that are most heavily studied, including material science, nanotechnology, genomics, bioinformatics, neuroscience, conflict and terrorism, are all interdisciplinary. Today worldwide there are thousands of research centers with this buzz word of "interdisciplinary" in their titles. Among them successful examples include Janelia Farm research campus of Howard Hughes Medical Institute, and Center for Materials Science and Engineering of MIT. Moreover the necessity of integrating ideas from diverse fields is appreciated by funding agencies such as National Science Foundation of USA.

Majority of respondents to our survey support the idea of interdisciplinary research in Bilkent University (73 affirmative to 16 negative opinions). Given the climate in the scientific world and readiness of our faculty members, we conclude that as a research strategy Bilkent University should take measures to encourage interdisciplinary work. However this requires a coordinated effort: real and virtual barriers must be removed; the institution should firmly support the notion.

8   Infrastructure Needs

8.1.1 Need for a Sponsored Research Office
Although the university already has a sponsored research office, there is a certain need to revise and define the goals and activities of this office. This office was established nearly 20 years ago when the external research funds were very limited. In order to define these new goals and activities we had conducted a faculty survey on various issues. Two main criticisms emerged evolved out of this survey. First, as stated in the following select excerpts, more than 20% of the faculty members were stating the lack of

"start-up" and "small-scale project funding" as a negative factor. Second, some of the faculty members were asking for guidance on grants and technology transfer.

"The negatives: lack of startup funds, starting teaching multiple courses at the time one needs to acquire competitive funding (considering no startup funds) delays research launch, restricted physical lab space blocks growth of research groups despite good funding, need more guidance on grants and technology transfer and interactions between academia-industry partnership."

"When I started at Bilkent I remember that I needed a start-up grant (seed money) to jumpstart my new research. Its absence prolonged the process of getting a large-scale grant. This will also be the case when I venture into a new line of research as grant agencies such as TUBITAK do take into account whether the candidate would have had experience in the line of research proposed. In such contexts, Bilkent funding, however modest, has the potential to spearhead sizable funding."

What can Bilkent do to improve the situation?

A) Develop a university wide "research grants" program with a limited budget. These funds should be reserved for i) new faculty members and ii) Faculty with limited project funds. The recipients of these grants should be selected by the departments (during the recruitment of new faculty) and the research centers' management.
B) Revise the "Sponsored Project Office (SPO)" into a scalable structure where the application, approval, and project management functions of this office can function along the needs of the increased quantity and size (budget-wise) of the externally sponsored projects.
C) Within the revised SPO, develop a "project application and management" branch and a well-prepared "Bilkent restricted web page" where faculty members can use as a "one-stop" shop for announcements of new national and international research projects (calls), preparation of new research project, and preparation of research progress reports (including budgets and audits).
D) Establish regular workshops (or encourage involvement to such workshops) that will teach and train Bilkent faculty members how to write various TUBITAK and EU-FP projects.
E) Allow the university professors to borrow "seed research funds" from the university which will be later paid from the future funds allocated to individual research funds (KAF) of the same faculty member.
F) Minimize the paperwork and the evaluation time for new project applications.
G) Minimize the "approval" time for payments that will be made from projects budgets.

8.1.2 Need for Bilkent Office of Technology Licensing (Bilkent-OTL)

Although most US and European research universities have "Intellectual Property (IP) Management Office" or "Office of Technology Licensing", Bilkent University does not have such an office. This was partly due to Turkish patent laws which significantly

restrict the share that a university can take from the licensing of the patents developed within the university laboratories.

Bilkent University has already declared "innovation" as one of the "defining" characteristics of the teaching and research agenda of the university.

In the faculty survey, there were a few comments on this issue. Here is an example.

"…need more guidance on grants and technology transfer and interactions between academia-industry partnership."

Indeed, there is definitely more need now than ever to raise the consciousness of Bilkent faculty and students about the legal and commercial aspects of their research. As part of this effort, and in support of it, it is also time that Bilkent should start considering establishing a Bilkent-OTL and drafting policies in this regard. Such a move would be timely and in line with the trend in Turkey. In little over a decade, Turkey has witnessed the establishment of a great number of technoparks. There is now much greater consciousness in Turkey about innovation and entrepreneurship. TUBİTAK and The Ministry of Industry, The Ministry of Development are instituting programs designed specifically to promote innovation and patenting. It is Turkey's strategic aim to increase the added value in its exports. The climate is right for Bilkent to take these issues into its own agenda. Bilkent is in a unique position with its highest caliber faculty and students to spearhead Turkey's drive into becoming a society of innovation as we head towards the centennial of the Republic. There is definitely greater need now than ever to at least educate our faculty and students about IP rights, patenting, and commercialization.

What can Bilkent do to improve the situation?

A) Establish Bilkent Office of Technology Licensing (Bilkent-OTL) to handle all issues related to intellectual property and technology transfer"
B) Bilkent-OTL should guide and help the University faculty and researchers for the patent applications.
C) Bilkent-OTL will license the Bilkent patent portfolio to companies and then collect royalties.
D) Bilkent-OTL will also handle the legal protection of the university patent portfolio from infringement.
E) Bilkent-OTL should set the rules for the sharing of the income generated through the licensing of the university patent portfolio among the inventors, departments (and centers).

8.1.3 Need for a Medical Ethics Committee

As research areas at Bilkent increasingly address human and animal subjects, a need has developed to have Bilkent's own Medical Ethics Committee. The current practices are to search for a hospital that would accept the application for its evaluation that takes valuable time of the researchers.

9   Recommendations for Processes

1. Setting up **external advisory board** for each department would help keep all faculty and administrators on their toes in terms of producing cutting edge research and maintaining an up-to-date curriculum as well as an active learning environment. Such advisory boards could comprise both PhD and UG alumni, top level researchers and potential recruiters from the field.

2. Departments could be encouraged to define their **'niche' research area** and identify faculty needs in the form of **'strategic plans'**. As opposed to, that is, being encouraged to hire only when they lose a faculty member. This would allow faculty appointments to be shaped by excellence in terms of both research and teaching rather than letting teaching needs shape faculty recruitment. When faculty find out after a few years that they are not a 'good fit' they either get demoralize and lag behind in terms of research output or leave – both undesirable outcomes. Depending on the field this may happen sooner rather than later. In those fields that call for team research, faculty who cannot join/set up a team at Bilkent find they lag behind in research productivity. While some are able to join international research networks, those who cannot either fail to excel but stay or leave for institutions that promise them a better fit. Hiring in line with the strategic plans of departments may caution against such pitfalls. Encouraging departments to define their niche areas would also be helpful in making them especially attractive to candidates (and PhD students) in those areas. Defining departmental niche areas of competence as such may also allow for more competitiveness both nationally and internationally.

3. Review of Research Centers: Besides establishing priority research and technology areas, the committee will also be responsible to evaluate the performance of existing research centers/institutes. This annual evaluation will be based on criteria including the research output, financial feasibility and various success criteria set during the initial establishment of each center/institute. The committee will then use this evaluation to recommend continuation, additional support or (in case of failure) closure of research centers/institutes.

4. Respond to "Existing Opportunities" in Research

   i) Global Level: Closely monitor "Research Infrastructure Program" announcements and other large-scale research project calls in the existing and future EU-FP and related international research programs. The university can then evaluate the feasibility of these programs and determine the overlap with the existing and the foreseen "strategic research areas" of the university. If the

overlap is significant, the university may allocate financial and administrative resources to apply for these programs to maximize the chances of bringing these resources to the university.

ii) National Level: Closely monitor the announcements on "national research and technological development areas" by TUBITAK and other national funding agencies that might overlap with the existing and the "foreseen strategic research and technology areas" of the university. If there is a significant overlap, the university can then allocate financial and administrative resources to apply for these programs to maximize the chances of bringing these national resources to the university.

5. Create New Opportunities

Bilkent as a leading research university should also have a very active role in defining and creating new priority areas of "research and technology" at a national and international level. To achieve this Bilkent needs to take the following actions

   a. Establish an office with representatives from made up from various Bilkent faculties, which will closely monitor the "promising research and technology areas" where the university may have a global and/or national level impact. Bilkent faculty will be asked to prepare and submit reports to this committee, where they will share their "vision" on their "research" areas. This committee will also seek the input of "world renown" authorities on various areas of "research and technology" and ask for their views on possible research areas where Bilkent's involvement may have a significant impact. After these evaluations, the committee will then set a list of "research and technology" areas where involvement of Bilkent will result in a significant impact. This list will be re-evaluated every year and will be revised along new input and developments.

   b. The University will then use this "Priority research and technology areas for Bilkent" list and the existing resources to determine the establishment of new research centers/institutes on these new research and technology areas. The university will also provide the seed funding (personnel and infrastructure) that is needed for the establishment of these research centers/institutes.

6. Besides forming these research centers/institutes, the university will also be very active in various national and international committees that define the future research and technology areas that will be supported by national and international funding organizations. The university will take an active role in appointing Bilkent faculty members to these committees.

10   Summary & Recommendations

Some of the recommendations presented in this report focus on the well-being of faculty, others focus on infrastructure and organizational issues. They are important and need to be addressed on a continuous basis. However, resolving them will not be enough to take the large steps in research that Bilkent aspires.

1. The current organizational structure of the university does not have a research office that addresses strategic issues. Such an office, at Vice Provost level but separate than finance and other existing administrative responsibilities may well serve the university. A new office should enhance not hinder faculty initiatives should also have metrics of success against responsibilities and resources it is assigned. Such responsibilities may include increased success in EU projects and starting large-scale centers of excellence.

2. Establish a task force, with a finite life, to investigate the feasibility of large scale centers of excellence at Bilkent with a view toward whether such centers can conduct Nobel-level research. Towards this goal invite from groups of faculty proposals for such centers and have them evaluated based on their merits. It is recommended that the task force develops a set of criteria by which to select the topics.

3. Another task force can be helpful to investigate possible new models for research at a university such as Bilkent. Traditional models rely largely on PhD students. Are there alternatives to competing across the globe for a large number of graduate students? Instead, perhaps relying on research staff and educating fewer higher caliber students may serve the university better in the long run. At the same time, can Bilkent become an attractive alternative for undergraduates to continue their graduate studies?

4. Each Faculty and their Departments should develop their own strategic plans (for research).

5. A task force should look into the feasibility and cost assessment of the infrastructure developments.

6. Another task force should develop plans to place Bilkent at the forefront of universities as an international center, at first, in selected areas. Inviting international faculty, researchers, providing scholarships to graduate students, and workshops can be part of the portfolio of activities.

7. Groups of faculty should be invited to develop white papers on S&T for Turkey in order to create opportunities discussed earlier in this report.

APPENDIX A - Best Practices

Copenhagen University's 'Programmes of Excellence'

In 2008 Copenhagen University initiated a program of excellence whereby 20 programmes were selected for support for five years. Here is a list to the website detailing the 20 selected programs called 'programmes of excellence': http://research.ku.dk/introduction/programmer/Copenhagen University is a member of the International Alliance of Research Universities (http://www.iaruni.org/about-us/about-iaru).

Copenhagen University's 'Research Platforms'

Around the same time, Copenhagen University selected 12 areas for interdisciplinary research called 'research platforms'. This allowed tapping into existing expertise to generate synergy for new research projects: http://research.ku.dk/introduction/research_platforms/

Maastricht University's 'Submission Clinic'

In the fall of 2011 Research Officer of Maastricht University visited Bilkent to give a presentation on their recent success in Marie Curie and other EC grants through the appointment of a Research Officer who runs a 'submission clinic'. Attached is a summary of their 'success' and the visiting Research Officer's offer of services to Bilkent University. I am appending this second document to provide an external perspective on Bilkent University's research grant generation capacity.

University of Virginia's 'Small Research/Travel Grants in the Social Sciences'

Often in the Social Sciences small grants go a long way. As little as 1500 USD can jump start a research project, bring a comparative/empirical dimension to an existing one, advance collaborative research, bring to fruition a drawn out research process. Here is the link to a successful programme: http://www.virginia.edu/vpr/internalfund.html

Binghamton University's 'Research Days'

Designed to inform undergraduate students about research done by faculty, 'research Days' could equally be used to attract best Bilkent undergraduates into our own

research projects. Here is the link:
http://www.binghamton.edu/inside/index.php/inside/story/binghamton-research-days-to-take-center-stage

Warwick University's 'Global Priorities' Programme

Similar to Copenhagen University's research platforms in some ways, Warwick's programme is based on selecting areas of multidisciplinary research to better respond to funding bodies' priorities. http://www2.warwick.ac.uk/research/priorities/

APPENDIX B - Summary of Survey

Question 4-What were some Bilkent-specific positive or negative factors that affected your research performance?

Negative:
Heavy teaching load – 29
Number of courses
Expectations/emphasis
Large class size – 7
Modest – 7
Scattered class hours – 3 +
Lack of research oriented
Lack of Ph.D students (grad students mobility)
Project management/ grant management
Promotion process not transparent.
Travel funds insufficient
Support for small projects – 18
Start-up funding/seed

Positive:
Library - 25
Collegial - 45

Discussions:
Perception of research and teaching as orthogonal
Teachin load is reduced by offering courses in multiple sections
A professor who is unable to get research grants is not capable
Qualified doctoral students can be attracted with pay
Those who conduct experimental research need higher startup support (experimental facilities)

Question 5- What were some other positive or negative factors that affected your research performance?

TUBITAK support / başvuru güçlüğü (yabancıların başvuru güçlüğü).
TUBITAK post-doc desteği zayıf.
Çocuk – leave policy (küçük çocukların yuvaya alınmaması)
Lack of grad students
Post-doc-Doc öğrencilerine yetersiz maddi destek
International collabaration - positive

Question 6 - What can Bilkent do to serve the needs of its faculty better in matters concerning research?

> Improving grad students hiring conditions (stipend/housing).
> More financial support for research
> Areas for which there is no funding from TUBITAK.
> Provide teaching buy-out
> Research performance vs. teaching load
> Colloquium – a given period across the university
> Research office
> Up-date/inform available grants
> EU projects
> Be less bureaucratic
> Web based administration tool-more efficient management

Question 7 - Do you think there is need for more interdisciplinary or cooperative research at Bilkent? In your opinion, what would be the effective means for achieving such goals?

> More interdisciplinary projects - 73% yes, 16% no.
> Institutes / centers – 5
> Workshops/seminars/events – 7
> Fear of collaboration with others & promotion - 3
> Bilkent bireysel çabalarla adını duyuruyor ancak kurumsal bir çalışma yok (collaboration Bilkent'in etkinliğini attırır).
Collaboration'ın düşük olması handicap. Kurumsal destek ve çaba ile daha büyük işler yapılabilir.
> How to encourage collaborations?/strategies?

Question 8 - One of Bilkent's goals is to foster creativity and entrepreneurship among its undergraduate students. As a faculty member, in what ways would you be able to contribute to such a goal? For example, would you be willing to include undergraduates in your research projects?

> Innovation için UG'da research tabanlı eğitim yapılmalı.
> Thesis supervision does not count as teaching load.

Question 9 - Please feel free to indicate any other suggestions for improving research at Bilkent.

> External scientific advisory board for each department.
> Loyalty satisfaction/job satisfaction.
> Mentoring system to guide Jr. faculty
> Carefully monitor new opportunities.

APPENDIX C - Statistics for Research Projects

Table 4: All Research Projects Total Budget (1000$)

Year	Sponsor	Sum	Minimum	Maximum	Mean
2005	Defense (Other Resources*)	1000	180	819	499.90
	EU	198	99	99	99.20
	Other Institutions	51	6	45	25.44
	Private	129	129	129	129.03
	Public	11107	5	11029	2221.39
	TUBITAK	4953	23	583	159.79
	Training&Workshop	7	7	7	6.91
	Total	17445	5	11029	396.49
2006	Defense (Other Resources*)	5739	2498	3241	2869.69
	EU	408	3	101	68.05
	Other Institutions	14	14	14	14.03
	Private	286	10	162	57.28
	Public	168	1	84	16.81
	TUBITAK	9561	17	3097	273.18
	Training&Workshop	106	106	106	105.52
	Total	16283	1	3241	271.38
2007	EU	449	61	109	89.76
	Other Institutions	3039	1374	1665	1519.47
	Private	267	37	192	89.13
	Public	3277	1	2095	297.89
	TUBITAK	8957	37	2464	447.84
	Total	15989	1	2464	389.97
2008	Defense (Other Resources*)	6710	36	4083	2236.78
	EU	5461	9	1387	321.25
	Other Institutions	790	790	790	790.09
	Private	166	15	55	33.15
	Public	29039	1	22727	2639.92
	TUBITAK	35679	13	32342	1274.24
	Training&Workshop	65	65	65	64.96
	Total	77910	1	32342	1180.46
2009	Defense (Other Resources*)	20931	29	18398	3488.52
	EU	1256	139	422	179.39
	Other Institutions	106	22	83	52.86
	Private	149	3	50	29.72
	Public	3125	1	2329	390.67
	TUBITAK	5646	4	2542	188.20
	Training&Workshop	377	19	120	62.89
	Total	31590	1	18398	493.59

* MSB, TAI, ASELSAN, ROKETSAN, SSM

Year	Sponsor	Sum	Minimum	Maximum	Mean

2010	Defense (Other Resources*)	1251	149	912	416.89
	EU	1903	19	381	158.58
	Other Institutions	1564	5	1219	312.80
	Private	329	12	102	41.18
	Public	13552	8	9868	1232.03
	TUBITAK	4530	3	257	107.85
	Training&Workshop	379	2	87	63.09
	Total	23508	2	9868	270.20
2011	Defense (Other Resources*)	2056	18	744	342.72
	EU	2632	10	1958	438.75
	Other Institutions	2763	42	2381	920.87
	Private	1242	7	650	103.46
	Public	3462	2	1765	494.61
	TUBITAK	5060	5	266	115.00
	Training&Workshop	384	12	75	54.85
	Total	17599	2	2381	207.05
2012	Defense (Other Resources*)	205	85	121	102.72
	EU	2462	36	1914	410.35
	Other Institutions	354	73	281	177.09
	Private	696	24	359	69.57
	Public	231	1	192	77.07
	TUBITAK	7181	14	1621	159.58
	Training&Workshop	265	8	82	53.06
	Total	11395	1	1914	156.09
Total	Defense (Other Resources*)	37893	18	18398	1578.88
	EU	14770	3	1958	242.13
	Other Institutions	8680	5	2381	482.25
	Private	3264	3	650	66.61
	Public	63962	1	22727	969.12
	TUBITAK	81567	3	32342	296.61
	Training&Workshop	1582	2	120	58.61
	Total	211719	1	32342	407.15

* MSB, TAI, ASELSAN, ROKETSAN, SSM

Table 5: All Research Projects

Year	Type	Sum	%	Minimum	Maximum
1999	Defense Projects	1420	100	1420	1420.00
	Total	1420		1420	1420.00
2001	Non-Defense Projects	8	100	8	8.10
	Total	8		8	8.10
2002	Non-Defense Projects	537	100	61	402.18
	Total	537		61	402.18
2003	Non-Defense Projects	321	61	6	110.12
	Defense Projects	206	39	6	200.00
	Total	527		6	200.00
2004	Non-Defense Projects	4040	68	2	2097.02
	Defense Projects	1937	32	90	1410.00
	Total	5978		2	2097.02
2005	Non-Defense Projects	16446	94	5	11029.41
	Defense Projects	1000	6	180	819.39
	Total	17445		5	11029.41
2006	Non-Defense Projects	5352	33	1	309.68
	Defense Projects	10931	67	2095	3241.38
	Total	16283		1	3241.38
2007	Non-Defense Projects	13525	85	1	2302.55
	Defense Projects	2464	15	2464	2463.61
	Total	15989		1	2463.61
2008	Non-Defense Projects	38858	50	1	22727.27
	Defense Projects	39053	50	36	32342.33
	Total	77910		1	32342.33
2009	Non-Defense Projects	8117	26	1	2329.00
	Defense Projects	23473	74	29	18398.00
	Total	31590		1	18398.00
2010	Non-Defense Projects	22257	95	2	9868.42
	Defense Projects	1251	5	149	912.42
	Total	23508		2	9868.42
2011	Non-Defense Projects	15543	88	2	2380.95
	Defense Projects	2056	12	18	744.05
	Total	17599		2	2380.95
2012	Non-Defense Projects	9568	84	1	1914.11
	Defense Projects	1827	16	85	1621.42
	Total	11395		1	1914.11
2013	Non-Defense Projects	482	100	9	204.13
	Total	482		9	204.13
Total	Non-Defense Projects	135053	61	1	22727.27
	Defense Projects	85617	39	6	32342.33
	Total	220670		1	32342.33

Table 6: TUBITAK Projects Total Budget(1000$)

Year	Type	Sum	Minimum	Maximum	Mean
2005	Non-Defense Projects	4953	23	583	159.79
	Total	4953	23	583	159.79
2006	Non-Defense Projects	4369	17	310	132.41
	Defense Projects	5192	2095	3097	2595.93
	Total	9561	17	3097	273.18
2007	Non-Defense Projects	6493	37	2303	341.75
	Defense Projects	2464	2464	2464	2463.61
	Total	8957	37	2464	447.84
2008	Non-Defense Projects	3337	13	317	123.58
	Defense Projects	32342	32342	32342	32342.33
	Total	35679	13	32342	1274.24
2009	Non-Defense Projects	3104	4	280	107.05
	Defense Projects	2542	2542	2542	2541.61
	Total	5646	4	2542	188.20
2010	Non-Defense Projects	4530	3	257	107.85
	Total	4530	3	257	107.85
2011	Non-Defense Projects	5060	5	266	115.00
	Total	5060	5	266	115.00
2012	Non-Defense Projects	5560	14	250	126.36
	Defense Projects	1621	1621	1621	1621.42
	Total	7181	14	1621	159.58
Total	Non-Defense Projects	37407	3	2303	139.06
	Defense Projects	44161	1621	32342	7360.14
	Total	81567	3	32342	296.61

TUBITAK Projects

Figure 2: TUBITAK Projects

Table 7: Defence Projects Budget (1000$)

Year	Sponsor	Sum	Minimum	Maximum	Mean
1999	Defense Projects (Other resources*)	1420	1420	1420	1420.00
	Total	1420	1420	1420	1420.00
2003	Defense Projects (Other resources*)	206	6	200	103.02
	Total	206	6	200	103.02
2004	Defense Projects (Other resources*)	1937	90	1410	484.36
	Total	1937	90	1410	484.36
2005	Defense Projects (Other resources*)	1000	180	819	499.90
	Total	1000	180	819	499.90
2006	Defense Projects (Other resources*)	5739	2498	3241	2869.69
	TUBITAK Defense Projects	5192	2095	3097	2595.93
	Total	10931	2095	3241	2732.81
2007	TUBITAK Defense Projects	2464	2464	2464	2463.61
	Total	2464	2464	2464	2463.61
2008	Defense Projects (Other resources*)	6710	36	4083	2236.78
	TUBITAK Defense Projects	32342	32342	32342	32342.33
	Total	39053	36	32342	9763.17
2009	Defense Projects (Other resources*)	20931	29	18398	3488.52
	TUBITAK Defense Projects	2542	2542	2542	2541.61
	Total	23473	29	18398	3353.24
2010	Defense Projects (Other resources*)	1251	149	912	416.89
	Total	1251	149	912	416.89
2011	Defense Projects (Other resources*)	2056	18	744	342.72
	Total	2056	18	744	342.72
2012	Defense Projects (Other resources*)	205	85	121	102.72
	TUBITAK Defense Projects	1621	1621	1621	1621.42
	Total	1827	85	1621	608.95
Total	Defense Projects (Other resources*)	41457	6	18398	1337.31
	TUBITAK Defense Projects	44161	1621	32342	7360.14
	Total	85617	6	32342	2313.98

* Other resources: MSB, TAI, ASELSAN, ROKETSAN, SSM
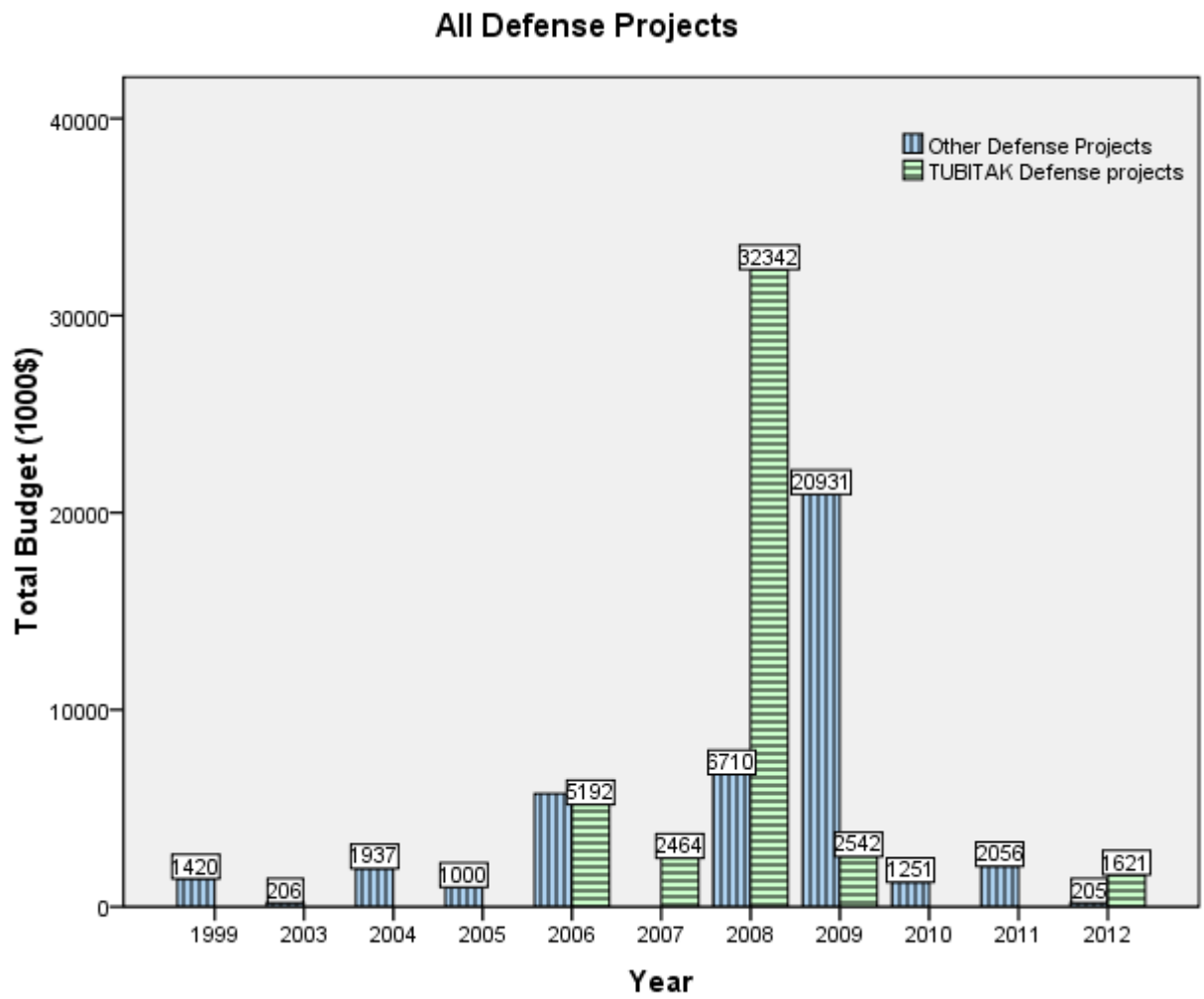
8 February 2013

Figure 3: All Defense Projects Budget

Table 8: Enrollment Statistics (Students lowest and highest placements)

Faculty of Engineering

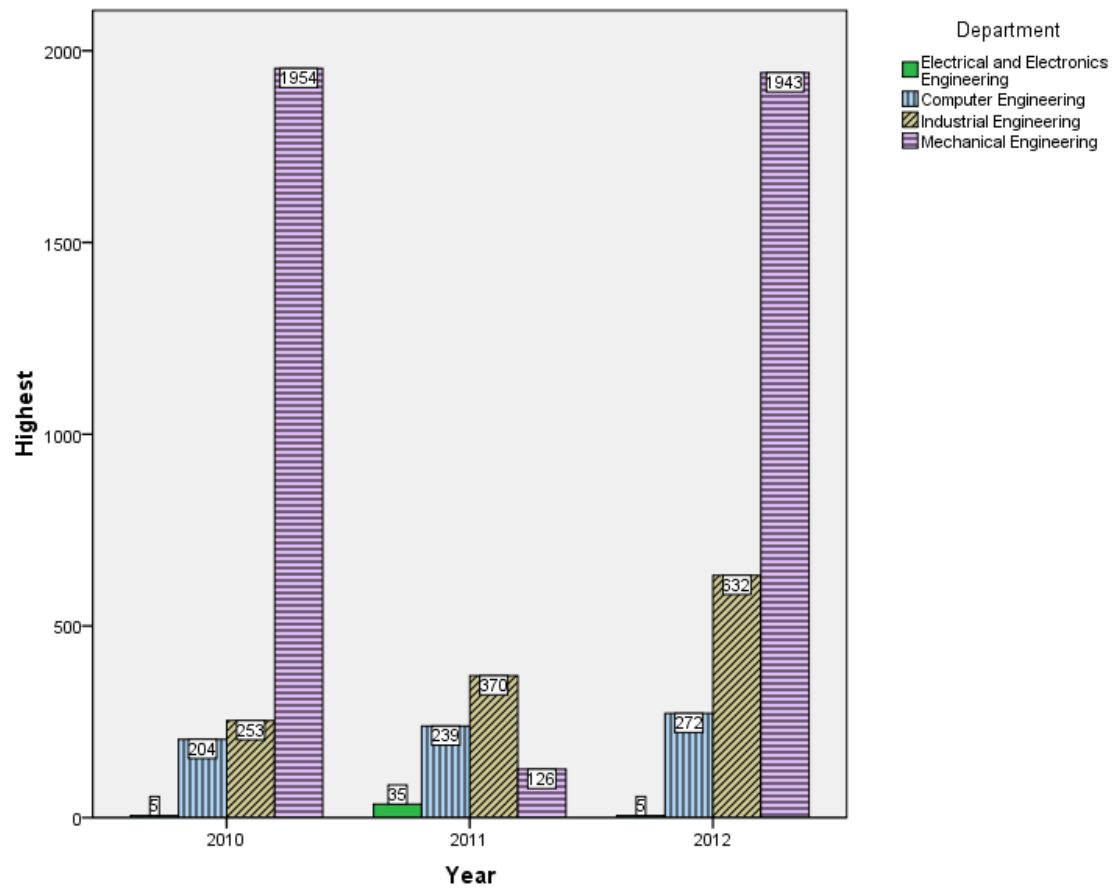| Department	Year	Lowest	Highest
Computer Engineering	2008	2365	
	2009	2643	
	2010	3599	204
	2011	3443	239
	2012	3214	272
	Minimum	2365	204
Electrical and Electronics Engineering	2008	729	
	2009	589	
	2010	909	5
	2011	628	35
	2012	579	5
	Minimum	579	5
Industrial Engineering	2008	1785	
	2009	2226	
	2010	3546	253
	2011	2769	370
	2012	2800	632
	Minimum	1785	253
Mechanical Engineering	2009	4495	
	2010	6474	1954
	2011	5795	126
	2012	5731	1943
	Minimum	4495	126
Total	2008	729	
	2009	589	
	2010	909	5
	2011	628	35
	2012	579	5
	Minimum	579	5

8 February 2013

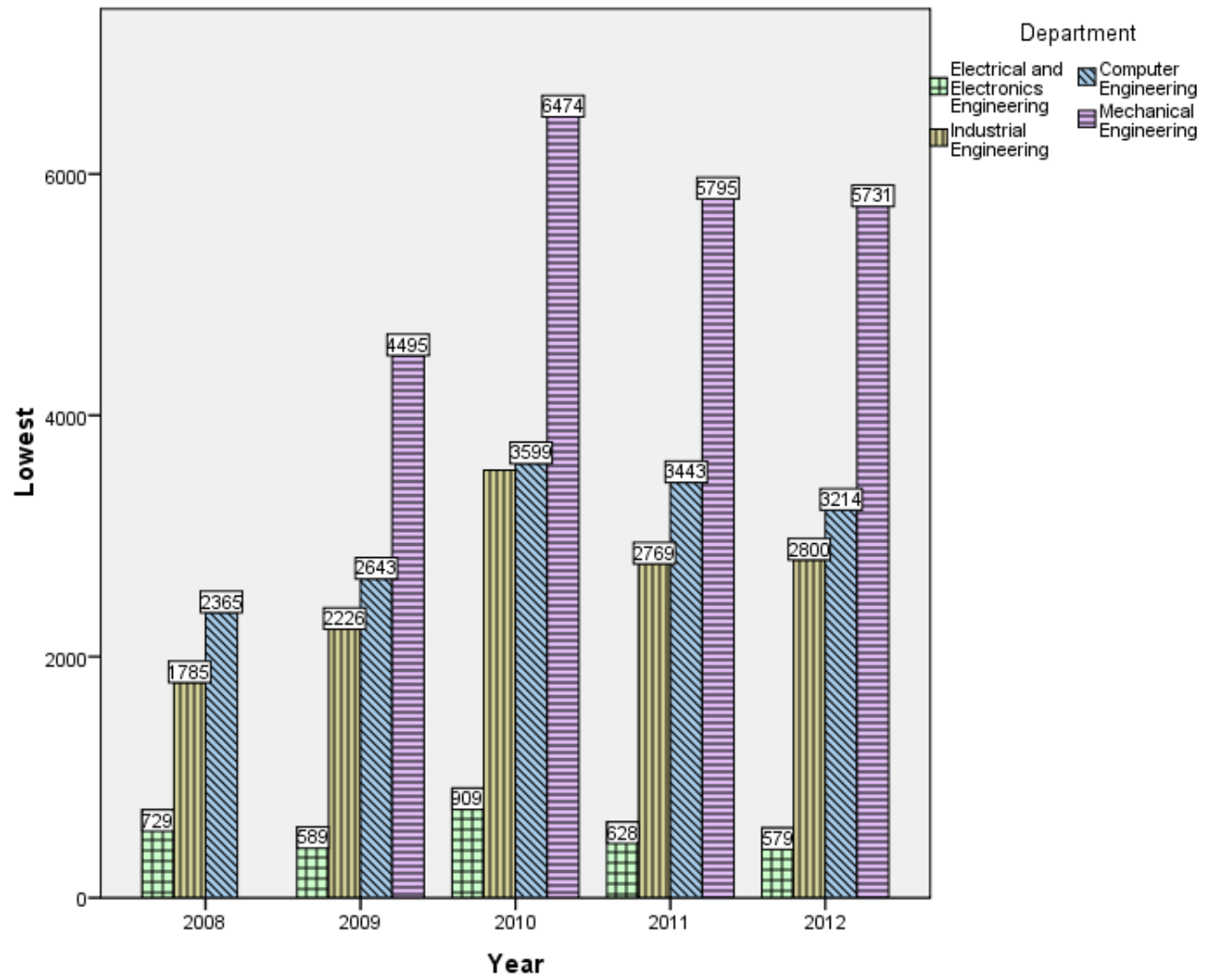Figure 4: Faculty of Engineering Enrollment Highes Scores

Figure 5: Faculty of Engineering Enrollment Lowest Scores

Table 9: Enrollment Statistics (Students lowest and highest placements)

Faculty of Science

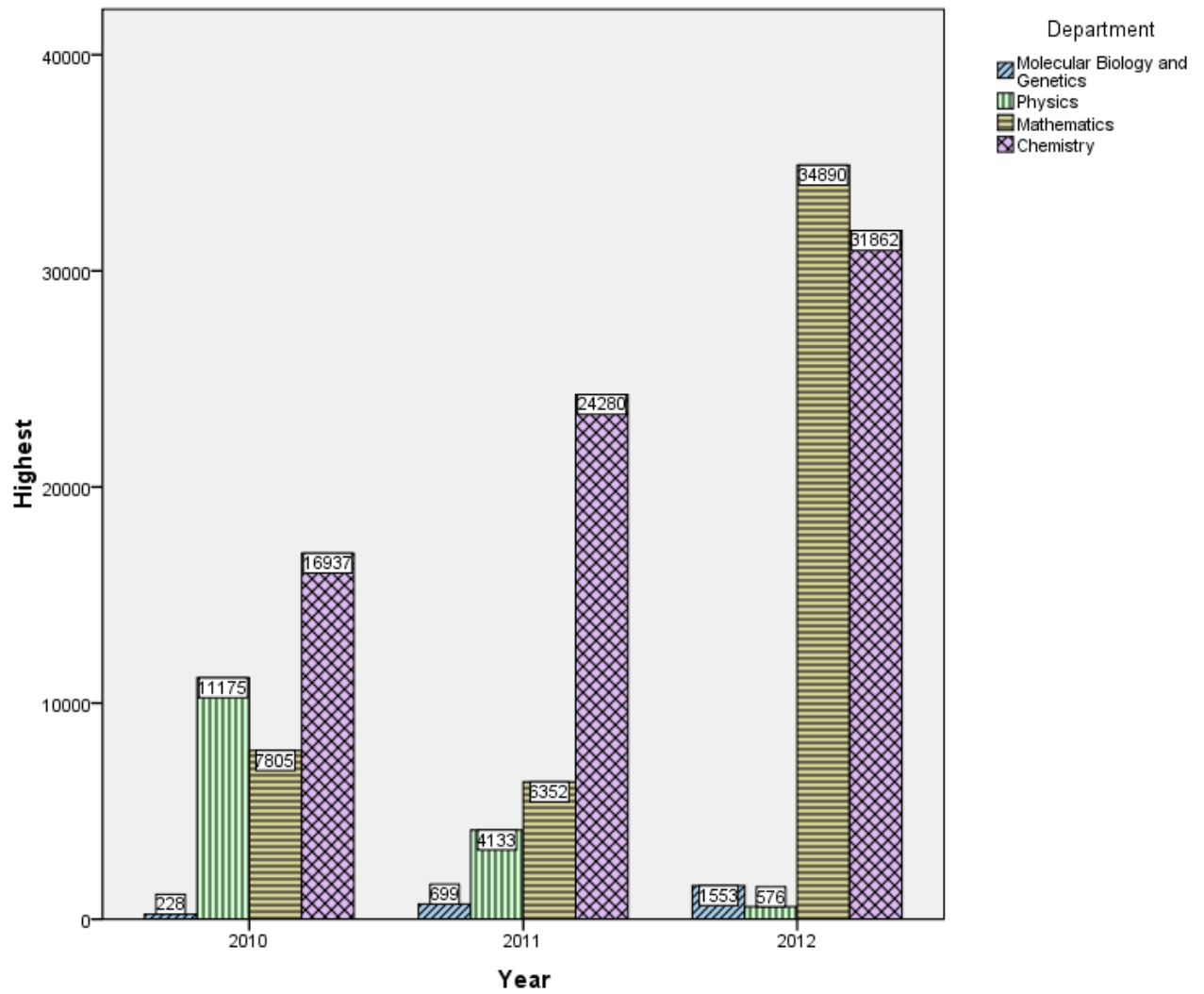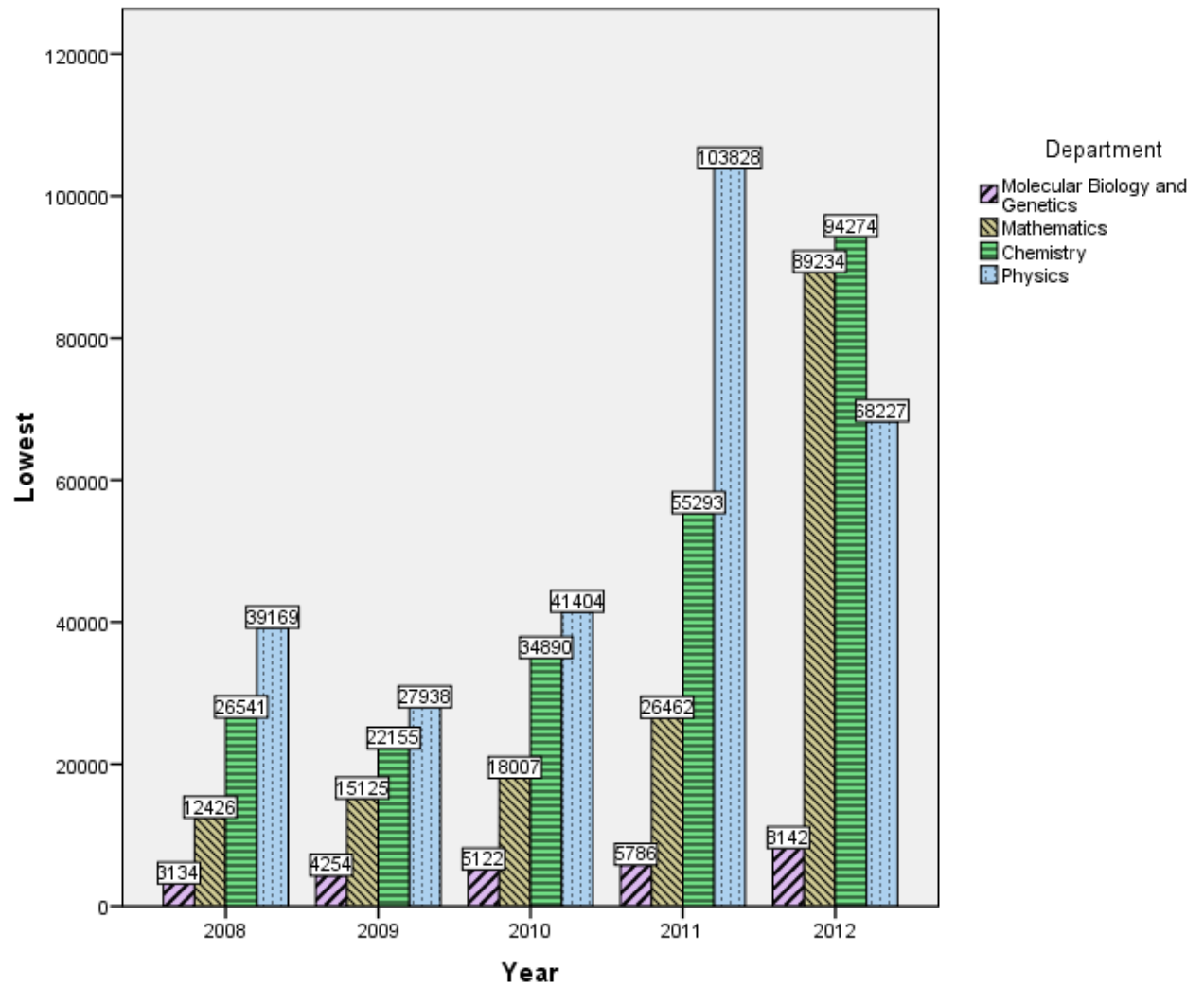| Department	Year	Lowest	Highest
Physics	2008	39169	
	2009	27938	
	2010	41404	11175
	2011	103828	4133
	2012	68227	576
	Total	27938	576
Chemistry	2008	26541	
	2009	22155	
	2010	34890	16937
	2011	55293	24280
	2012	94274	31862
	Total	22155	16937
Mathematics	2008	12426	
	2009	15125	
	2010	18007	7805
	2011	26462	6352
	2012	89234	34890
	Total	12426	6352
Molecular Biology and Genetics	2008	3134	
	2009	4254	
	2010	5122	228
	2011	5786	699
	2012	8142	1553
	Total	3134	228
Total	2008	3134	
	2009	4254	
	2010	5122	228
	2011	5786	699
	2012	8142	576
	Total	3134	228

Figure 6: Faculty of Science Enrollment Highest Scores

Figure 7: Faculty of Science Enrollment Lowest Scores

APPENDIX D - Faculty Awards

Name of Award	Number of Faculty Member																				Total
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
TUBITAK Science Award		1					1							2		1	1			1	7
TUBITAK-TWAS Science Award				1							1										2
TUBITAK Young Scientist Awards	2	1	2	3	3	1	2		1	3	1	1		1	2	1	4	2	3	1	34
TUBITAK Hüsamettin Tuğaç Foundation Award			1	1		1	1														4
TÜBA Service Awards							1														1
TÜBA Encouragement Awards						1	1	1	2						1						6
TÜBA-GEBIP Young Investigator Science Fellowship									3	2			3	5	3	3	1		4		24
Sedat Simavi Foundation Awards							1		1				1								3
Parlar Foundation Awards / Science Award													1		1			1		1	4
Parlar Foundation Awards / Social Science Award			1																		1
Parlar Foundation Awards / Young Investigator Awards	2	1	2		1	2			1	1	1		1	1		2			2	3	20
Alexander von Humboldt Fellowships	1					1					1	1								1	5
Best Paper Awards		1							1		2		1					1		1	7
Other Awards Won by Bilkent Faculty	3		1			3	2	1	1	1	1	1	5	7	2	3	2		1	4	38
Total	8	4	7	5	4	9	9	2	10	7	7	3	12	16	9	10	8	4	10	12	