ABET

Self-Study Report

for the

Geological Engineering Program

at

Istanbul Technical University

Istanbul, Turkey

July 2016

CONFIDENTIAL

ABET SELF-STUDY QUESTIONNAIRE: TEMPLATE FOR A SELF-STUDY REPORT

2016-2017 Review Cycle

APPLIED SCIENCE ACCREDITATION COMMISSION

ABET
415 North Charles Street
Baltimore, MD 21201
Phone: 410-347-7700
Fax: 410-625-2238
Email: asac@abet.org
Website: http://www.abet.org

SELF-STUDY REPORT

Geological Engineering Program

Bachelor of Science

Istanbul Technical University

BACKGROUND INFORMATION

Contact Information

The primary pre-visit contact person lists and their mailing address, telephone number, fax number, and e-mail addresses are as follows:

1- Prof. Sezai KIRIKOĞLU, Chairman
İstanbul Technical University
Faculty of Mines
Department of Geological Engineering
Maslak 34469 Istanbul - Turkey
Telephone : +90 212 285 62 49 / 62 53
Fax : +90 212 285 62 51
Mobile : +90 532 363 95 94
e-mail: sezai@itu.edu.tr, http://www.akademi.itu.edu.tr/sezai

2- Assoc. Prof. Emin ÇİFTÇİ, Deputy Chair and ABET Department Coordinator
İstanbul Technical University
Faculty of Mines
Department of Geological Engineering
Maslak 34469 Istanbul - Turkey
Telephone : +90 212 285 61 09
Mobile : +90 532 487 08 96
e-mail: eciftci@itu.edu.tr, http://www.akademi.itu.edu.tr/eciftci

3- Res.Asst. Hüseyin KOCATÜRK, ABET Department Coordination Member
Istanbul Technical University
Faculty of Mines
Department of Geological Engineering
Maslak 34469 Istanbul - Turkey
Telephone : +90-212 285 62 52
Mobile : (+90) 507 348 0321
e-mail: kocaturkhu@itu.edu.tr, http://www.faculty.itu.edu.tr/kocaturkhu

Program History

The Department of Geological Engineering in the Faculty of Mines at the Istanbul Technical University began education **in 1961** as the second geology program in Turkey. When students were admitted, they could graduate with Master's Degree in Engineering according to the 5-year education system. **In 1972**, the curriculum was changed to a four-year Bachelor of Science (B.Sc.) and two-year Master of Science degrees. At the same time, department started a Doctor of Philosophy (Ph.D.) program. **In 1989**, English Supported Teaching was introduced in all departments of ITU with additional English course credits. **In 1996**, ITU Senate made a decision to start a new system with at least 30 % of all program courses to be taught in English language. The Geological Engineering Program started modifying its B.Sc. program for the ABET's substantial equivalency **in 2000**. Since ITU was established, there was old traditional division system. **In October 2009**, ITU Senate decided to eliminate the divisions in the Departments and consequently, our administration systems have been converted to Departmental system, similar to the American universities. It was first evaluated for **ABET's substantial equivalency in 2004** and has been accredited with a substantial equivalency in accordance with ABET's Engineering Criteria - 2000 in 2004. **ABET visited in 2010 and the department has been granted full accreditation in December 2011.**

Since the last review, five faculties have retired and three new faculties have been hired. Department of Geological Engineering has modified the curriculum and especially the "Graduation Design Project" has significantly been improved according to the suggestions of 2010 ABET Evaluation Committee. Department of Geological Engineering currently has 20 Professors, 9 Associate Professors, 5 Assistant Professors, 15 Teaching Assistants, 1 lecturer with Ph.D., 6 Engineers with Ph.D., 5 Engineers with M.Sc., 1 Engineer with B.Sc., 1 Professional Technician, and 1 secretary.

Options

There is not any option for the Geological Engineering Department.

Program Delivery Modes

The undergraduate program in the Department of Geological Engineering, and also in the other Departments at ITU, is offered only in the day mode. The day program takes 4 years (8 semesters) to complete. The incoming freshmen are allowed to start their program only after passing an English proficiency exam. According to the results of this proficiency examination, some may be placed in the English Preparatory School; and the English education may take generally two, but sometimes one semester if student passes the exam. Due to the nature of geology education, most of the core courses require field studies and therefore, faculty prefers to take students to the field studies during weekends for daily field trips by bus. ITU administration provides bus or minibus without any limit if faculty applies. Summer Field Camp and geological mapping techniques for three weeks are a part of degree requirement of the Department. Web-based education is strongly encouraged in ITU by the administration and lecture notes of many courses, attendance lists, the results of quiz or mid-term exams and class announcements are available in NINOVA program in campus. In contrast to American universities, 60 working days of industry experience are a required part of degree requirement for undergraduate students and therefore, our students are strongly encouraged to complete summer experience in major companies. If suitable projects are available for students, Department also advises students to complete a part of their summer experiences in faculty member's projects. Besides, ERASMUS program in European universities and double major programs inside ITU campus are also available as additional education opportunities.

Program Locations

Geological Engineering Program is located at the address below:

Istanbul Technical University, Ayazağa Campus

Faculty of Mines, Geological Engineering Department, 34469 Maslak, İstanbul

Public Disclosure

Program educational objectives are broad statements, which describe how the program prepares graduates to be successful in their professional career. Student outcomes describe what level of knowledge and skills from the students are expected for the program to prepare them to achieve the program educational objectives. New program was revised after the first evaluation of ABET 2010 Committee. The committee established the preliminary draft and the program educational objectives using the following instruments:

Surveys from employees and alumni

- Department meetings
- Faculty and student feedback
- Student meetings
- Advisory Board meeting

The mission statement, program educational objectives and student outcomes were evaluated periodically. The objectives were distributed to all faculty members in the department for discussion and comments. The revised mission statement and the program educational objectives after 2010 ABET evaluation were discussed during the regular meeting of the Department Advisory Board. The new revised mission statement and the program educational objectives were sent to the Dean of the Faculty of Mines, who made them available to the Department Faculty Board and opened them for discussion during regular meetings. In December 2013, ABET Education Commission discussed and revised previous concepts of missions and visions of the Geological Engineering Program. New suggestions discussed in the Department Board, which meets regularly every month.

Student learning is the fundamental goal of university education. The strategic planning efforts at ITU are directed ultimately to the enhancement of the quality of student's learning and teaching them "**learning how to learn**". Student's development and program learning outcomes are used to make judgments about overall educational performance and our academic programs. Institutional effectiveness is also assessed to monitor and improve the academic environment provided for teaching and learning and for enhancing overall student success.

The program learning outcomes were first established by the ABET Commission and approved by the department in 2003, along with the mission and program objectives. The

student outcomes were revised before the ABET Commission visit in 2010 and approved by the Department Board to reflect the minor changes in ABET criteria. Later, the student outcomes are revised and improved in 2013 by Department Advisory Board. Detail information on the annual student enrollment and graduation data sheets is available in the Criterion 2.

Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

Substantial Equivalency application was accepted with only one concern as **NGR** for six years by ABET Evaluation Committee in 2004. Subsequent to the departmental visit, Geological Engineering Program has been deemed substantially equivalent to geological programs in the United States. Our department has not only implemented a renewal to the whole undergraduate and graduate programs, but also administrative system has been restructured in fall of 2009.

Overall student and outcomes survey questions were revised and updated for the application of Department of Geological Engineering by ABET Education and Accreditation Commissions. The observations and the actions taken to address them are presented below.

1. The assessment process includes both direct measures of individual achievement, for example examination and project report grades and indirect measures of program effectiveness, including students' course objectives achievement surveys, senior exit surveys, alumni surveys, faculty outcomes surveys, advisory board input, etc. Because of students' general lack of experience, care must be taken in the interpretation of student self-assessments. A greater use of direct measures to ensure that all students individually meet all program requirements should also be considered.

   Action: The questions about the program outcomes were removed from the course surveys (only the course objectives, which are currently course-learning outcomes, are asked) and more direct measures are employed.

2. The Geological Engineering faculty size is the largest, resulting in the smallest student-to-faculty ratio, among five departments in the Faculty of Mines, because:

   a. Department of Geological Engineering, as a part of historical and traditional mission of ITU in Turkey, faculty and graduates have been major contributors in the planning and construction of early years of the Republic of Turkey's

such as roads, bridges, dams, buildings, energy plants and department become the leader in engineering achievements,

b. In addition, providing technical assistants to the governmental agencies such as MTA (Geological Survey of Turkey), TPAO (Turkish Petroleum Corporation), TKI (Turkish Coal Works), TTI (Turkish Lignite Works), ETİBANK (Turkish Metal Mining Works), DSI (State Water Works), KGM (State Highway Construction Works) etc.,

c. Providing consulting and teaching support for newly establishing almost one dozen Turkish universities,

d. Turkey is a disaster country and its complex tectonic structure is unique. It has been as geological laboratory, always interesting region in the world to study for scientists, therefore, faculty members are specialized and published in very highly and different specific areas for the international recognition,

e. Besides, there were four different divisions according the YOK (Council of Higher Education) system and this division system is converted to department system in October 2009. For this reason, more people were hired in highly specialized fields,

f. Like in Medical Sciences, Geological Engineering widely spreads out in many specific field of academic interests, which requires highly experienced people in those academic areas,

g. Our department needs to hire young faculty who is specialized in new fields of the forefront of geology. Therefore, there are still gaps in specific academic fields; in contrast, there are more faculty members in traditional fields. In addition, three faculty members were retired in last 5 years. Five of our faculty members became affiliated in the Eurasia Institute of Earth Sciences. Department of Geological Engineering also provides many service courses to other departments.

Action: Ten new faculty members, who have good English knowledge, have been hired since the last visit, and search for new faculty members is continuing in the specific areas of our needs.

3. The research cooperation of faculty members with foreign universities is observed to be at a medium level. In order to increase international recognition of our department, more multi institutional research projects should be submitted and more foreign scientists should be encouraged to visit our department, doing more field studies and mutual projects in Turkey.

   Action: Much scientific cooperation was carried out and exchange agreements were signed with European and American universities since the last visit.

4. The level of the faculty-industry interaction is observed to be improved. The competence of faculty generally includes field experience in various specialization fields of geology, problem solving of industry needs and participation in professional society. Consulting and other interaction with industry should be actively encouraged.

   Action: The faculty - industry interaction has been improved. Numbers of industrial application projects were increased gradually through Faculty of Mines Foundation. Besides, many students Graduation Projects were supported with industry projects.

5. Available laboratory opportunities and quality of analytical instruments were limited in our department. Many faculty members could not have carried out sophisticated analysis for research opportunities in our department and therefore, they had to visit foreign universities to make more research and publications.

   Action: Almost all laboratories were renewed to serve more students under the support of infrastructure research grant available from State Planning Organization (DPT) and ITU Research Funds. The following laboratories renovated in terms of both physical appearance and purchasing new instruments during 2009 - 2010. These are; (1) Thin Section, Rock Cutting and Polishing Lab, (2) Sample Preparation Lab, (3) X-Ray Diffraction and X-Ray Fluorescence Lab, (4) Sample Crushing and Grinding Lab, (5) Biogeochemistry Lab, (6) Geochemical Analyses Lab, (7) Clean Room, (8) AA and LA-ICP-MS Lab, and (9) Geomicrobiology Lab.

   Moreover, **EMCOL** (Eastern Mediterranean Centre for Oceanography and Limnology) Research Laboratory, (http://www.emcol.itu.edu.tr) was up in 2005 by funds from EC FP6. The Centre has Core Analysis and Sedimentology-Geochemistry labs and field equipment facility for Marine and Lake studies. Many of our students have been using these labs for their graduation thesis work and training. EMCOL was organized for Limnology and Core Analysis Studies both under the financial aid of

EU and under the supports and coordination of members of DGE during 2004 – 2008 period. Besides, this laboratory was encouraged financially by the Faculty of Mines.

Turkish mining industry needs reliable and internationally certified geochemical analyses laboratory for industrial application. Our department decided to enhance cooperation with mining industry and industrial raw materials producers and for this reason, **JAL** (Geochemical Analysis Laboratory; (http://www.jal.itu.edu.tr) was established within the department. Thus, our new highly sophisticated laboratories can serve the needs of both advanced scientific research and mining industry projects.

Graduation Design Projects also fit for purpose which as a supplementary of our education.

DEPARTMENT OF GEOLOGICAL ENGINEERING GRADUATION DESIGN PROJECT (JEO 496/496E) IMPLEMENTATION RULES

1) Objective

In this chapter, objective of the study, methods and materials used, significance of the study, its actuality, its interest in terms of economy, and previous studies are briefly explained (program outcome "c").

2. Introduction of the Study Area

In this chapter, geographic, morphologic, climatologic, floral, and seismologic characteristics are briefly explained. Location map is given (program outcome "f").

3. Geology of the Study Area

This chapter covers issues such as lithology-petrography, stratigraphy, structural elements, and geological evolution. Geological map(s) and relevant section(s) are given (program outcome "b").

4. Definition of the Problem, its Modeling, and its Solution

In this chapter, based on the field study, description of critical case and the boundary conditions, defining methods towards solving the problem, discussing performances, associating and evaluating the data, developing infrastructure and assessment techniques to solve the problem, presenting all these in scaled manner, composing alternative techniques to solve the problem, assessment and discussing of economic and environmental impacts, modeling the outcomes towards solving the problem ((program outcome "b, d, e").

5. Conclusions and Suggestions

This chapter covers results of the study and suggestions for multi-optional solutions for the problem (program outcome "g, h, i").

6. Curriculum Vitae

In this chapter, a short but comprehensive and systematic resume is given. Within this context, jury members are to make suggestions for the career planning for the student (program outcome "j").

7. Validity

I.T.U. GE GDP Implementation Rules are valid starting Fall 2014-2015.

Sample Subjects for the Graduation

- Slope design depending on groundwater variations
- Evaluation of alternative routes in selecting dam axis location and its comparative design
- Effects of weathering in greywackes of the Thrace Formation comparing to fresh greywackes in terms of stress and intrinsic parameters on slope design
- Planning production and feasibility of an ore deposit with regards to reserve, grade and geochemical characteristics
- Designing water wells according to hydrogeological characteristics of any region for a bottling establishment using the ground waters of the region and economic analysis for such facility
- Planning production and designing energy use for a marble and/or industrial raw material quarry according to a projected production
- Designing a drilling system for 150 m deep and 24 inch diameter ventilation shaft based on geological characteristics of the any area for a hypothetical underground mining operation
- During a hypothetical open pit coal mining operation, designing drainage wells based on the hydrogeological characteristics of the area and its economic analysis
- Designing geothermal wells to heat a hypothetical hothouse with regards to local climatologic characteristics and physical and chemical features of the geothermal waters and its economic analysis
- Within a groundwater exploitation field, developing solution methods responding probable technical complications in isolating of artesian saline water aquifer, and designing and projecting suitable drilling methods

GENERAL CRITERIA

CRITERION 1. STUDENTS

Student Admissions

The geological engineering program in ITU is the second most popular amongst the 21 geological engineering programs offered in Turkey (Table 1.1). This is evidenced by the results of the nation-wide basis university entrance examination in last year (Table 1.1) and constitutes the group with the second highest Entrance Examination scores among all the Geological Engineering Departments. ITU Geological Engineering Department leads all others by a wide margin in terms of the ranks and test scores of the candidates placed in these programs. The program admits the students in the following categories:

1. ÖSYS: ÖSYS is the abbreviation of Öğrenci Seçme Yerleştirme Sınavı, or Selection and Placement of Student Exam in Higher Education Institutions in Turkey. This nation-wide exam is offered once every year. The number of students taking this exam exceeds one and a half million. The overwhelming majority of the students in the Department are admitted as a result of this nationwide exam (about 52 students). Results for the 2015 are tabulated below for the nation's top two programs (Table 1.1.). The data in this table refer to the first and last student placed in each program. Those students who rank first in a certain number of national and/or international scientific competitions are given extra points in the ÖSYS. Consequently, almost all of these students score more than the maximum points possible on ÖSYS. These students are treated as belonging to a separate category and are placed by ÖSYM (Student Selection and Placement Center) accordingly.

2. YÖS: YÖS is the abbreviation for Yabancı Öğrenci (Yerleştirme) Sınavı or Foreign Student Placement Exam. The number of foreign students per year placed this way is 1-2.

3. Transfer Students: Each year, the Department admits a number of students from other universities in Turkey. A very small number of exceptionally successful students can apply to our department from other universities if they pass from all courses and they can be accepted according to their GPA performance to our sophomore of junior level. Typically, the number of transfer students is 1-2. Since they have already studied in other geology departments, these students are treated as transfer students once they are admitted so, they have to take some deficiency courses.

Table 1.1. The "Min Enrollment ÖSYS (= SAT)" Scores Applied to the Various Geological Departments in Turkey in fall 2015

Name of University	Number of New Students Enrolled	Nation-Wide Basis University Entrance Exam (ÖSYS) Minimum
1- Middle East Technical University	52	364.138
2- Istanbul Technical University	**41**	**328.046**
3- Hacettepe University	52	269.156
4- İstanbul University	82	249.071
5- Ankara University	72	245.914
6- Dokuz Eylül University	52	238.428
7- Osmangazi University	52	231.407
8- Akdeniz University	41	229.140
9- Çanakkale Onsekiz Mart University	21	225.195
10- Kocaeli University	52	224.735
11- Karadeniz Technical University	41	222.159
12- Muğla Sıtkı Koçman University	21	220.890
13- Balıkesir University	21	218.886
14- Süleyman Demirel University	11	218.694
15- Selçuk University	31	207.525
16- Dumlupınar University	11	206.947
17- Aksaray University	11	204.802
18- Mersin University	31	202.747
19- Pamukkale University	26	202.242
20- Çukurova University	31	201.474
21- Kocatepe University	11	200.432

Statistical data are available for the current students in 2015-2016 academic year in Table-1.1. Higher Education Council (YÖK) decided to increase the number of enrollments capacity in all public universities in 2007, and therefore, our matriculating students suddenly increased from 40 to 70 students. This number is fixed to about 40 students since 2012 - 2013 academic years. Almost all of students are Turkish nationals who are among the top 5 % of their age group. The class sizes vary between 40 and 60, due to the fluctuations in the number of students placed in the English Preparatory School each year. Average residence time and average GPA of geological engineering students graduating over the last five years were about 10 semesters and 2.50/4.00, respectively, and about 70 % of the matriculates of freshman students graduated every year.

Table 1.2. Active student enrollment data to Geological Engineering Program in fall 2015 for the 2015 – 2016 academic year (These numbers always change every semester)

	Female	Male	Foreign Students (Male)	Foreign Students (Female)	Total
English Preparation Class	24	47	6	1	**78**
Freshman	32	49	4	0	**85**
Sophomore	27	31	3	0	**61**
Junior	17	24	4	0	**45**
Senior	20	36	3	2	**61**
TOTAL	**120**	**187**	**20**	**3**	**330**

In order to ensure provide the success of the program and achieve the objectives, all students are evaluated by the procedures indicated within the program. Students take an English proficiency exam and those with grades 60/100 and above can attend to the 1st year courses of the program. The students who are below this grade have to register for English Language Education in the ITU College of Foreign Languages. The “Min Enrollment ÖSYS (= SAT)” Scores applied to the various Geological Departments in Turkey in fall 2015 and history of admissions standards for Freshmen for past five years are given in Tables 1.2. and 1.3.

Table 1.3. History of Admissions Standards for Freshmen for Past Three Years

Academic Year	Nation-Wide Basis University Entrance Exam (ÖSYS) Composite SAT (out of 380 point)		Rank in Nation-Wide Basis University Entrance Exam (ÖSYS) (out of 1.5 million students)			Number of New Students Enrolled
	MAX.	MIN.	MIN.	MAX	AVG.	
2015 - 2016	360.685	328.047	81503	55593	72796	41
2014 - 2015	365.947	334.06	81272	58477	73823	26
2013 - 2014	364.008	325.785	84637	56752	77061	41

At the beginning of each academic year, the new students are invited to a traditional welcoming and meeting during organization which the Department introduces its faculty and staff as well as its teaching research facilities. We regard this activity as the first step in achieving our objectives.

Evaluating Student Performance

Class activities such as midterm and final exams, home assignments, term projects, team projects, field and laboratory reports, are the primary means of evaluation of the progress of students. Each activity was designed to contribute towards the final success of the student in courses. This form of evaluation, provided in an integrated manner for each course through the Faculty Course Self-Assessment Forms, is reflected on the course grades at the end of each semester. These course grades form a base for the next advisory and monitoring activity stage in the Program.

Student questionnaires for course evaluation surveys, graduate surveys and employer surveys provide additional means of evaluation and assessment of students and the degree of success attained by the Program Objectives. Relative Grading system is being used for the definition of the success of the students as indicated below in terms of success level.

Table 1.4. Relative Grading and Success Relation

Relative Grade	***Success Level***
AA (4.0/4.0), BA (3.5/4.0), BB (3.0/4.0), CB (2.5/4.0) and	Pass
DC (1.5/4.0) and DD (1.0/4.0)	Conditional Pass
FF (0.0/4.0)	Fail
VF, unsuccessful to enter final exam due to non-attendance	Fail

AA	4.0 excellent	BA	3.5 very good	BB	3.0 good
CB	2.5 average	CC	2.0 satisfactory	DC	1.5 poor
DD	1.0 min acceptable	FF	2.0 failure		
VF	0.0 not permitted to take courses with prerequisites				

The grade point average (GPA) is a weighted average determined multiplying the grade received in each course by the number of its credit hours and then dividing the sum by the total number of course credit hours earned.

In the ITU, Double Major Program (DMP) is offered as an opportunity for students to have a second diploma under the monitoring of the Department DMP advisor. Horizontal and vertical transferring between different programs is being offered for the students according to the rules determined by ITU DMP Commissions. Students are evaluated regularly in all of their departmental courses through a combination of homework, quizzes, midterm exams, projects, reports, term papers and oral presentations. Projects, papers and reports are assigned either to individuals or to small teams of 3 - 5 students. Hence, continuous feedback on course performance is available both to the student and to the instructor. Last two weeks of each semester are reserved for scheduled final examinations, which make a significant contribution to the final letter grade students receive in almost every course. Grading is extremely rigorous in ITU campus and the geological engineering faculty has often been criticized as being rather stringent in this respect. A grade point average of 2.00 is sufficient for graduation but those who wish to pursue a higher degree in our department should graduate with a minimum GPA of 2.25. Being fully aware of the thorough evaluation procedure they must comply with, the students manage to put in the necessary extra effort throughout their undergraduate career, as evidenced by the high graduation percentages of the matriculates. No students are normally allowed to take less than 15 credits of course load per semester. The course load is usually about 18 - 21 credits per semester. Students with poor academic performance (GPA below 2.00 for two consecutive semesters) are placed on “repeating status” and are required to repeat all previous courses with FF grades together with a maximum of two new courses in each semester.

VF grade gives only under special circumstances if attendance to the course is very poorly done, so student does not allow entering final exam. According to university regulation, student must attend minimum 70 % of lectures and 80 % of laboratories.

Minimum of 60 working days compulsory industrial training, which is a very significant component of the student's 4-year program, is also closely monitored by the department. The industrial training coordinator is primarily in charge of establishing contacts with industrial organizations to provide a sufficient number of vacant training positions, of announcing them and of preparing a tentative placement list according to demand. The final placement is subject to the oral approval of the student's advisor, who also evaluates the report submitted by the trainee upon completion of his/her training. Employers are also requested to evaluate job performance of the students.

Transfer Students and Transfer Courses

An average of 3 transfer students is admitted each semester from the other universities. Transfer applications submitted to the Registrar's Office are processed by the department on the basis of the applicant's GPA, score and rank on the nation-wide university placement examination and letters of recommendation. External transfer applicants are also required to prove their proficiency in English either by taking TOEFL or the Proficiency Examination of the English Preparatory School. A tentative list of successful candidates is then proposed by the department and transfer action is completed by the approval of the Executive Board of the Faculty of Mines. According to the university regulations, no students are allowed to transfer into the first and last years of the undergraduate program. Minutes of the Department and Executive Board meetings (in Turkish) will be made available to the team members during the ABET visit. The number of external transfers is limited to 4 per year and the minimum GPA requirement is 3.00 and they must pass from English Proficiency Exam. About 10 % of new enrolled students transfer to another department inside ITU campus every year. The history of internal transfer students in the last three years is given in Table 1.5 and Table 1.6. Any deviation from the prescribed curricular requirements and transfer of credits for courses taken at other institutions must be petitioned for. The petition form requires signatures of the student's advisor and the Department Chair.

The petition is then processed by the Executive Board of the Faculty of Mines. Minutes of Executive Board meetings (in Turkish) on credit transfer will be made available and translated to the team members during the ABET visit. Any petitions requiring special consideration are brought before the highest administrative body, i.e., the Executive Council of the University for discussion and decision. The academic department at Istanbul Technical University, which offers an equivalent course, is consulted whenever credits are to be transferred for previously unevaluated courses.

Table 1.5. Transfer Student Quotas and Activities for Past Three Years

	2013	2014	2015	Total
Geological Engineering	46	34	51	131
Vertical Transfer	3	2	1	6
Additional Quota		1		1
Horizontal Transfer		2	4	6
Standard College Board Exam	41	26	41	108
Aboard Students	2	3	5	10
Total	**46**	**34**	**51**	**131**

Table 1.6. Transfer and ERASMUS Students for Past Three Years

Academic Year	Number of Transfer Students From Other Universities	Number of Transfer Students From Two-Year Institutes	Number of Transfer Students From Within the University	Number of Double Major Program Students	Number of Minor Program Students	Number of ERASMUS Students	
						Incoming	**Outgoing**
2015-2016	1		4	3		1	4
2014-2015	2		2	1		2	2
2013-2014	3		3	2		3	3

Academic Year	Number of International Students From Abroad	Number of Visiting Students From Abroad
2015-2016	6	2
2014-2015	3	2
2013-2014	2	0

Table 1.7. Enrollment Trends for Past Five Academic Years

Years	UG	MSc	PhD	Total
2011 - 2012	310	69	29	408
2012 – 2013	333	78	35	446
2013 – 2014	340	90	39	469
2014 – 2015	327	111	43	481
2015 - 2016	330	130	40	500

Various exchange programs are available for our students as a result of bilateral agreements with the foreign universities and also as a part of EU Mobility programs with the European Universities (http://www.eucenter.itu.edu.tr). Lifelong Learning Program (LLP)/ERASMUS program is extremely valued within this framework and ITU's active involvement in mobility is noteworthy for its willingness on close collaboration with its European partners as well as other partners from the world. To increase visibility in Erasmus activities, the Institutional ECTS/DS Coordinator and the Erasmus Office Head visited all the faculties to promote especially teaching staff mobility. The decision of displaying Erasmus Policy Statement and the Erasmus University Charter on the web is considered as an additional support of information dissemination. The exchange program applications of the students are first evaluated by the department through an interview and then by the Office of International Relations (OIR) of the university. OIR makes the final decisions on the applications by taking the interview ratings and the available quotas into account. Eligible students are advised by the department about the suitability of the courses for transfer before the students join the exchange program. The courses taken during the exchange program are transferred with the approval of the department and of the instructor who offers the corresponding course.

Advising and Career Guidance

All departments of Technical University joined a Career Guidance program which supported directly by our Rectorate. Mainly these programs comprise online interactions with the significant industrial companies, internship activities on the career path and live events, which organized, with mutually our engineer candidates and these companies. While our engineers following up these career opportunities also, they can set their career goals according to today's world. This professional guidance program mainly contains related with our senior students who are close to graduate. This guidance program can evaluated by the given link (http://ikm.itu.edu.tr/).

On the other hand, all undergraduate students are divided into a small group for each faculty member, so faculty can better control this small group. The advising system in geological engineering emphasizes continuity and close communication with the student. Hence, each incoming freshman student is assigned a full time faculty member, who provides guidance on academic issues to the student throughout his/her enrollment in the department. The students are encouraged to see their advisors at any time and on academic as well as non-academic issues. All full time faculty members participate in advising and each one has approximately 8 - 10 advisees. The Department Chairman provides coordination between the advisors to ensure uniform implementation of rules and regulations.

They are advised also on how to increase their performance. Every student has a specific adviser and meeting with the advisers at least twice a year is required. This system also provides a means for monitoring students for the duration of their program in the department. The advisory system also encourages the students to discuss their personal problems with their advisors.

Students are advised to follow the curriculum for the successful completion of their Programs. During all advisory discussions, they are made aware of all educational rules and regulations, which could affect their success. They are also given advice in choosing their elective courses. Students are monitored and evaluated throughout their summer practice studies held in various private industries.

A schedule of courses to be taken by the student each semester is subject to approval of the advisor via the on-line registration system, which also permits on-line advising. Information of

interest to students including curricular requirements, regulations, list of electives, etc., is also announced on the web site (http://www.sis.itu.edu.tr) during the registration period.

Compliance with most curricular requirements (prerequisites, minimum number of credits, etc.) is automatically monitored by the on-line registration system; this enables the advisor to spend more time on issues like choice of available options, elective courses and career planning.

The advisors review student programs at the beginning of each semester and it is the responsibility of the advisor to warn the student of possible delay of graduation time due to deficiencies in his/her program and to propose remedial action, if possible. Another way to advice to the students is to establish some kind of social activities with Student Geology Club, to organize daily field trips to clay or stone quarries in the surrounding of the city of Istanbul, to invite lecturers from industry and to organize picnics.

English Preparatory School has been included as advisees of the freshman class advisors to ease their transition to their new Department. Besides, new orientation meetings and seminars were organized twice in a year in the English Preparatory School for students to get more insight into the Geological Engineering concepts. These students are invited to the department at the beginning of the school year for an orientation to the department, allowing these students to ask questions about the University or the Department.

In addition to all of these activities, department seminars are also organized which mainly aims to career guidance and understanding industrial standards for the geological engineer candidates. Two of these seminars directly related Engineering Career Planning. For the last two years it has been organized in regular platform and details shared in continuous development section of the report.

Work in Lieu of Courses

There is not any awarding system for the out of campus activities.

Graduation Requirements

The advisor of a student keeps track of all the courses in which the student is enrolled starting from the freshman year. At the beginning of the last semester before graduation, a tentative list of the students who are likely to graduate at the end of the spring semester is prepared and sent to the Dean's Office and to the Registrar's Office. Prior to graduation, the advisor reviews the files of his/her advisees to propose the list of the students who have satisfied all the requirements for the Bachelor of Science degree including the industrial training. The Department Chair checks the list and forwards it to the Executive Board of the Faculty of Mines. Executive Board audits the academic records in consultation with the Registrar's Office to ensure that the prescribed curriculum has been completed within the required total credit hour and with a minimum GPA of 2.00. The Executive Board then certifies graduation, which is included in the minutes of its meeting.

The enrollment trends in our undergraduate program and the status of the last 25 graduates are given in Table 1.10, 1.11 and 1.12, respectively.

Table 1.10. Enrollment Trends for Past Three Academic Years

	2013	**2014**	**2015**
Full-time Students	41	26	41
Part-time Students	-	-	-
Student FTE[1]	-	-	-
Graduates	21	23	

[1] FTE = Full-Time Equivalent

Table 1.11. History of Admissions Standards for Graduate Students for Past Three Years

Academic Year	Composite GRE **(ALES)**		Composite Undergraduate GPA		Percentile Rank in Undergraduate Program		Number of New Students Enrolled
	MIN.	**MAX.**	**MIN.**	**MAX.**	**MIN.**	**AVG.**	
2015 - 2016	**64,4**	**87,1**	**2,27**	**3,09**			**18**
2014 - 2015	**58,6**	**83,2**	**2,28**	**3,38**			**36**
2013 - 2014	**57,3**	**93,8**	**2,26**	**3,06**			**31**

Table 1.12. Program Graduates

(For Past Five Years or last 25 graduates, whichever is smaller)

No	Race	Year Matriculated	Year Graduated	Initial or Current Employment/ Job Title/ Other Placement
Cansu Demirel	Female	2012	2015	PhD student, RA
Serhat Palakcı	Male	2010	2015	E-Berk Tunneling Technologies / Engineer
Hasan Özkök	Male	2008	2015	ITU Eastern Mediterranean Centre for Oceanography and Limnology / Researcher
Özlem Abacı	Female	2009	2015	ASSECO See / First Level Support Specialist
Yunus Emre Kavuran	Male	2004	2015	No Data Retrieved
Hande Şile	Female	2010	2015	Project Assistant
Başak Fidancı	Female	2009	2015	No Data Retrieved
Gökhan Untöken	Male	2009	2015	No Data Retrieved
Berkan Nuri Durmuş	Male	2007	2015	Co-Founder at Craft Training
Gökhan Celep	Male	2009	2015	Field Engineer
Müge Yazıcı	Female	2010	2015	Project Assistant
Merve Nart	Female	2010	2015	Research Assistant
Recep Uğur Acar	Male	2011	2015	Research Assistant
Esra Çetin	Female	2010	2015	PhD student, RA
Anıl Yeni	Male	2009	2015	Al Rayyan Road Project - Zetas Qatar W.L.L / Project Engineer Site
Ali Yetkin Egi	Male	2006	2015	No Data Retrieved
Müge Çakıner	Female	2009	2015	Turcas Petrol Corp. / Intern
Yağmurcan Yılmaz	Female	2010	2015	Gözek Safety Constultancy/ Specialist
Cansu Akın	Female	2010	2015	Master Student
Seymur Gojayev	Male	2010	2015	Master Student
Hikmat Babayev	Male	2013	2015	Research Assistant
Tahsin Aykan Kepekli	Male	2004	2015	PhD student, RA

Transcripts of Recent Graduates

050100153 Müge Yazıcı
May 03, 2016 04:24 pm

Student's Photo

Student ID : 050100153
Surname : Yazıcı
Name : Müge
Birth Place : Samsun
Birth Date : 29-10-1991
Father Name : Hüseyin

Republic of Turkey ID No : 40523048264
Level : Undergraduate

Reg. Date : 02-09-2010
Reg. Type : Standard Student Selection Exam

2011-2012 / Fall

Lec. Code	Title	Crd.	Grd.
FIZ 101E	Physics I	3.00	FF *
FIZ 101EL	Physics I Laboratory	1.00	BA
ING 101	English I	3.00	CB
JEO 111E	Crystallography	2.50	CB
JEO 121E	Design in Earth Sciences	2.00	CC
JEO 131E	Introduction to Geological Engineering	1.00	BB
MAT 101E	Mathematics I	5.00	CC
STA 201E	Statics	3.00	CC

Geological Engineering

	A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
Term	20.50	17.50	20.50	40.25	1.96
Total	20.50	17.50	20.50	40.25	1.96
Acd. Stan.	Good				

2011-2012 / Spring

Lec. Code	Title	Crd.	Grd.
BIL 101E	Intro. to Computer and Inf.Systems	1.50	CC
FIZ 101E	Physics I	3.00	DD
ING 102	English II	3.00	CB
JEO 114E	General Geology	2.50	AA
KIM 101E	General Chemistry I	3.00	DC *
KIM 101EL	General Chemistry I Laboratory	1.00	BA
MAT 102E	Mathematics II	5.00	CC

Geological Engineering

	A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
Term	19.00	19.00	19.00	41.50	2.18
Total	39.50	36.50	36.50	81.75	2.24
Acd. Stan.	Good				

2012-2013 / Fall

Lec. Code	Title	Crd.	Grd.
ATA 101	History of Turkish Revolution I	2.00	AA
ING 201	English III	3.00	BB
JEO 211E	Mineralogy	2.00	CC
JEO 221E	Paleontology	2.50	BA
MAL 201E	Materials Science	3.00	BA
MAT 201E	Differential Equations	4.00	DD *
MUK 203E	Strength of Materials I	3.00	DD
TUR 101	Turkish I	2.00	AA

Geological Engineering

	A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
Term	21.50	21.50	21.50	55.25	2.57
Total	61.00	58.00	58.00	137.00	2.36
Acd. Stan.	Good				

2012-2013 / Spring

Lec. Code	Title	Crd.	Grd.
FIZ 102E	Physics II	3.00	FF *
FIZ 102EL	Physics II Laboratory	1.00	AA
JEO 222E	Geomechanics	3.00	AA
JEO 242E	Optical Mineralogy	2.00	CB
JEO 256E	Structural Geology	2.00	AA
JEO 262E	Stratigraphy	2.00	BB
JEO 272E	Thermodynamics in Geology	2.00	AA
KIM 101E	General Chemistry I	3.00	BB
MAD 312E	Surveying	3.00	BB
TUR 102	Turkish II	2.00	BA

Geological Engineering

	A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
Term	23.00	20.00	23.00	68.00	2.96
Total	84.00	75.00	78.00	200.50	2.57
Acd. Stan.	Good				

2012-2013 / Summer

Lec. Code	Title	Crd.	Grd.		A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
FIZ 102E	Physics II	3.00	AA	**Geological Engineering**					
MAT 201E	Differential Equations	4.00	BA	**Term**	7.00	7.00	7.00	26.00	3.71
				Total	91.00	78.00	78.00	222.50	2.85
				Acd. Stan.	Good				

2013-2014 / Fall

Lec. Code	Title	Crd.	Grd.		A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
ATA 102	History of Turkish Revolution II	2.00	AA	**Geological Engineering**					
EKO 201E	Economics	3.00	FF *	**Term**	23.00	20.00	23.00	74.75	3.25
JEF 341E	Geophysics	3.00	BA	**Total**	114.00	98.00	101.00	297.25	2.94
JEO 323E	Geochemistry	2.50	CB	**Acd. Stan.**	Good				
JEO 343E	Drilling Techniques	2.00	AA						
JEO 348E	Sedimentary Rocks Petrography	2.00	AA						
JEO 349E	Magm.&Metamor.Rokcs Petrog.	2.50	AA						
KIM 205E	Organic Chemistry	3.00	AA						
SNT 211E	Istanbul:History ,Art and Society	3.00	AA						

2013-2014 / Spring

Lec. Code	Title	Crd.	Grd.		A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
BIL 108E	Intro.to Scientific&Eng.Computing	3.00	CB	**Geological Engineering**					
EKO 201E	Economics	3.00	CB	**Term**	20.00	20.00	20.00	59.75	2.99
ITB 202E	World History	0.00	T	**Total**	134.00	118.00	118.00	357.00	3.03
JEO 312E	Field Geology	3.00	CB	**Acd. Stan.**	Good				
JEO 322E	Hydrogeology	3.50	BA						
JEO 334E	Subsurface Geology	3.00	AA						
JEO 341E	Sedimentology	2.50	CC						
JEO 347E	Rock Mechanics	2.00	AA						

2014-2015 / Fall

Lec. Code	Title	Crd.	Grd.		A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
ALM 101	Deutsch I	0.00	BL	**Geological Engineering**					
ITB 203E	Sociology	3.00	BB	**Term**	20.50	20.50	20.50	73.50	3.59
JEO 325E	Computering in Geology	3.00	BB	**Total**	154.50	138.50	138.50	430.50	3.11
JEO 336E	Historical Geology	3.00	AA	**Acd. Stan.**	Good				
JEO 339E	Ore Deposits	2.50	BB	**Dean List**	High Honor List				
JEO 411E	Tectonics	2.50	AA						
JEO 417E	Geology of Turkey	3.00	AA						
JEO 431E	Engineering Geology	3.50	AA						

2014-2015 / Spring

Lec. Code	Title	Crd.	Grd.		A.Crd.	E. Crd.	U.Crd	Q.Point	GPA
ALM 102	Deutsch II	0.00	VF	**Geological Engineering**					
ETK 101E	Engineering Ethics	1.00	DC	**Term**	15.00	15.00	15.00	43.50	2.90
ITB 233E	Anthropology	3.00	CB	**Total**	169.50	153.50	153.50	474.00	3.09
JEO 412E	Industrial Materials	2.00	BB	**Acd. Stan.**	Good				
JEO 448E	Neotectonics	3.00	BA						
JEO 492E	Graduation Project	3.00	AA						
MAT 271E	Probability and Statistics	3.00	CC						

Student's Photo

Ögrenci No	: 050100172	**TC Kimlik No**	: 26492164464
Soyadi	: Şile	**Seviye**	: Lisans
Adi	: Hande		
Dogum Yeri	: Sakarya		
Dogum Tarihi	: 09-01-1992	**Kayit Tarihi**	: 02-09-2010
Baba Adi	: Semih	**Kayit Tipi**	: Standart ÖSS

2010-2011 / Bahar

Ders Kodu	Ders Adi	Kredi	Not
BIL 101E	Int to Comp and Inf Systems	1.50	FF *
FIZ 101E	Physics I	3.00	VF *
ING 102	English II	3.00	FF *
JEO 112E	General Geology	3.00	CB
KIM 101E	General Chemistry I	3.00	DC
KIM 101EL	General Chemistry I Lab	1.00	AA
MAT 101E	Mathematics I	5.00	FF *

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	19.50	7.00	19.50	16.00	0.82
Toplam	19.50	7.00	19.50	16.00	0.82
Akd. Durum	Gözetim Listesi				

2011-2012 / Güz

Ders Kodu	Ders Adi	Kredi	Not
FIZ 101EL	Physics I Lab	1.00	BA
JEO 111E	Crystallography	2.50	CC
JEO 121E	Design in Earth Sciences	2.00	CC
JEO 131E	Intr.to Geological Engineering	1.00	CC
MAT 101E	Mathematics I	5.00	FF *
STA 201E	Statics	3.00	CC

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	14.50	9.50	14.50	20.50	1.41
Toplam	34.00	16.50	29.00	36.50	1.26
Akd. Durum	Gözetim Listesi				

2011-2012 / Bahar

Ders Kodu	Ders Adi	Kredi	Not
FIZ 101E	Physics I	3.00	FF *
FRA 101	Fransızca I(Kredisiz)	0.00	BL
JEO 212E	Chemical Equilibrium inGeology	2.50	CB
JEO 252E	Structural Geology	2.50	DC *
JEO 262E	Stratigraphy	2.00	BB
MAT 101E	Mathematics I	5.00	FF *

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	15.00	7.00	15.00	16.00	1.07
Toplam	49.00	23.50	36.00	52.50	1.46
Akd. Durum	Gözetim Listesi				

2011-2012/Bütünleme Dönemi

Ders Kodu	Ders Adi	Kredi	Not
FIZ 101E	Physics I	3.00	FF *
MAT 101E	Mathematics I	5.00	FF *

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	8.00	0.00	8.00	0.00	0.00
Toplam	57.00	23.50	36.00	52.50	1.46
Akd. Durum	Gözetim Listesi				

2012-2013 / Güz

Ders Kodu	Ders Adi	Kredi	Not
ING 102	English II	3.00	AA
JEO 211E	Mineralogy	2.00	DD
JEO 221E	Paleontology	2.50	BA
JEO 341E	Sedimentology	2.50	DC
MAT 101E	Mathematics I	5.00	DD

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	15.00	15.00	15.00	31.50	2.10
Toplam	72.00	38.50	43.00	84.00	1.95
Akd. Durum	İyi Durum				

2012-2013 / Bahar

Ders Kodu	Ders Adi	Kredi	Not
ATA 102	Atatürk İlk & İnkılap Trh II	2.00	AA
ITB 094E	International.Rel.and Globali.	3.00	AA

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	21.00	21.00	21.00	59.25	2.82

JEO 222E	Geomechanics	3.00 CC	**Toplam**	93.00	57.00	61.50	139.50	2.27
JEO 242E	Optical Mineralogy	2.00 CC	**Akd. Durum**	İyi Durum				
JEO 252E	Structural Geology	2.50 BA						
JEO 322E	Hydrogeology	3.50 DD						
MAD 312E	Surveying	3.00 BB						
TUR 102	Türk Dili II	2.00 AA						

2013-2014 / Güz

Ders Kodu	Ders Adi	Kredi	Not
ATA 101	Atatürk İlk & İnkılap Trh I	2.00	CB
BIO 301E	Fundamentals of Biology	3.00	BA
FIZ 101E	Physics I	3.00	FF *
JEF 341E	Geophysics	3.00	CB
JEO 321E	Ore Deposits	3.00	BB
JEO 331E	Petrography	2.50	BB
MAT 102E	Mathematics II	5.00	DC
SNT 227E	Sound and Society	3.00	BB

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	24.50	21.50	24.50	56.00	2.29
Toplam	117.50	78.50	83.00	195.50	2.36
Akd. Durum	İyi Durum				

2013-2014 / Bahar

Ders Kodu	Ders Adi	Kredi	Not
BIL 101E	Int to Comp and Inf Systems	1.50	DD
ING 103I	Short Stories	3.00	BA
ITB 208E	Formations of Modern Turkey	3.00	FF *
JEO 312E	Field Geology	3.00	CB
JEO 324E	Sedimentary Rocks Petrography	3.00	AA
JEO 332E	Petrology	2.00	BB
JEO 412E	Industrial Materials	2.00	AA
JEO 418E	Hydrogeochemistry	3.00	AA
MAT 201E	Differential Equations	4.00	FF *

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	24.50	17.50	24.50	57.50	2.35
Toplam	142.00	96.00	106.00	253.00	2.39
Akd. Durum	İyi Durum				

2013-2014 / Yaz Öğretimi

Ders Kodu	Ders Adi	Kredi	Not
FIZ 101E	Physics I	3.00	DD

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	3.00	3.00	3.00	3.00	1.00
Toplam	145.00	99.00	106.00	256.00	2.42
Akd. Durum	İyi Durum				

2014-2015 / Güz

Ders Kodu	Ders Adi	Kredi	Not
BIL 108E	Intr. to Sci. & Eng.Computing	3.00	CC
ETK 101E	Engineering Ethics	1.00	BA
JEO 323E	Geochemistry	2.50	BB
JEO 325E	Computering in Geology	3.00	BB
JEO 411E	Tectonics	2.50	AA
JEO 425E	Igneous Petrology	3.00	AA
JEO 431E	Engineering Geology	3.50	AA
MAL 201E	Materials Science	3.00	BA
MUK 203E	Strength of Materials I	3.00	AA

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	24.50	24.50	24.50	84.50	3.45
Toplam	169.50	123.50	130.50	340.50	2.61
Akd. Durum	İyi Durum				
Bas. Listesi	Onur Listesi				

2014-2015 / Bahar

Ders Kodu	Ders Adi	Kredi	Not
EKO 201E	Economics	3.00	CB
FIZ 102E	Physics II	3.00	CB
FIZ 102EL	Physics II Lab	1.00	BA
ING 201	English III	3.00	BA
ITB 208E	Formations of Modern Turkey	3.00	DC
JEO 338E	Mining Exploration	3.00	BA
JEO 492E	Graduation Desing Project	3.00	AA
MAT 201E	Differential Equations	4.00	CC
MAT 271E	Probability and Statistics	3.00	BB
TUR 101	Türk Dili I	2.00	AA

Jeoloji Mühendisliği	A.Krd.	B.Krd.	O.K.Krd.	B.Puan	Ort.
Dönem	28.00	28.00	28.00	81.00	2.89
Toplam	197.50	151.50	151.50	421.50	2.78
Akd. Durum	İyi Durum				

Belge Sonu

Belge Tarihi:04-04-2016

RELEASE: 8.4

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

Mission Statement

Istanbul Technical University is proud to be the Turkey's oldest engineering and technology university. ITU was established in 1773 as a Naval Engineering School and as time goes by, it was changed covering to school of all engineerings. ITU graduates are well prepared to lead the scientific, technologic and economic development of an increasingly complex national and international.

Istanbul Technical University's vision is to become a leading, international university through its expertise and creativity in science, technology and art. (http://www.itu.edu.tr/en/about-itu/general/vision-and-mission).

The program and ITU's missions are published on the departments and ITU's web pages, respectively (http://www.jeoloji.itu.edu.tr). Geological Engineering Program has also web pages in Facebook for a better communication with alumni members (https://www.facebook.com/groups/itu.jeoloji.muhendisligi.kulubu/?fref=ts).

Geological Engineering Program's vision is to provide and keep high quality and internationally accepted educational standards so that its graduates will be an unnegligible part of industry for technical, economic and social necessities of the society and life. (http://www.mines.itu.edu.tr/Icerik.aspx?sid=6029).

The mission of the Faculty of Mines is to serve industry, the nation and the world by producing high quality graduates, conducting research, and developing breakthrough technologies related to earth science and engineering applications.
(http://www.mines.itu.edu.tr/Icerik.aspx?sid=6029).

Geological Engineering Program's mission is to graduate professionals who are able to resolve problems related to the geology faced to all sectors of private and public components using all aspects of science and technologies.

Objectives of ITU in Education and Research:

- Education targeting change and improvement
- Outcome-oriented, interdisciplinary research to be beneficial for society
- Effective cooperation in international relations
- Versatile, effective and sustainable university – industry cooperation (UIC)
- Strengthening the ITU perception in public; a participatory and transparent governance and with increasing own revenue

Program Educational Objectives

The Objectives of the Geological Engineering Program, which is consistent with the mission of the program, is (http://www.jeoloji.itu.edu.tr/Icerik.aspx?sid=7247);

1. Our graduates will have the basic knowledge and skills on mathematics, basic sciences, and engineering integrated with earth sciences that required implementing in academic, public and private sector practices.
2. Our graduates will have ability to utilize effectively the knowledge of field and laboratory tools, and will contribute in designing and conducting geological engineering solutions.
3. Our graduates will have abilities to function individually single or multidisciplinary teamwork, effective communication, as well as ability of 3 and 4 dimensional analytical and critical thinking in engineering problems and will engage in life-long learning and will be ready to cope with competitive and rapidly changing industrial and academic environments.
4. Our graduates will have ability to understand the impact of both local and global geological engineering problems with a grasp in all dimensions the awareness of professional and ethical responsibilities, and needs of society to protect public health and safety.

The program objectives are published on the department's web page.

A. Consistency of the Program Educational Objectives with the Mission of the Institution

As a state university, The ITU has broad based and historical missions as suggested in its stated mission statement above. ITU's principle mission is that academics come first; we serve public through life-long learning, discovery, problem solving and engagement. The Geological Engineering Program Educational Objectives are consistent with the ITU, the Faculty of Mines and Geological Engineering Department missions. Consistent with the mutual missions of ITU, the Department has historically been and is currently an integral part of the Faculty of Mines producing engineering graduates, conducting research on critical problems, and performing outreach activities to meet the needs of industry, government, and the nation. The Geological Engineering Department has developed a set of objectives with its mission statement. The objectives are more specific than the department mission, elucidating the expected results of study of our program. The program objectives describe the means to close encounter with both the missions of the Faculty of Mines and Geological Engineering Program, and also shows abilities and skills of the graduates should have. The second and third clauses of the objective statement, which are related to the analytical thinking and engineering problem solution ability, were also indirectly covered by the mission of the ITU through historical reputation of strong basic sciences and mathematics education. The fourth clause of the program objective statement matches more comprehensively than other clauses with the mission of ITU due to achievement efforts to the technological leadership, globalization, professional and ethical responsibilities. By preparing our graduates who have a strong basis in the fundamentals of engineering, the ability to design systems, field experience, and industry practices, and who have developed knowledge and skills to function professionally. The Geological Engineering Department mission is also congruent with these missions and objectives, as evidenced by the assessment and evaluation processes. The Geological Engineering Program is focused on three basic objectives: (1) Teaching: undergraduate curriculum is designed to produce well-educated geologists and engineers for the workforce of industry's needs; (2) Research: our department is currently #1 research department in Turkey in terms of Science Citation Index group publications and we want to keep this performance in the future. Student and faculty collaborate on research for the development of scientific knowledge and applications; and (3) Service/Extension: the transfer of knowledge to the nation's needs in public and private sectors; in other means, close relationship in the industry-university cooperation.

Program Constituencies

Followings were identified as the primary constituents of the program:

1. Current Students
2. Faculty
3. Employers
4. Alumni
5. ITU Administration
6. Administration of Faculty Board of Faculty of Mines

Secondary constituents of the program include

1. Other Engineering and Applied Science Departments
2. Humanity and Social Sciences Institute
3. Sponsors and industry
4. Parents

The primary constituents are directly involved, to varying extents and through different processes, in the establishment and review of program objectives as explained in the next section. Whereas, the secondary constituents are not directly involved because, each individual program in ITU campus is associated another department, which is close to their academic fields. Therefore, one department's success is related to the academic successes of other departments. For example, the courses taken from the other departments are designed through close collaboration with those departments. Geological Engineering Program Industry Advisory Board regularly meets with our faculty. Our indirect interaction with our constituents takes place through periodic surveys. We conduct in order to measure our success in achieving our program objectives and educational outcomes. In those surveys, among other questions, we solicit their opinions and suggestions for program objectives and industry's future needs. Additional informal interaction occurs through faculty involvement in professional organizations and through their consulting activities. Other direct and indirect interactions with employers of graduates occur through the Career and Counseling Center.

ITU regulations and Geological Engineering Department requirements for double major students are listed in http://www.jeoloji.itu.edu.tr/Icerik.aspx?sid=7247 and for minor program are listed at http://www.jeoloji.itu.edu.tr/Icerik.aspx?sid=7247 web pages.

Process for Review of the Program Educational Objectives

Program educational objectives are broad statements, which describes how the program prepares graduates to achieve in their professional career. Program outcomes describe what units of knowledge or skill are students are expected from the program to prepare them to achieve the program educational objectives.

ABET Education Commission discussed and revised previous concepts of missions and visions of the Geological Engineering Program. New suggestions discussed in the Department Board, which meets regularly every month. Besides, the chair and vice chair paid too much attention on the attendance of the board members in meetings.

Program educational objectives is based primarily on the feedback from students, supply and demand law of various industries and proposals from faculty members, who want to follow being fore-front in science and technologies, that has been an important feature of the departmental policy. The following information was used to improve the courses and the provide program educational objectives.

- Advisory board suggestions and proposals from program outcomes
- Recent developments in private industries
- Student survey conducted by the university
- Following up the literature and scientific developments in the content of courses
- Instructor evaluation of surveys, grades and the other indicators
- Senior exit and alumni survey results
- Following up the programs offered by top American and European universities
- Feedback from faculty and the students

Table 2.1. ABET Industrial Advisory Board Members

	Name	Company	Position	Address
1	Fazıl Kıran	STFA Holding	Director of Materials Division	STFA İş Merkezi, Yeşilvadi Sok. No:3, Kat.10, Bostancı-Istanbul
2	Sinan Biberoğlu	Avrasya - METRO Subway Project	Geological Engineer	Kadıköy-Kartal METRO projesi, AVRASYA METRO Grubu, Ünalan Mah. Ünalan Cad. (AYEDAS yanı) Merkez Şantiyesi, Üsküdar - Istanbul
3	Serdar Oran	ZEMAR Soil Mechanics Corp	Geological Engineer	ZEMAR Ltd. Mahirler Sok., No: 45/2 Florya-Istanbul
4	Halide Kaynar	MADEKS Ltd.	Associate Director	Darüşşafaka Mah. Ilıca Sok. Arıkent Sitesi, A-1 Blok, No:6, D.12 Tarabya-Istanbul
5	Mehmet Ziya Ateş	CAMİŞ Corp.	Director	CAMİŞ A.Ş. İş Kuleleri Kule-3, Kat.14, 34330 4. Levent - Istanbul
6	Şeyda Çağlayan	Turk Maadin Corp.	General Director	Turk Maadin Şirketi A.Ş., Barboros Bulvarı, Eser Apt. No.78, Kat.7, D.19, Balmumcu-Beşiktaş 34349 Istanbul
7	İsmail Eriş	Mosmetrostroy A.Ş.	Manager	Levent Cad No:27, 1. Levent-İstanbul
8	Oya Sarı	Anadolu Şişecam Corp.	Director of IT	İş Kuleleri, Kule-3, Kat.20, 4. Levent - Istanbul
9	Timur Ustaömer	University of Istanbul	Professor of Geology	İstanbul Üniversitesi, Dept.of Geol. Eng. Avcılar-Istanbul
10	Müjdat M. Özkaya	Durukaya Marble Ltd.	Chairman of the Board	Durukaya Mermer Ltd. Kozyatağı, No.86/19, Kadıköy-İstanbul
11	Hadiye Yücel	ELFA Engineering Co.	Chairman of the Board	Bülent Tarcan Sok. BOTEK İş Merkezi, No 10, B-1 Mecidiyeköy-Istanbul
12	Orhan Arkun	SANIDIN Mining Ltd.	Chairman of the Board	Feneryolu Çamtepe Sok, Burcu Apt. No:14/3, D.6, Kadıköy-Istanbul
13	Levent Körpe	Turkish Petroleum Corp.	Exploration Geologist	TPAO, Arama Dairesi Başkanlığı, Karadeniz Projesi, Esentepe-Ankara

14	Müslüm Gündüz	Zemin Technologies Center Ltd.	Chairman of the Board	Zemin Teknolojileri Merkezi, Kardeşkent 1. Sitesi, B-3 Blok, D.2, Istanbul
15	Haluk Sipahi	MATEL Industrial Raw Materials Corp.	Executive Vice-President	MATEL AŞ. Yalı Mah. Ziya No.3, Maltepe-Istanbul
16	Serkan Dağlıoğlu	DSİ (State Hydraulic Works) Istanbul Region	Vice-Director	DSİ XIV. Bölge Müd. Libadiye Cad. No.54, Küçükçamlıca-Istanbul
17	Belgin (Kırışoğlu) Arslanboğa	Esen Mikronize Corp.	Member of the Board, Geologist	ESEN Mikronize A.Ş. Marmara Cad. No:10, Tepeören Köyü, Tuzla-Istanbul
18	Mehmet Özmen	Taşdekor Ltd.	Manager	Tasdekor Yapı Dekorasyon San. Tic. Ltd. Ferhatpaşa Mah. Akdeniz Cad. G-57 Sok. No.7, Atasehir-İstanbul
19	Kağan Kayacı	Thermal Ceramic Ltd.	Technical Manager	Termal Seramik A.Ş. Söğüt-Bilecik
20	İsmail Kuşçu	MTA (Geological Survey of Turkey)	Marine Geologist	MTA Jeoloji Etüdleri Dairesi, Çankaya - Ankara
21	Dr. Ahmet Onak	MTA (Geological Survey of Turkey)	Engineer. Geologist	MTA Fizibilite Etüdleri Dairesi, Dumlupınar Bulvarı No:139, 06800 Ankara
22	Korkut Möroy	Yüksel Proje Uluslararası A.Ş.	Technical Manager	Yüksel Proje A.Ş. Istanbul Metro Kontrolluğu, Tersane Cad. İstanbul
23	Selahattin İş	YERTEK	General Manager	YERTEK Ltd. Dereboyu Cad. Gürcü Kızı Sok. No: 33, D.1, Ortaköy-Beşiktaş-Istanbul
24	Kadir GÜRGEY	MERTY Energy Corp.	Coordinator	Ziaur Rahman Cad. No:3, Gaziosman Paşa, Ankara
25	Osman AYDIN	Kaltun Mining A.Ş.	Director	Kaltun Madenciik A.Ş. Devlet Yolu kenarı Çine, AYDIN
26	Kemal YANIK	CAMİŞ	Manager	CAMİŞ A.Ş., İş Kuleleri Kule-3, Kat.14, 34330 4. Levent - Istanbul
28	Ekrem ARSLAN	Nizhnekamsk Rafinery & Chem. Complex	Technical Manager	Fluor Daniel Construction Site Nizhnekamsk, Rep. Tataristan
29	Dr. Ali POLAT	University of Windsor	Faculty	Memorial Hall nset Avenue Windsor, Ontario CANADA N9B 3P4

30	Dr. Atilla AYDIN	Stanford University	Faculty	Stanford University Department of Geology, Serra Mall, Stanford, CA 94305 USA
31	Dr. Hüseyin Akarsu	ÇAMİŞ	Genel Müd. Yard.	CAMİŞ A.Ş. İş Kuleleri Kule-3, Kat.14, 34330 4. Levent - Istanbul
33	Cansın MECİT	TERRA ZEMİN	Director	TERRA ZEMİN Ltd. Turistik Çamlıca Cad. No:9 Büyükçamlıca -İstanbul
34	Turgut ÖZTAŞ	Çağıl Engineering	Director	Çağıl Mühendislik Ltd. Rasimpaşa Mah. Prof. Macit Erbudak Sok. No:16/1 Kadıköy İsanbul
35	Hüseyin ARACI	Efe Engineering	Manager	Hürriyet Cad. Belediye İş Hanı Kat:5 No:110 Batı Blok - Kocaeli
36	İbrahim GÜNER	Günerler Engineering Ltd.	Manager	Atışalanı Cad. Güçlükardeşler İşhanı Kat:3/34 Esenler-İstanbul
37	Vedat ŞAHİN	Kadıköy Manuciple Finance Service	Geological Engineer	Kadıköy Belediyesi, Mali Hizmetler Müdürlüğü, Kadıköy - İstanbul
38	Orhan ARKOÇ	Trakya University	Faculty	Kırklareli Teknik Bilimler Meslek Yüksek Okulu, Maden Programı - Kırklareli
40	Cafer YUMAK	Consulting	Director	Kutman Sitesi, Mimar Sinan Mah. Kanarya Sok. B Blok, No:29, D.16, Kemerburgaz - İstanbul
41	Erkan PUNAR	Soiltest Ltd.	General Director	Soiltest Zemin Etüd Ltd. Güneşli Mah. Bağlar Sok. Ekşioğlu Apt.No: 11/A, Bağcılar- İstanbul
43	Yalçın ERMİŞ	TPAO (Turkish Petroluem Corp.)	Exploration Geologist	TPAO Arama Daire Başkanlığı, M. Kemal Mah. 2. Cad., No:86, Kat.19, Söğütözü - Ankara
44	Eyüp AKDAĞ	AKDAĞLAR Mining Industry and Trade Corp.	General Manager	AKDAĞLAR A.Ş. Cendere Cad. Topyolu Sok. No: 80, Ayazağa – İstanbul

CRITERION 3. STUDENT OUTCOMES

The Geological Engineering Program has accepted and implemented the use of the term "outcomes" as described in the ABET Engineering Technology Criteria 2015-2016. The program outcomes for the Geological Engineering Program support the program educational objectives and mission of the department and the University.

Student Outcomes

The following is an outline of the process for establishing and revising Geological Engineering program outcomes:

i. Define goals, objectives, and learning outcomes

ii. Identify performance criteria and measurement metric for each learning outcome and identify the courses that support the outcome.

iii. Identify assessment tools and provide data relevant to each learning outcome

iv. Develop plan to assess achievement of program goals and learning outcomes

v. Identify problem areas and develop strategies for improving delivery of learning outcomes

vi. Implement strategies targeted at improving specific learning outcomes and assess the effectiveness of the changes

vii. Reassess objectives and learning outcomes and continue the process.

Some examples to check if program revising is effective or needs more revising process are mentioned below. These are used appropriately in GE program accreditation procedure:

- Department-designed comprehensive or capstone examinations and assignments.
- Performance on licensing or other external examinations.
- Professionally judged performances or demonstrations of abilities in context.
- Portfolios of student work compiled over time.
- Samples of representative student work generated in response to typical course assignments.

Student learning outcomes, then, are properly defined in terms of the particular levels of knowledge, skills, and abilities that a student has attained at the end (or as a result) of his or her engagement in a particular set of collegiate experiences.

Our department routinely provides students and prospective students with information about student learning outcomes and institutional and program performance in terms of these outcomes. GE program regularly reports aggregate information about student learning outcomes to external constituents, and supplement this information with additional evidence about the soundness of institutional and program operations, overall effectiveness with respect to mission fulfillment, as well as concrete evidence of how they benefit students in other ways.

Our department's learning outcomes were developed and approved by ABET Commission and the department in order to be consistent with the requirements set forth by ABET shown below:

a. an ability to apply knowledge of mathematics, science, and engineering or computing as appropriate to discipline
b. an ability to design and conduct experiments, as well as to analyze and interpret data, or an ability to analyze a problem and identify and define the computing requirements appropriate to solution
c. an ability to design a system, component, program or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function on multidisciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. an understanding of the impact of engineering or computing solutions in a global, economic, environmental, and societal context
i. a recognition of the need for, and an ability to engage in life-long learning and continuing professional development
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering and computing tools necessary for engineering or computing practice.

Specifically, the Geological Engineering Program has adopted a set of student learning outcomes, which define what students are expected to know and be able to do by the time they graduate. These parallel to the requirements of ABET Engineering Criterion 3 items (a) through (k) and applicable Program Criteria.

Geological Engineering Program Student Outcomes aim by the time of graduation our students will present different skills according to ABET Criterion 3 designed for Engineering programs. All students of the Geological Engineering program at ITU are expected to have at the time of graduation:

1. A knowledge of mathematics and a knowledge of basic engineering sciences (***Program Criteria***)
2. The ability to apply knowledge of mathematics, science and engineering to solve problems in GE. The ability to use knowledge of relevant mathematics and computer principles and parameters in engineering, especially an ability to use various simulations models, probability applications and sampling techniques, and quality improvement methods (***Engineering Criterion 3(a)***)
3. The ability to use contemporary engineering techniques and tools for analysis and design. (***Engineering Criterion 3(k)***)
4. The ability to work with modern instrumentation, software and hardware, design and perform experiments, and analyze and interpret the results. Moreover, to be able to design, conduct and analyze experiments through the use of engineering analysis, statistical, life cycle and models, sampling tables and techniques, probability applications that use examples from service applications (***Engineering Criterion 3(b), Program Criteria***)
5. The ability to integrate knowledge gained from the core curriculum to solve a complex design problem. This includes the identification, specification, design and implementation of products/components and/or systems that meet desired safety, economic and performance criteria. To have the ability to determine the scientific and engineering management variables of interest and processes to manage engineering design alternatives and planning (***Engineering Criterion 3(c, e), Program Criteria***)

6. The ability to function on multi-disciplinary teams and exercise leadership to accomplish project goals. (***Engineering Criterion 3(d)***)
7. The ability to communicate effectively through written technical papers and/or Project reports. Being capable of submitting periodic oral and written progress reports as well as final written and oral reports on the entire project and be capable of commenting on and evaluating such. (***Engineering Criterion 3(g)***)
8. The ability to make effective oral presentations and convey technical material to an audience. (***Engineering Criterion 3(g)***).
9. An understanding of professional and ethical responsibility and a broad education to appreciate the impact of engineering solutions in the societal context. (***Engineering Criterion 3(f, h, j)***)
10. Recognition of the need for and an ability to engage in "life-long" learning. (***Engineering Criterion 3(i)***)

The program learning outcomes are documented and published in the web page of the department at http://www.jeoloji.itu.edu.tr/Icerik.aspx?sid=8041.

Relationship of Student Outcomes to Program Educational Objectives

The Geological Engineering Program at Faculty of Mines, ITU aims to provide high quality education that will transform students into professional engineers who are prepared to meet the needs of society and adapt to rapidly changing technology. Thus, the learning outcomes of the GE Program are aligned with the Baccalaureate Learning Goals of Istanbul Technical University, Turkey. The GE Program's learning outcomes include emphasis on the achievement of critical problem-solving and communication skills alongside accomplished ability in the Geological Engineering discipline. Also emphasized is the need for professionalism, ethics and flexibility within society.

As a result, there is a serious relationship between GE Program Educational Objectives' Effectiveness and Student Learning Outcomes. *"Effectiveness" is a broad concept that refers to the overall attainment of the mission and goals of GE program.* As such, it may embrace various kinds of behavioral outcomes for students that go beyond student learning such as employment, economic mobility, and contributions to civic and personal life. It also includes good effects that go beyond students, such as research and creative activity or service to various intellectual and geographic communities.

Student learning outcomes are an important dimension of both program effectiveness and program educational objectives. For example, the graduates of GE program will be mastered a range of cognitive and applied abilities to perform effectively on the job. Graduates of the GE program, meanwhile, will be internalized specific areas of knowledge and values-and the disposition to apply these appropriately-to fulfill ITU's broader claims about educating graduates for citizenship or lifelong learning. Appropriate and adequate levels of student learning outcomes are thus necessary conditions for programmatic effectiveness.

The relationship between the program outcomes and the program educational objectives are summarized in Table 3.1 and in Table 3.2. It can be clearly observed that these are almost one–to–one relationship between the two sets of statements.

Table 3.1 – Relationships between Program Learning Outcomes and Program Educational Objectives

	Program Educational Objectives			
Program Learning Outcomes	1	2	3	4
(a) an ability to apply knowledge of mathematics, basic sciences, and engineering	✓		✓	
(b) an ability to 3-D analytical and critical thinking in earth sciences to design and conduct experiments, as well as to analyze and interpret geological data.	✓	✓	✓	
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.		✓	✓	✓
(d) an ability to function on multidisciplinary teams and to implement the engineering background to other areas.	✓	✓	✓	✓
(e) an ability to identify, formulate, and solve geological engineering problems in 3 and 4 dimensions by following cutting-edge technologies.		✓	✓	
(f) an understanding of professional and ethical responsibility to protect and inform public health and safety on the social and environmental impact of geological engineering problems.			✓	✓
(g) an ability to communicate effectively and to improve communication skills through oral and written presentations.	✓		✓	
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.			✓	✓
(i) a recognition of the need for, and an ability to engage in life-long learning and to adapt to the continuously changing economic, social, and technological environments.		✓	✓	
(j) a knowledge of contemporary issues.		✓	✓	✓
(k) an ability to use the field and laboratory techniques, skills, and modern engineering tools necessary for engineering practice according to international standards and codes.		✓	✓	✓

Table 3.2 – Program Educational Objectives

Program Educational Objectives
1. Our graduates will have the basic knowledge and skills on mathematics, basic sciences, and engineering integrated with earth sciences that required implementing in academic, public and private sector practices.
2. Our graduates will have ability to utilize effectively the knowledge of field and laboratory tools, and will contribute in designing and conducting geological engineering solutions.
3. Our graduates will have abilities to function individually single or multidisciplinary teamwork, effective communication, as well as ability of 3 and 4 dimensional analytical and critical thinking in engineering problems and will engage in life-long learning and will be ready to cope with competitive and rapidly changing industrial and academic environments.
4. Our graduates will have ability to understand the impact of both local and global geological engineering problems with a grasp in all dimensions the awareness of professional and ethical responsibilities, and needs of society to protect public health and safety.

CRITERION 4. CONTINUOUS IMPROVEMENT

Student Outcomes

Program mission statement, which established for 2016-2021 accreditation term and it is structurally same as the earlier terms of accreditation process. According to last accreditation term, it is possible to say our vision begin to formed with the used digital tools and career relevant education activities.

On the behalf of 2015-2016 GE ABET Coordination Committee:

Prof. Dr. M. Sezai Kırıkoğlu - Assoc. Prof. Dr. Emin Çiftçi - Prof. Dr. Şafak Altunkaynak Prof. Dr. Murat Budakoğlu - Assist. Prof. Dr. Kayhan Develi - Dr. Eng. Cengiz Zabcı - Res.Asst. Hüseyin Kocatürk - Res.Asst. Alp Ünal following instruments developed and used for our engineer candidates to join them changing global workforce.

- Professional IT Networks Databases (e.g. LinkedIn)
- Advisory Board Meetings with the Chosen Institutive Companies
- Industry Related Feedback by ITU Career Center
- Student Club Special Sessions and Department Seminars

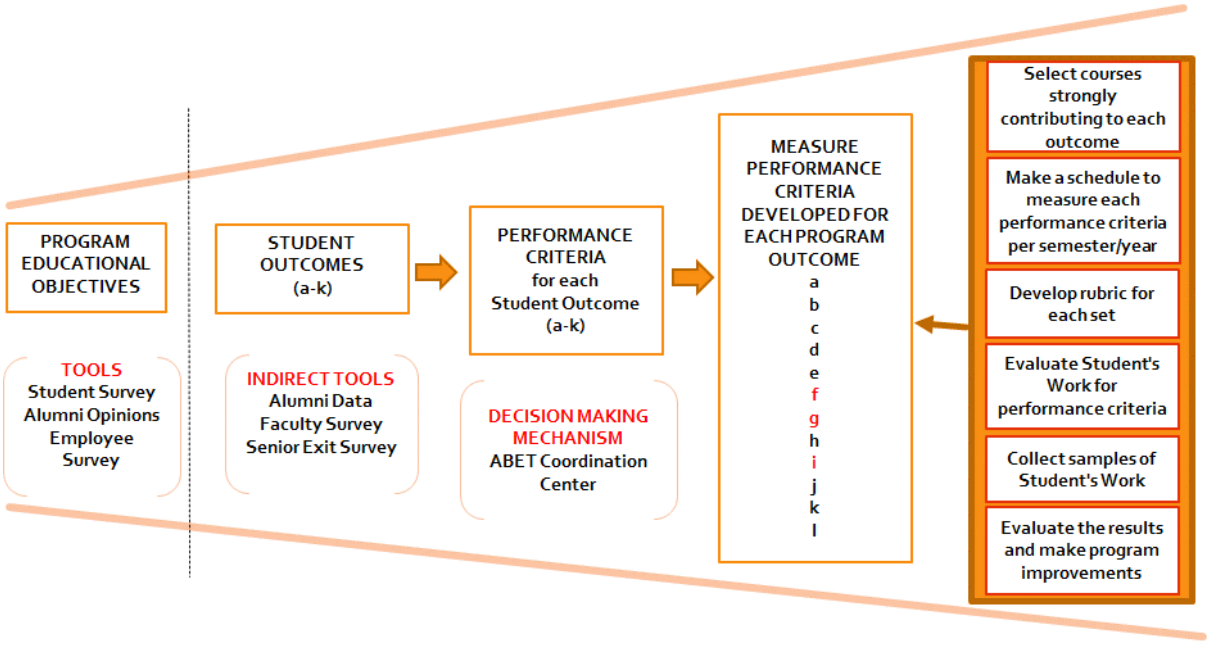


Figure 4.1. Student Outcomes' Loop

Table 4.1 Student Outcomes for Geological Engineering Department

a	an ability to apply knowledge of mathematics, basic sciences, and engineering on geological problems
b	an ability to 3-D analytical and critical thinking in earth sciences to design and conduct experiments, as well as to analyze and interpret geological data
c	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d	an ability to function on multidisciplinary teams and to implement the engineering background to other areas.
e	an ability to identify, formulate, and solve geological engineering problems in 3 and 4 dimensions by following cutting-edge technologies.
f	an understanding of professional and ethical responsibility to protect and inform public health and safety on the social and environmental impact of geological engineering problems.
g	an ability to communicate effectively and to improve communication skills through oral and written presentations.
h	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i	a recognition of the need for, and an ability to engage in life-long learning and to adapt to the continuously changing economic, social, and technological environments.
j	a knowledge of contemporary issues.
k	an ability to use the field and laboratory techniques, skills, and modern engineering tools necessary for engineering practice according to international standards and codes.

Our ABET Coordination Center based on to provide these outcomes for our engineer candidates. Abet Coordination Center is gathering updated data for each several months and according the new developments on the global education and working networks meetings organized without time limits. For the Education networks, we make our observation by two ways:

- For Europe, our Exchange Committee interviews with exchange students from Europe and Contacts with the Responsible from there.
- We searched developments through internet and examined programs of the ABET Accredited American Universities in order to improve our program. These are given bellow:

1. Missouri University of Science and Technology (Formerly University of Missouri-Rolla)> Rolla, MO, USA
2. Michigan Technological University >Houghton, MI, USA
3. Colorado School of Mines >Golden, CO, USA
4. South Dakota School of Mines and Technology >Rapid City, SD, USA
5. University of Mississippi >University, MS, USA
6. Montana Tech of the University of Montana (Formerly Montana College of Mineral Science and Technology) >Butte, MT, USA
7. University of Utah >Salt Lake City, UT, USA
8. University of Wisconsin - Madison >Madison, WI, USA
9. University of Minnesota - Twin Cities (Formerly University of Minnesota - Twin Cities) >Minneapolis, MN, USA
10. University of Texas at Austin >Austin, TX, USA

Following 2010-2011 ABET review, following changes were made to strengthen the curriculum. After the senate's approve, these changes were immediately executed:

1. <u>Semester</u>

Crystallography (JEO111E) 2+1 → 1+2

Legal ground: To improve performance rates as indicated by student surveys.

Adaptation: New 1+2 Crystallography accepted as equivalent to 2+1 Crystallography.

2. <u>Semester</u>

General Geology (JEO112) 3+0 → 2+1

Legal ground: Lab practices are required to improve performance rates.

Adaptation: New 2+1 General Geology accepted as equivalent to 3+0 General Geology.

3. <u>Semester</u>

Paleontology (JEO221) 2+1 → 1+2

Legal ground: Lab practices are required to improve performance rates.

Adaptation: New 2+1 Paleontology accepted as equivalent to 1+2 Paleontology.

4. <u>Semester</u>

- JEO212 Chemical Equilibrium in Geology was removed to add to 6. Semester Elective Courses package in exchange of Thermodynamics in Geology (JEO 263). Course content of Thermodynamics in Geology (JEO 263) was updated and added to 4. Semester mandatory course list.

  Legal ground: Thermodynamics in Geology being an engineering course was considered to be more suitable for the engineering education.

  Adaptation: Students who failed from mandatory "JEO212 Chemical Equilibrium in Geology" will be accounted from mandatory "JEO 263 Thermodynamics in Geology**"**. Students who failed from elective "TER201 Thermodynamics" will be held responsible from elective "JEO212 Chemical Equilibrium in Geology". Changes are valid from 2011 – 2012 educational calendar onward.

- JEO 252E Structural Geology 2+1 → 1+2

  Legal ground: Lab practices are required to improve performance rates.

  Adaptation: New 2+1 Structural Geology 2+1 accepted as equivalent to 1+2 Structural Geology.
- JEO 211 Mineralogy is prerequisite of JEO 242 Optical Mineralogy.
- JEO 112 General Geology is prerequisite of JEO 252E Structural Geology.

5. Semester

- JEO 421E Geochemistry was removed from 7th Semester mandatory course list and added to 5th Semester mandatory course list as JEO 323E Geochemistry and its credit was changed from 3+0 to 2+1. Conversely, JEO 321 Ore Deposits was removed from 5th Semester mandatory course list to add to 7th Semester mandatory course list and its credit was changed from 3+0 to 2+1.

  Legal ground: Course content of ore deposits requires geochemistry knowledge.

  Adaptation: Both courses accepted as equivalent to earlier counterparts. Students who are not registered to JEO 321 Ore Deposits are required to take JEO 323E Geochemistry first.

- Course title of 5th Semester mandatory "JEO331 Petrography" was changed to "JEO331 Magmatic and Metamorphic Rock Petrography".

  Legal ground: Current course (JEO331 Petrography) covers both magmatic and metamorphic petrography. Title was changed accordingly.

  Adaptation: "JEO331 Magmatic and Metamorphic Rock Petrography" accepted as equivalent to "JEO331 Petrography".

- JEO 324 Sedimentary Rock Petrography (1+2) was removed from elective courses package to 5th Semester mandatory course list.

  Legal ground: Course content was considered to be equally important for the curriculum.

  Adaptation: This update is valid from 2011-2012 education calendar for the students who didn't register to JEO 332E Petrology. Students who failed from JEO 332E Petrology are required to take JEO 324 Sedimentary Rock Petrography.

- Elective "JEO 333 Drilling Techniques" was taken to 5th Semester mandatory course list as "JEO 333E Drilling Techniques and Geotechnical Measurements (2+0)".
  Legal ground: The course content was found to be imperative for GE students. This change was also enhanced the ratio of Engineering courses over the others as imposed by ABET.
  Adaptation: This update is valid only for the students with 2011 entrance.
- JEO 242 Optical Mineralogy is prerequisite of "JEO331 Magmatic and Metamorphic Rock Petrography".
- JEO 242 Optical Mineralogy is prerequisite of "JEO 324 Sedimentary Rock Petrography".

6. Semester

- 6th Semester mandatory JEO 332E Petrology was taken to elective course package.
  Legal ground: Most of the course content was covered by petrography courses.
  Adaptation: Students who failed from JEO 332E Petrology are required to take JEO 324 Sedimentary Rock Petrography.

- 5th Semester mandatory JEO 341E Sedimentology was taken to 6th Semester mandatory course list.
  Legal ground: JEO 324 Sedimentary Rock Petrography was added to 5th Semester mandatory course list as its prerequisite.
  Adaptation: This update is valid only for the students with 2011 entrance and onward.

- "JEO 252 Structural Geology" is prerequisite of "JEO 322E Hydrogeology".

7. Semester

- Course credit of "JEO 321 Ore Deposits" was changed from 3+0 to 2+1.
  Legal ground: Lab practices will enhance the performance rates.
  Adaptation: New 2+1 Ore Deposits accepted as equivalent to 3+0 Ore Deposits.

- "JEO 222 Geomechanics" is prerequisite of "JEO 431 Engineering Geology".

8. Semester

- Course title of "JEO492 Senior Thesis" was updated as "JEO492 Graduation Design Project". Basis of the application is also given as separate appendix.

  Legal ground: This update was carried out to address to the earlier ABET evaluation process in that contents of some of the senior thesis was found to lack in engineering design component.

  Adaptation: This update is valid only for the students with 2011 entrance and onward.

- JEO 347 Rock Mechanics Applications (1+2) was added to 8th Semester mandatory course list.

  Legal ground: Course content of Rock Mechanics Applications was found to be imperative for GE students. This change was also enhanced the ratio of Engineering courses over the others as imposed by ABET.

  Adaptation: This update is valid only for the students with 2011 entrance and onward.

- "JEO 312 Field Geology" is prerequisite of "JEO 492 Graduation Design Project".
- "JEO 412 Industrial Raw Materials" is prerequisite of "JEO 321 Ore Deposits".

Changes Implemented to Elective Courses

- As suggested by the ABET criteria, engineering students must take at least 48% engineering design courses. Earlier program had 37.5% credit hours. In the earlier ABET review, this was pointed out and our department was advised to improve the current curriculum. To address this, 5 elective course packages were updated each to have at least 3 engineering design courses. In the new concoction, 5., 6. and 8. Semester elective courses are now entirely engineering topic courses.
- Following courses, which were in elective course packages were entirely removed from the department program:

  JEO 314 Rock-forming Minerals
  JEO 318 Environment and Mineralogy
  JEO 344E Intro to Climate Dynamics
  JEO 345E Concepts and Models in Ecology
  JEO 425 Magmatic Petrology

JEO 427 Applied Geochemistry

JEO 414 Clay Mineralogy

JEO 424 Volcanology

JEO 426 Phase Diagrams in Mineralogy

JEO 428 X-Rays in Mineralogy

JEO 433 Metamorphic Petrology

JEO 447E Petrology of Sedimentary Rocks

Legal ground: These courses were not offered in last three years.

Adaptation: Students who failed these elective courses can take new courses irrespective of relevance but from the same packages of relevant semesters.

- JEO 448 Geographic Information Systems in Earth Sciences was added to 8th Semester elective courses package.

  Legal ground: Content of this course recently became imperative for GE students due to the advances in applications to keep the GE students up with new techniques and up to date applications.

  Adaptation: This update is valid only for the students with 2011 entrance and onward.

Graduation Design Project (GDP):

To address concerns on the lack of engineering design component in the most of senior theses reviewed as pointed out by the earlier ABET review cycle, certain actions were taken and the GDP implementation rules were revised (refer to Page 11).

Continuous Improvement

Gathering Data

ABET Coordination Center use digital tools such as LinkedIn, ITU Career Center Database to gather data about feedbacks for our alumni. In the Figure 4.2 and Figure 4.3 ITU Career Center program interface and some opportunities that as shown by this online interface. We also contact to get the opinion of Internationally Approved Companies and our alumni, who have well career.

Full-time Job Postings		End Date
MAXION	AR-GE Muhendisi	25.03.2016
MAXION	Talasli Imalat Muhendisi	25.03.2016
AVIVASA	Management Trainee	31.03.2016
LAV	Elektrik Elektronik Muhendisi	01.04.2016
LAV	Imalat - Makine Muhendisi	18.04.2016
TRT WORLD & ARAPCA	Genel Ise Alim	21.04.2016
NETA	Donanim Muhendisi	30.04.2016
LAV	Bilgisayar Muhendisi / Yazilim Uzmani	01.05.2016
SELCO	Transportation Optimization Expert	16.05.2016
SELCO	Warehouse & Material Handling Logistics Consultant	16.05.2016
KARTACA	Java Yazilim Gelistirme Uzmani	30.05.2016
KAANTEKS	Merchandiser	31.12.2016
APPLE	Business Specialist	31.12.2016
DATAMARKET	Yazilim Gelistirme Uzmani	31.05.2017
Part-Time Job Postings		**End Date**
VIRASOFT	Part Time Developer/ Intern	31.03.2016
B/S/H EV ALETLERI	Part-Time PhD Students (Supply Chain)	03.04.2016
B/S/H EV ALETLERI	Part-Time PhD Students (Supply Chain)	03.04.2016
ENWAIR	Battery Development	15.04.2016
ENWAIR	Biyokimyager/Elektrokimyaci	01.08.2016
ALBARAKA	Genc Albaraka Akademisi	31.12.2016
Internship Postings		**End Date**
L'OREAL	Marketing WINtern	31.03.2016
GARANTI	Garantili Gelecek	01.04.2016
Announcements		**End Date**
YILDIZ HOLDING	Bizz@kampus - Hayal Et ve Tasarla	31.03.2016
TURK EKONOMI BANKASI	"Ace Manager" Yarismasi	13.04.2016
TURK EGITIM VAKFI	Singapur'da Karsiliksiz Doktora Burslari	31.04.2016
TURK EGITIM VAKFI	Yuksek Lisans Burslari (ABD, Bati Avrupa, Japonya)	31.04.2016

Figure 4.2. Posting and Announcement Examples from ITU Career Center

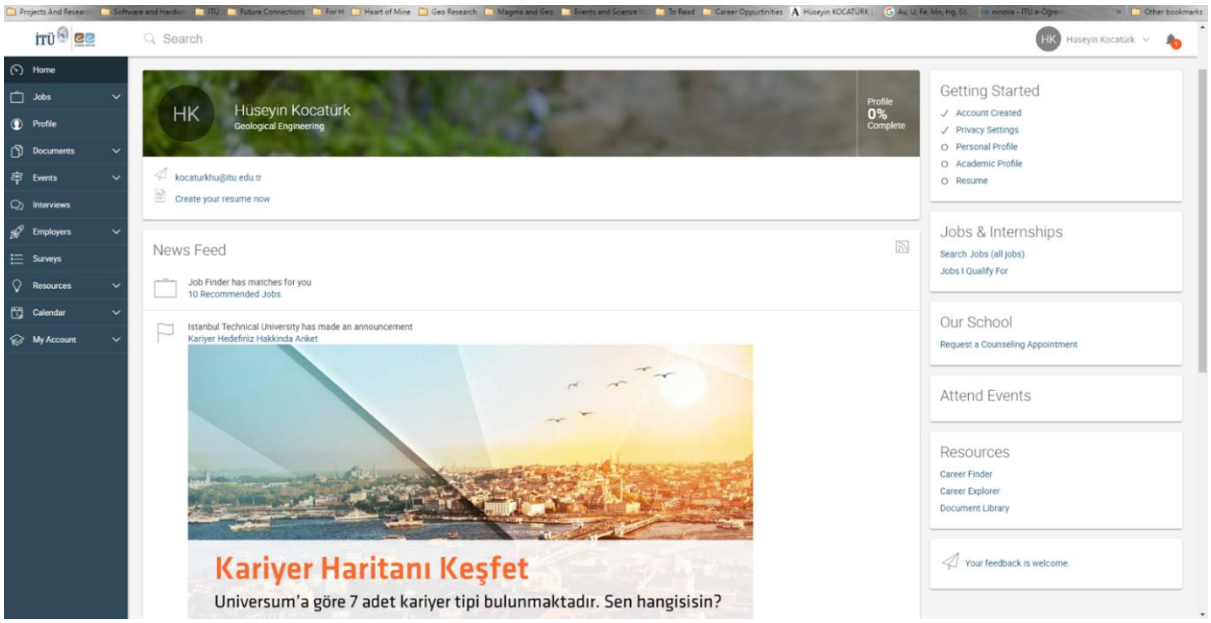


Figure 4.3. ITU Career Center Web-Based Online Interface

The Department of Geological Engineering conducted following serial meetings to keep up with updates by the ABET and to prepare the report accordingly:

1. Faculty Board Meeting for ABET Organization
2. Dean, Faculty of Mines ABET Organization Meeting
3. ITU Education Workshop
4. ABET Accreditation Commission Meeting: New education program was discussed
5. ABET Education and Ethics Commission Meeting: Department Vision, Mission, outcomes, objectives, and CV formats, course folders were discussed
6. ABET Education and Ethics Commission: Student questionnaires evaluated
7. With the Dean, Faculty of Mines Coordination Meeting
8. Advisory Board and Alumni Meeting
9. President, ITU Coordination Meeting
10. ABET Education and Accreditation Commissions Meeting EARTH'2015 Earth Sciences and Engineering Graduation Projects Symposium

Another data that our ABET Coordinator Center collected were from the LinkedIn. It is given in Figure 4.4 and Figure 4.5 for our 570 graduates. The data indicate where they live, work in which sectors they are engaged (it is lastly updated on 21 April 2016).

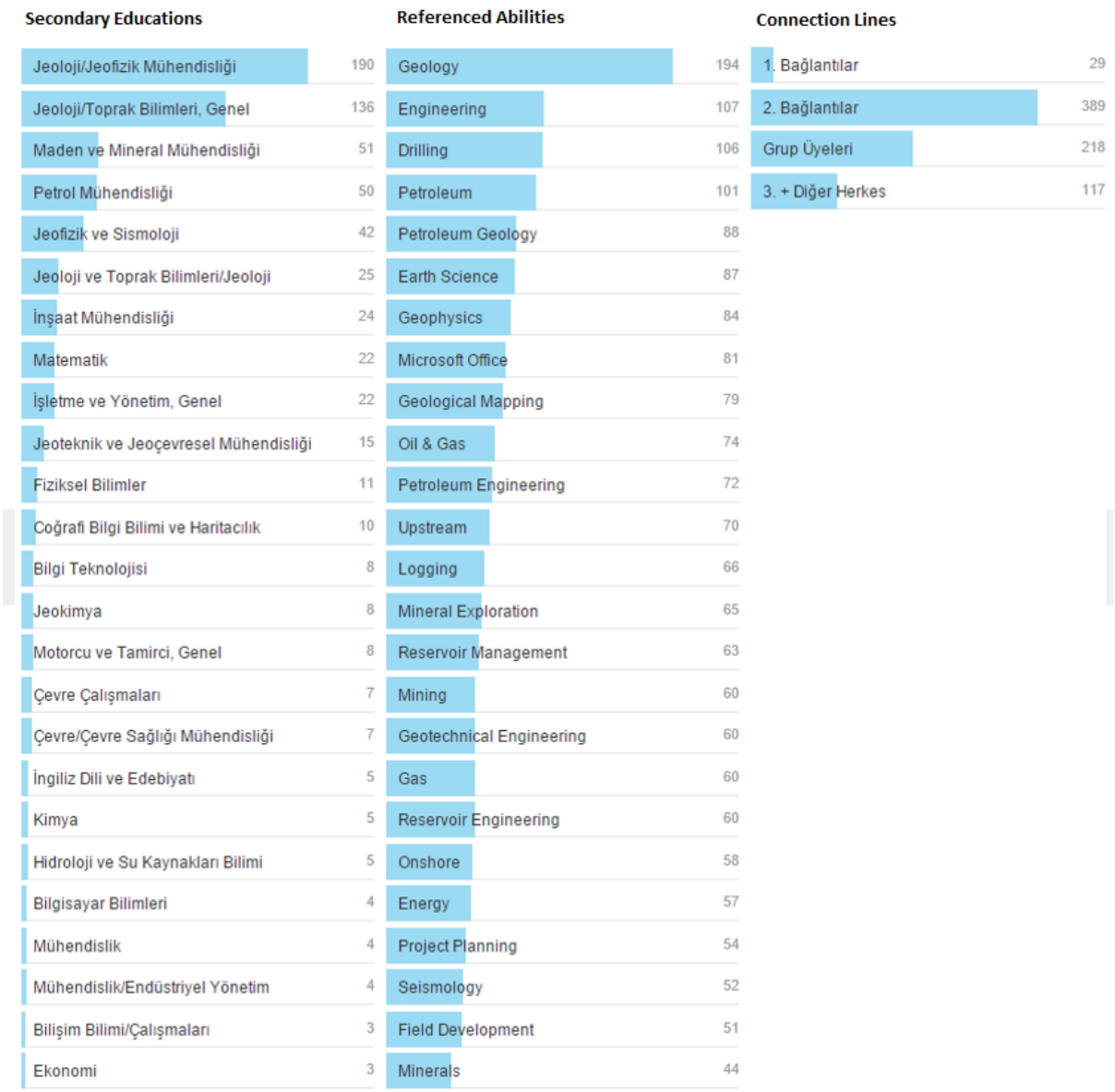


Figure 4.4. Alumni Data Taken from the LinkedIn

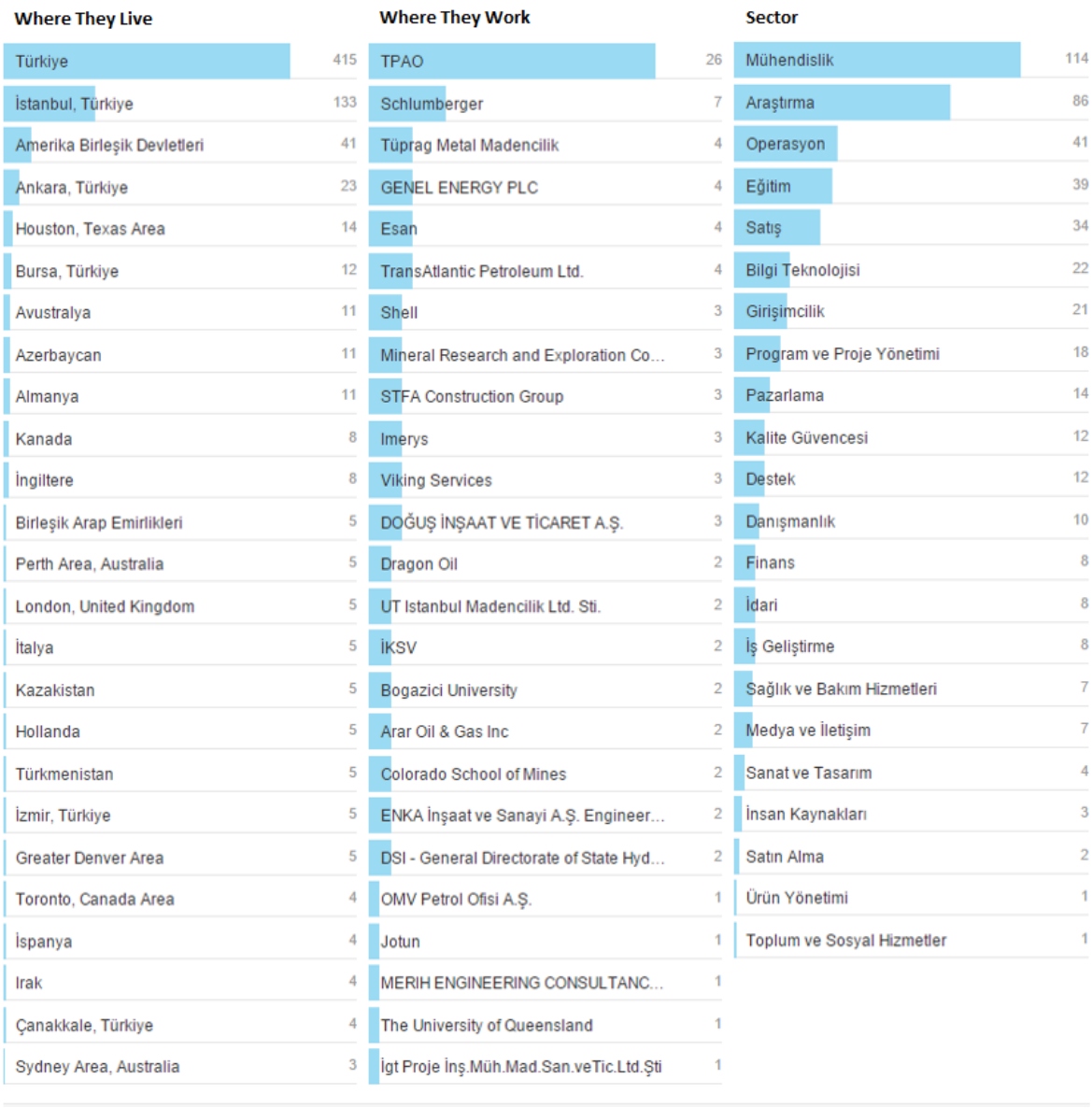


Figure 4.5. Alumni Data Taken from the LinkedIn

Different from data gathering process and industry meetings we organize department spring seminars for the orientation with the innovations, which are related with the specialists and their interest. About all this activities and events conducted by our department, student club is given at the additional information section.

Department and Student Club Activities

Geology Engineering Student Club Documentary Night1: Earth - Making A Planet:
On 26th of November, our student club organized an event in which a documentary on geology was presented. Documentary night was held at Room A301 to provide information about general geology and facilitate a medium to meet our club members. Event started with Derya Gültekin's presentation and continued with the documentary presentation. 18 students attended to the event and it continued about 1:30 hour. End of the documentary, students discussed the content.

02 March 2015; Internship Information Seminar I:
In spring semester of 2014-2015, Geological Engineering club has started a seminar to inform the student how to start an internship, what documents of internship needed and which companies can be applied. After the information session, students worked as interns as guests shared their experience. Guests have been chosen according to the places they worked with such as government agencies, universities, and private companies. Guests shared their experiences with the new students are Türkü Altıok, Nurettin Yakupoğlu, Arzu Saç, and Yağmur Güneş. Total of 28 students participated the event.

Figure 4.6. Photos of the Event on the Experiences of Internship

09 March 2015; Internship Information Seminar II:

On 3rd of March of 2014-2015, this seminar has been organized to inform the new students about the things to be done before internship, companies they can contact with, experience sharing of the students worked as interns with the new students. Guest students included Zeynep Çalışkanoğlu, Volkan Özen, and R.A. Alp Ünal. Topics talked about were researching in academic environment by Zeynep Çalışkanoğlu, and abroad internship by Volkan Özen.

Geological Engineering Students' Meeting:

First event of the 2015-2016 was this meeting organized to have GE students get socialized. Through this event, new students had chance to get information about the department, courses, faculties etc. Not only students but also Chair of the Geological Engineering Department, Prof. Dr. Sezai Kırıkoğlu, other professors and RA/TA assistants have joined this event and the event became more extensive and successful. The Chair and the President of the Student Club of Geological Engineering Department Işık Su Yazıcı started event with a short speech. She also introduced the board of directors of the student club. Participants were socialized while having pizza and soft drinks. Total 45 students participated this event at the foyer area in front of the İhsan Ketin Conference Hall within the Mining Faculty Building.

Figure 4.7. Photos from Gathering of Students and the Faculties

26 October 2015: Mineralogy – Petrography Introducing Seminar 1:

Our student club has begun to organize a seminar series, which introduced the occupational opportunities/areas in the Geological Engineering Department. The first of these seminars was on Mineralogy – Petrography, which was held in Room A301 on October 26, 2015. During the semester, our club has four different events organized for the purpose of introducing the sub-branches of geology (formerly the chairs). It is aimed to inform students on "how's and why's" who want to continue in their careers as a geological engineer can study on this major during their undergraduate education or after their graduation. The event was held by the presentation by Alp Ünal who is a research assistant on this area and with attendance of 14 people. This introducing seminar aimed to introduce this particular area to first and second grade students and how they can study in this area, and also to third and fourth grade students, it is aimed to inform about how they can plan their graduation projects in this area and where they can work after their graduation. In addition, during the Mineralogy – Petrography introduction seminar, the courses related to this major which are offered by the Department of Geological Engineering during the undergraduate education and the professors who teach these courses and also do their researches in this area were presented. The seminar also covered information about possible work areas in both government and private sectors so the student can plan their careers accordingly following their graduation. At the end of the seminar, the opinions of the participants about Mineralogy - Petrography branch were exchanged.

09 November 2015; General Geology Introducing Seminar 2:

Some topics on job areas of general geology and its importance as a profession in practical life were introduced. Another subject was that which research areas were of interest for the ITU professors who specialized in this particular area of the geology. Finally, for the students; instructors of this major and their interest areas were introduced to the attendees. Total 15 students participated this seminar. The event was held at Room A-301.

07 December 2015; Ore Deposits - Geochemistry Introducing Seminar 3:

The objective of this seminar was to introduce the main branches of Geological Engineering, and explain to the students their possible career options that the students may eventually need

to decide on. As a part of this event series, research assistant Zeynep Döner explained the Ore Deposits major to the students and the other participants. The importance of this major, the professors that studies this department, its importance in Turkey, its sub-branches, the options that students may have if they decide to study in this area, its research fields, job possibilities, and working conditions. Number of the participants was 10, and the event was held at Room A301 in the Faculty of Mines.

11 November 2015; Istanbul Technical University Student Club of Geological Engineering Student Seminar Series - David M. Raup Seminar 1:

The objective of this event was to share "Observations of David M. Raup on Mass Extinctions". Our undergraduate student Volkan Özen gave the talk on the historical background of "Mass Extinctions", which play an important role in geology and he introduced famous ideas about this topic belong to Darwin, Lyell, and Simpson and how their theories were improved and evolved to date. Finally, observations made by David M. Raup (April 24, 1933 – July 9, 2015; University of Chicago paleontologist) about this topic were shared in detailed way.

Figure 4.8. Photo of the First Student Seminar on the Memory of D. M. Raup

14 December 2015; Engineering Geology Introducing Seminar 4:

Introduction of Engineering Geology branch of Department of Geological Engineering was held on 14th of December 2015 at Room A301. The objective of this event was to explain the GE students engineering geology courses offered during undergraduate education, describe jobs and job possibilities. The event was moderated by research assistant Mehmet Korkut. During the event, speakers shared their experience and information. Total 21 students participated the event.

16 December 2015; Istanbul Technical University Student Clup of Geological Engineering Student Seminar Series - David M. Raup Seminar 3:

In this event, undergraduate student Volkan ÖZEN as the third part of the talk series has explained "Mass Extinctions" in evolution processes. Studies of various scientists have been comprehensively discussed, but special emphasis was dedicated to the ones carried out by David M. Raup.

Additional Information

The GE department concurrently organized many other successful events and activities to improve its reputation and educational quality. Department's Spring Seminar Program (Figure 4.10 and 4.11) was organized in conjunction with the Research and Development Division of Esan-Eczacıbaşı Inc., one of the leading companies of Turkey.

İTÜ/JEOLOJİ
Jeoloji Mühendisliği Bölümü

ITU GEOLOGICAL ENGINEERING DEPARTMENT
2016 SPRING SEASON SEMINAR PROGRAM
(Galip Sağıroğlu Seminar Hall)

DATE	TIME	SPEAKER	TOPIC
17 March 2016	15.30	Hüseyin Kocatürk (Research Assistant - ITU Faculty of Mines)	Following Up Career Opportunities
24 March 2016	15.30	Nimet Çömlek (Search Expert - Human Resources)	The international Codes in Mineral Exploration and Standard Operational Procedures & Industrial Materials
31 March 2016	15.30	Dr. Tonguç Uysal	Investigation on Geochronological Datas, Trace Elements and Isotope Geochemistry of Alteration Minerals as an Exploration Technic for Hydrothermal Ore Deposits
7 April 2016	15.30	Oya Yılmaz (Research Manager - Human Resources)	Overview of Metallic Ore Deposits in Turkey
14 April 2016	15.30	Hüseyin Kocatürk (Research Assistant - ITU Faculty of Mines)	Setting Up Career Goals
21 April 2016	15.30	Mustafa Tuna Kaskatı (Research Manager - Human Resources)	The Softwares Used for Modeling of Mineral Deposits
5 May 2016	15.30	Ali Can Akpınar (Research Manager - Human Resources)	Mining and Geology in Turkey
12 May 2016	15.30	Paul A. Schroeder, Prof. Dr.	Reconnaissance oxygen and hydrogen stable isotope geochemistry of waters from the critical zone in the Iznik Lake basin region, Turkey

Figure 4.9. 2015-2016 Department Spring Seminar Program

Figure 4.10 & 4.11. Photos Showing Moments from some of the Spring Seminars

Another activity was “Earth 2015”, which aimed to understand demand of the industry and to catch our Student’s Outcomes from the real world. In this event, number of companies had chance to get in contact with our students who had opportunity to present their graduation projects (Figure 4.12).

Figure 4.12. Earth'2015 Earth Sciences and Engineering Graduation Projects Symposium

One of the faculty events (Figure 4.13) was the organization of International Congress on Applied Mineralogy (ICAM) first time ever in Turkey at ITU, which is a prestigious conference that attracted more than 100 international scientists.

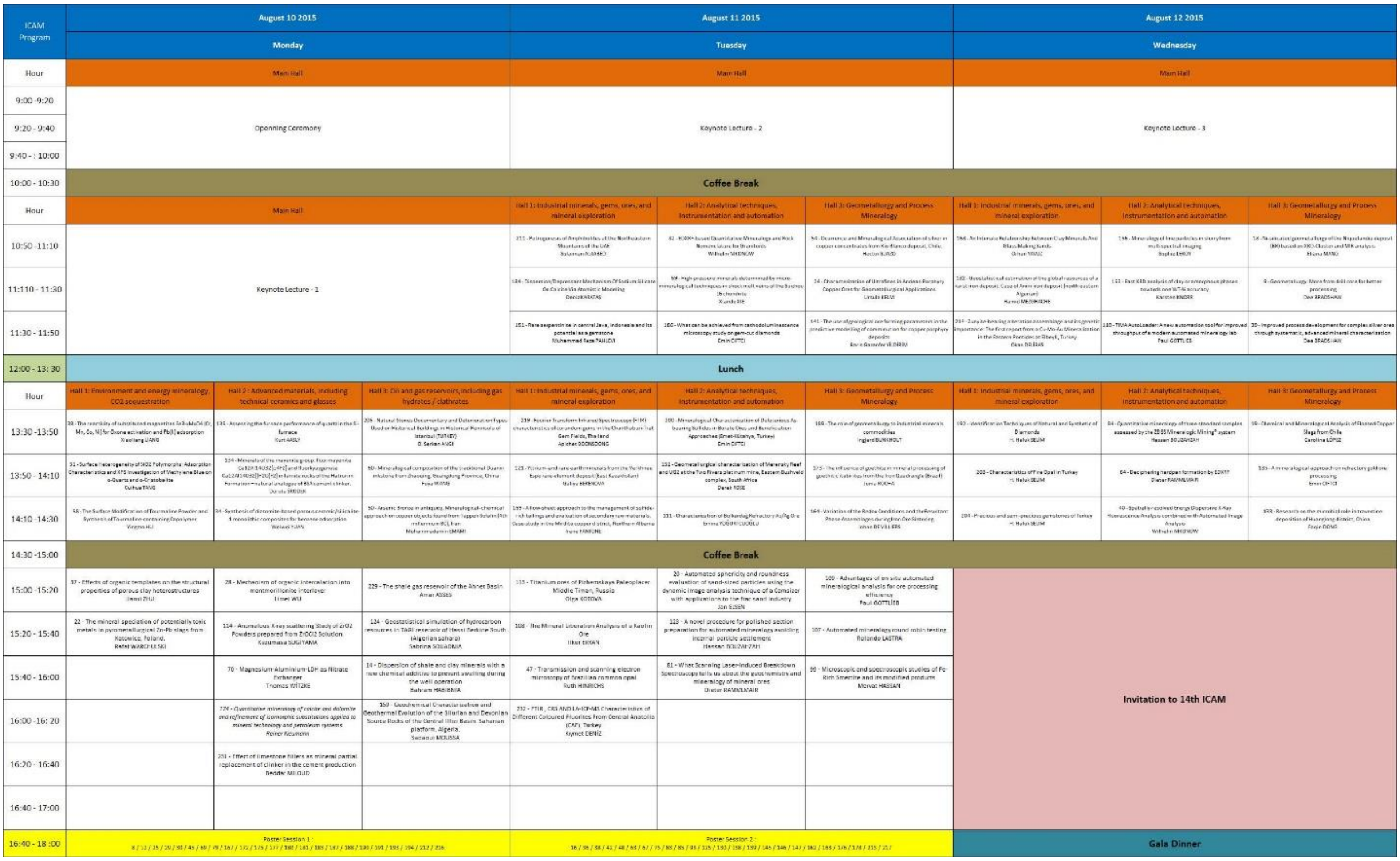


Figure 4.13. Program of the International Congress on Applied Mineralogy (ICAM 2015) was Organized by GE Faculty Members at ITU

Subsequently our faculty members had a very successful period as shown by the QSS World Ranking (Figure 4.14), which is one of the up-to date international science index respected and credited by the universities all around the world.

QS University Rankings: EECA Methodology

First published in 2014's pilot edition (http://www.iu.qs.com/university-rankings/eeca/results/), the **QS University Rankings: Emerging Europe & Central Asia** (EECA) has been extended in 2015 to feature the top 150 universities in the region. Aiming to celebrate and track the performance of higher education institutions in the EECA countries, the ranking uses a methodology adapted from the overall QS World University Rankings® (http://www.topuniversities.com/qs-world-university-rankings), and similar to those used for QS's other regional rankings (http://www.topuniversities.com/regional-rankings).

Among six new tables added to the QS World University Rankings by Subject for 2016 is a new ranking of the world's top universities for mineral and mining engineering. This new ranking of top mining engineering schools is led by three US-based institutions: Colorado School of Mines, Massachusetts Institute of Technology (MIT), and Stanford University. The QS World University Rankings by Subject assesses the world's leading institutions in a broad spectrum of academic areas, drawing on major global surveys of academics and employers, alongside research citations data. This first edition of the mineral and mining engineering ranking highlights the world's top 100 mining based engineering schools, spread across 26 different countries. US institutions account for almost a quarter (24) of these top 100 mining faculties, while the UK and Australia each have nine representatives, closely followed by Canada with eight entries. Other countries with at least one representative in the top 50 include France, Singapore, Germany, Russia, the Netherlands, Brazil, Argentina, South Korea, Saudi Arabia and Taiwan – a truly global spread of leading mining schools. Published annually, the QS World University Rankings by Subject aims to help prospective students identify high-performing and highly reputed institutions in their chosen field. In response to growing demand for these subject-level comparisons, QS is working to add more subjects to the list each year. Within the engineering and technology sector, the new mining ranking joins existing tables

(http://www.topuniversities.com/subject- rankings/2016) dedicated to chemical engineering, civil engineering, computer science, electrical engineering and mechanical engineering.

A total of nine factors are assessed, each of which contributes a certain proportion towards institutions' overall scores. The results table can be sorted to compare universities on each of these nine indicators.

Academic reputation (30%)

As is the case for all of QS's university rankings, global reputation is assessed through two major international surveys. The first of these is the annual QS Global Academic Survey, which asks academics worldwide to identify the institutions they perceive to be conducting the best work in the own field. In 2015, more than 72,000 responses were considered.

Employer reputation (20%)

Alongside the academic survey, the QS Global Employer Survey asks graduate employers across the planet to name the institutions they believe to be producing the best graduates in their sector. For the 2015 rankings, more than 44,000 employer responses fed into the results.

Faculty/student ratio (15%)

In lieu of a reliable or practical method by which to assess and compare teaching quality internationally, faculty/student ratio is considered. This is based on the number of students enrolled per full-time academic staff member, aiming to give an indication of each institution's commitment to providing high standards of academic support.

Papers per faculty (10%)

Calculated using data from Elsevier's Scopus (http://www.elsevier.com/solutions/scopus) – the world's largest abstract and citation database of peer- reviewed academic literature – this indicator reflects research productivity, based on papers published per academic faculty member.

Web impact (10%)

Based on the Webometrics (http://www.webometrics.info/) ranking, this indicator reflects the extent of each institution's online presence, one aspect of their commitment to international engagement and communication.

Staff with a PhD (5%)

A priority and growing strength for many leading universities in the EECA region is the recruitment of academic staff members qualified to PhD level or the equivalent. Progress in this area is assessed by calculating the proportion of faculty members at this level.

Citations per paper (5%)

Again based on data from the Scopus database, this indicator aims to assess research impact, based on the frequency with which an institution's published papers are cited by other researchers around the world.

International faculty (2.5%) and international students (2.5%)

Finally, the last two indicators are based on the proportion of faculty members and students who are international. This provides an indication of the diversity of the institution's community and learning environment, as well as reflecting success in attracting academics and students across national borders.

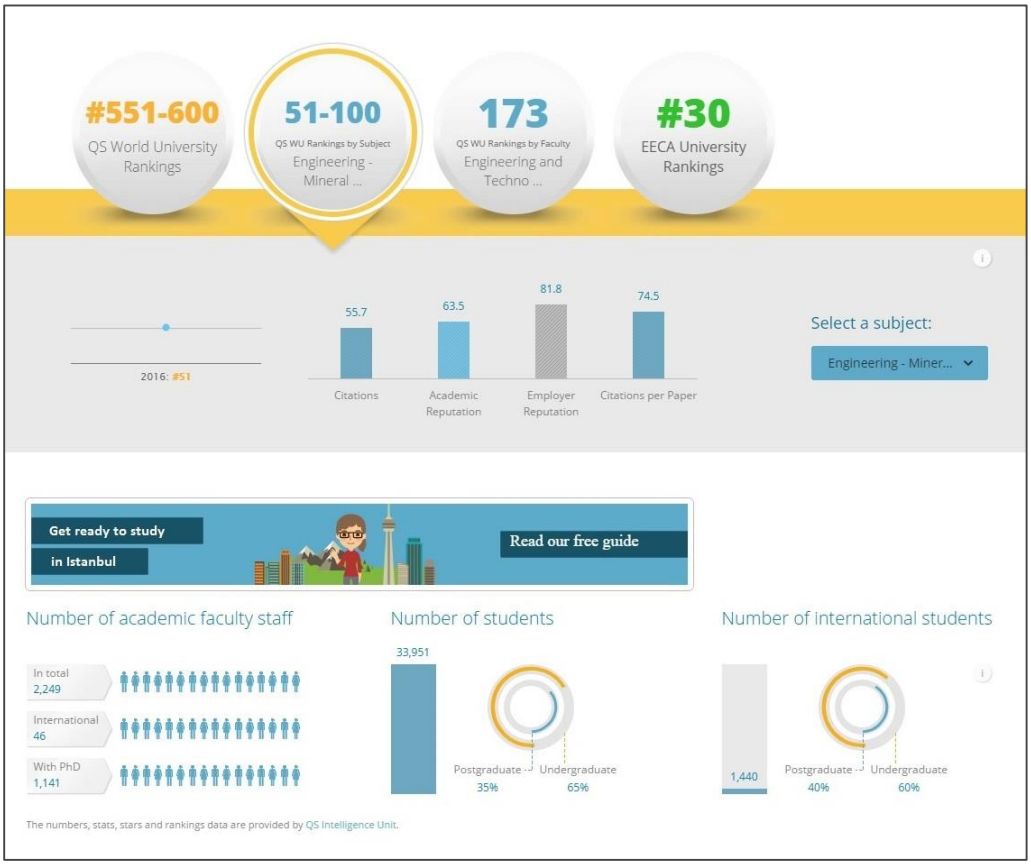


Figure 4.14. QSS Ranking of the Department for 2015

While all this are happening, we picked “Be in Action” as motto for the department to maintain this well-respected status and to continue our improvement in education and research capacity for the years to come (Figure 4.15).

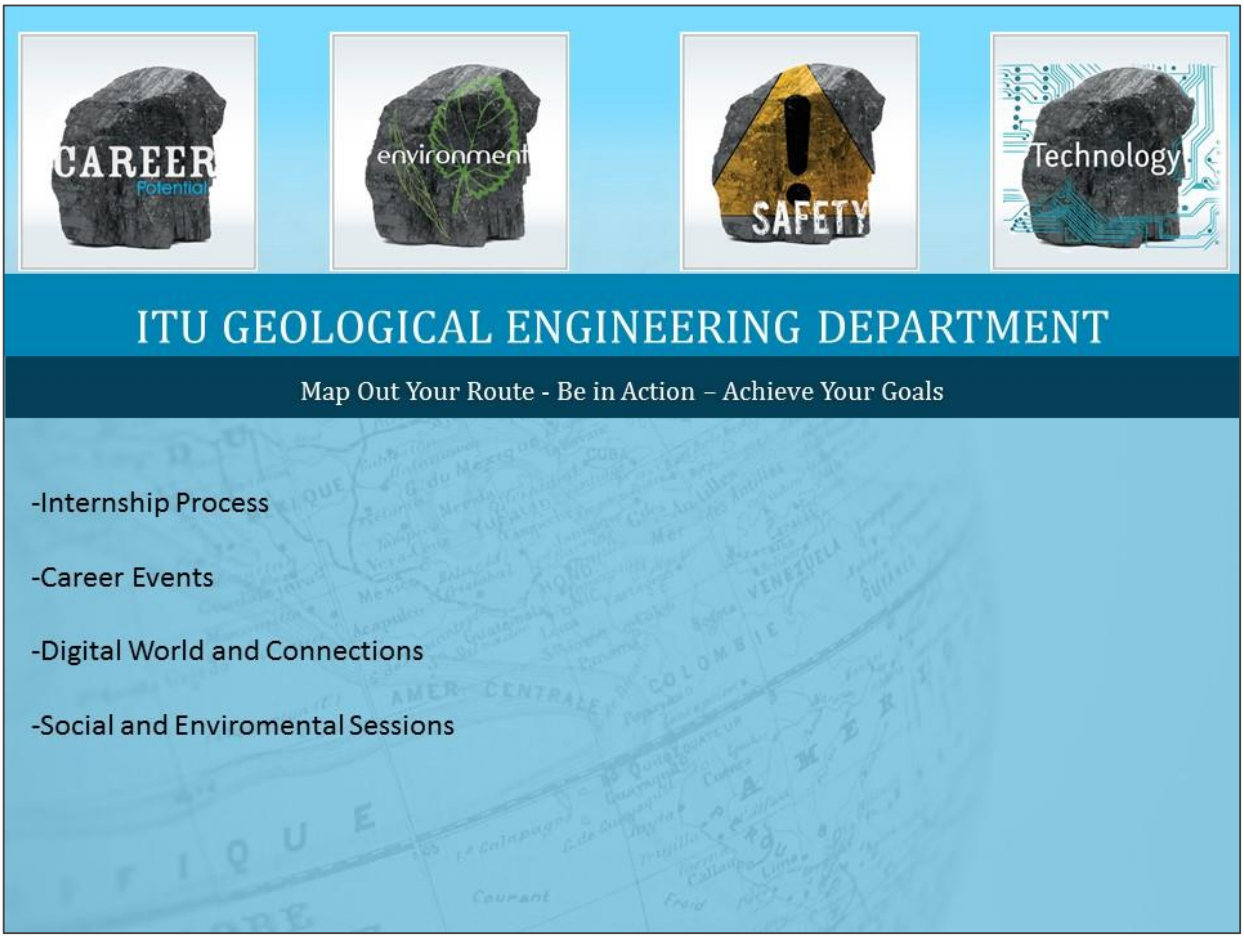


Figure 4.15. Route to Follow by the Department for Continuous Improvement

CRITERION 5. CURRICULUM

Program Curriculum

The ITU Faculty of Mines, the Department of Geological Engineering program curriculum and the suggested schedule with the credit hours for each course are summarized in Table 5.1.

Table 5.1. Recommended Schedule along with Average Section Enrollments for All Courses

Course (Department, Number, Title) List all courses in the program by term starting with the first term of the first year and ending with the last term of the final year.	**Indicate Whether Course is Required, Elective, or a Selective Elective by an R, an E or an SE[1]**	***Curricular Area (Credit Hours)***				**Last Two Terms the Course was Offered: Year and, Semester, or Quarter**	**Average Section Enrollment for the Last Two Terms the Course was Offered[2]**
		Math & Basic Sciences	**Engineering Topics Check if Contains Significant Design (√)**	**General Education**	**Other**		
JEO131 Intro. Geological Eng.	R		1			*1.Semester*	*40*
JEO111 Crystallography	R		2,5			*1.Semester*	*40*
MAT101 Calculus I	R	5				*1.Semester*	*40*
FIZ101E Physics I*	R	3				*1.Semester*	*40*
FIZ101EL Physics I Lab.	R		1			*1.Semester*	*40*
STA201 Statics	R	3				*1.Semester*	*40*
JEO121 Design in Earth Sciences	R		2(✓)			*1.Semester*	*40*
ING101 English I	SE			3		*1.Semester*	*40*

JEO114 General Geology	R		3			*2.Semester*	*60*
KIM101 General Chemistry I	R	3				*2.Semester*	*40*
KIM101L General Chem. I Lab.	R		1			*2.Semester*	*40*
BIL101E Intro. Comp. Info. Syst.	R		2			*2.Semester*	*40*
MAT102 Calculus II	R	5				*2.Semester*	*40*
FIZ102E Physics II	R	3				*2.Semester*	*40*
FIZ102EL Physics II Lab.	R	1				*2.Semester*	*40*
ING102 English II	SE			3		*2.Semester*	*40*
MAT201 Differential Equation	R	4				*2.Semester*	*30*
ING201 English III	R			3		*2.Semester*	*40*
JEO223 Paleontology	R		2,5 (✓)			*2.Semester*	*45*
MAL201 Material Sciences	R		3			*3.Semester*	*35*
JEO211 Mineralogy	R		2 (✓)			*3.Semester*	*40*
MUK203 Strength of Materials	R	3				*3.Semester*	*40*
BIL104E Intro. Sci. Eng. Comp.	R	3				*3.Semester*	*50*
JEO272 Thermodynamic in Geol.	R	2,5				*4.Semester*	*30*
JEO222 Geomechanics	R		3 (✓)			*4.Semester*	*20*
JEO242 Optical Mineralogy	R		2 (✓)			*4.Semester*	*40*

JEO262E Stratigraphy	R		2 (✓)			*4.Semester*	*60*
JEO256E Structural Geology	R		2,5 (✓)			*4.Semester*	*30*
MAD312 Topography	R		3 (✓)			*4.Semester*	*40*
TB Science Electives	E	3				*4.Semester*	*15*
EKO201 Economy	R			3		*5.Semester*	*15*
JEF341 Geophysics	R		3			*5.Semester*	*30*
JEO323E Geochemistry	R		3 (✓)			*5.Semester*	*40*
JEO349 Magmatic and Matamorphic Rock Petrography	R		2,5 (✓)			*5.Semester*	*25*
TUR101 Turkish I	R				2	*5.Semester*	*40*
JEO 343E Drilling Techniques	R		2			*5.Semester*	*30*
TM Minor electives	E		3			*5.Semester*	*15*
JEO322E Hydrogeology	R		3,5 (✓)			*6.Semester*	*45*
JEO332E Petrology	R		2 (✓)			*6.Semester*	*30*
MAT271E Probability Statistics	R	3				*6.Semester*	*30*
JEO312 Field Geology	R		3 (✓)			*6.Semester*	*50*
TUR102 Turkish II	R				2	*6.Semester*	*40*
JEO341E Sedimentology	R		2,5 (✓)			*6.Semester*	*50*
ITB Social Science electives	E			3		*6.Semester*	*15*
MT Major electives	E		3			*6.Semester*	*20*

ATA101 Ataturk Principles and History of Turkish Revolution I	R				2	*7.Semester*	*30*
JEO431 Engineering Geology	R		3,5 (✓)			*7.Semester*	*45*
JEO339 Mineral Deposits	R		3 (✓)			*7.Semester*	*50*
JEO411E Tectonics	R		2,5 (✓)			*7.Semester*	*45*
ITB Social Science electives	E			3		*7.Semester*	*15*
MT Major electives	E		3			*7.Semester*	*20*
MT Major electives	E		3			*7.Semester*	*20*
ATA102 Ataturk Principles and History of Turkish Revolution II	R				2	*8.Semester*	*30*
JEO492 Graduation Research Project	R		3 (✓)			*8.Semester*	*30*
JEO412 Industrial Raw Materials	R		2 (✓)			*8.Semester*	*40*
ETK101 Engineering Ethics	R		1			*8.Semester*	*15*
JEO347 Rock Mechanics			2			*8.Semester*	*45*
MT Major electives	R		3 (✓)			*8.Semester*	*20*
ITB Social Science electives				3		*8.Semester*	*15*
Overall Total Credıt Hours For The Degree		41,5	82	21	8		
PERCENT OF TOTAL		27,2	53,8	13,8	5,25		

As seen from Table 5.1, the Department of Geological Engineering offers an undergraduate curriculum that consists of courses in mathematics and basic sciences (27,2%), Engineering topics (53,8%), general education like non-technical elective courses, human sciences etc. (13,8%), and others (5%). The main task is to educate graduates who have extensive background in engineering, social and geological engineering topics.

The education program was planned to develop students with ability of analytical thinking and also to improve their communication skills in Turkish and English with engineering community from different disciplines.Thus the curriculum is generally planned so that the students can complete basic sciences and mathematics courses during the first, second and third semesters, the engineering sciences and social sciences and humanity courses during third, fourth and fifth semesters and the problem solving in geological engineering design courses in fifth, sixth, seventh and eight semesters.

The Department of Geological Engineering offers minimum 27 credit core courseswith mathematics and basic science components, which is higher than the minimum ABET requirement. When complementary and elective courses for specialization are included, the engineering topics component of the curriculum is about 54 credit hours, which is substantially above the minimum ABET requirements.

The Tables 5.2 and 5.3 below are to summarize these connections and to demonstrate each of the program educational objectives related with a large number of course objectives and in many cases, a given course has more than one objective, which addresses the same program objective. Hence, each program objective is covered satisfactorily through a combination of courses. Matrices describing the relationship between course and program objectives for each course, prepared by the course instructors, are available and will be presented to the team members during the ABET visit.

Table 5.2. Relationships between Course Learning Outcomes and the GE Program

Educational Objectives (2015-2016 Fall Semester)

Program Educational Objectives	**Course Learning Outcomes JEO Codes***
1	JEO111 (5) - JEO114E (3) - JEO121 - JEO131 (5) - JEO211 (3) JEO223 (3) - JEO222 (7) - JEO315(3) - JEO316 (4) - JEO339 (3) JEO325 (4) - JEO349 (3) - JEO341E (6) - JEO411E (5) - JEO413 (3) JEO417 (4) - JEO323E (7) - JEO423 (4) - JEO431 (6) - JEO445E (1)
2	JEO111 (5) - JEO114E - JEO 121 - JEO131 (3) - JEO211 (1) JEO223 (1) -JEO222(3) JEO315 (3) - JEO316 (4) - JEO339 (2) JEO325 (2) - JEO349 (1) - JEO341E (4) - JEO411E (5) - JEO413 (2) JEO417 (4) - JEO323E (5) - JEO423 (4) - JEO431(6) - JEO445E (1)
3	JEO111 (5) - JEO114E (3) - JEO 121 - JEO131 (4) - JEO211 (2) JEO223 (2) - JEO222 (6) JEO315 (3) - JEO316 (4) - JEO417 (4) JEO339 (1) - JEO325 (2) - JEO349 (2) JEO341E (6) - JEO411E (5) JEO413 (2) - JEO323E (6) - JEO423 (4) - JEO431(6) - JEO445E (1)
4	JEO114E (2) - JEO315 (3) - JEO417 (4) - JEO121 - JEO131 (4) JEO325 (3) - JEO411E (3) - JEO413 (3) - JEO211 (3) - JEO 223 (3) JEO222 (4) - JEO339 (2) - JEO 349 (3) - JEO 341E (3) - JEO323E (6) JEO423 (4) - JEO431 (6) - JEO445E (1)

As the course learning outcomes are directly related to the program objectives, feedback from the students is utilized to assess the achievement of the program objectives. In order to evaluate the achievement of the course objectives, a student survey was designed for each course and the students were requested to respond to this survey at the end of each semester. In this survey, the students evaluate the achievement of each course objective on a scale of 1 to 5. The survey results will be available to the team members during the ABET visit.

Table 5.3. Relationships between Course Learning Outcomes and the GE Program

Educational Objectives (2015 – 2016 Spring Semester).

Program Educational Objectives	**Course Learning Outcomes JEO Codes***
1	JEO114 (3) - JEO114E (4) - JEO121 (1) - JEO272 (3) - JEO222 (7) JEO242 (4) - JEO256E (5) - JEO254 (3) - JEO262E (5) - JEO312 (2) JEO315 (3) - JEO316 (4) - JEO322E (3) - JEO324 (2) - JEO349 (3) JEO332E (2) - JEO334 (1) - JEO336 (3) - JEO341E (6) – JEO346 (6) JEO412 (1) - JEO418 (1) - JEO423 (4) - JEO434 (2) - JEO448E (3)
2	JEO114 (1) - JEO114E (1) - JEO121 (1) - JEO272 (1) - JEO222 (3) JEO242 (4) - JEO256E (5) - JEO254 (4) - JEO262E (5) - JEO312 (3) JEO315 (3) - JEO316 (4) - JEO322E (2) - JEO324 (3) - JEO349 (1) JEO332E (2) - JEO334 (1) - JEO336 (1) - JEO341E (4) - JEO346 (5) JEO412 (2) - JEO418 (1) - JEO423 (4) - JEO434 (2) - JEO448E (1)
3	JEO114 (2) - JEO114E (2) - JEO121 (1) - JEO222 (6) - JEO242 (4) JEO256E (2) - JEO254 (3) - JEO262E (5) - JEO312 (3) - JEO315 (3) JEO316 (4) - JEO322E (2) - JEO324 (2) - JEO349 (2) - JEO332E (4) JEO334 (1) - JEO336 (2) - JEO341E (6) - JEO346 (5) - JEO412 (2) JEO418 (1) - JEO423 (4) - JEO434 (2) - JEO448E (3)
4	JEO114 (3) - JEO114E (4) - JEO121 (1) - JEO272 (2) - JEO222 (4) JEO242 (4) - JEO254 (3) - JEO262E (3) - JEO312 (2) - JEO315 (2) JEO322E (3) - JEO324 (2) - JEO349 (3) - JEO332E (4) - JEO334 (1) JEO336 (3) - JEO341E (3) - JEO346 (5) - JEO412 (3) - JEO423 (4) JEO434 (3) - JEO448E (2)

** The number in the parenthesis indicates that a given course has that much Course Learning Outcomes related with a given Geological Engineering Program Objectives.*

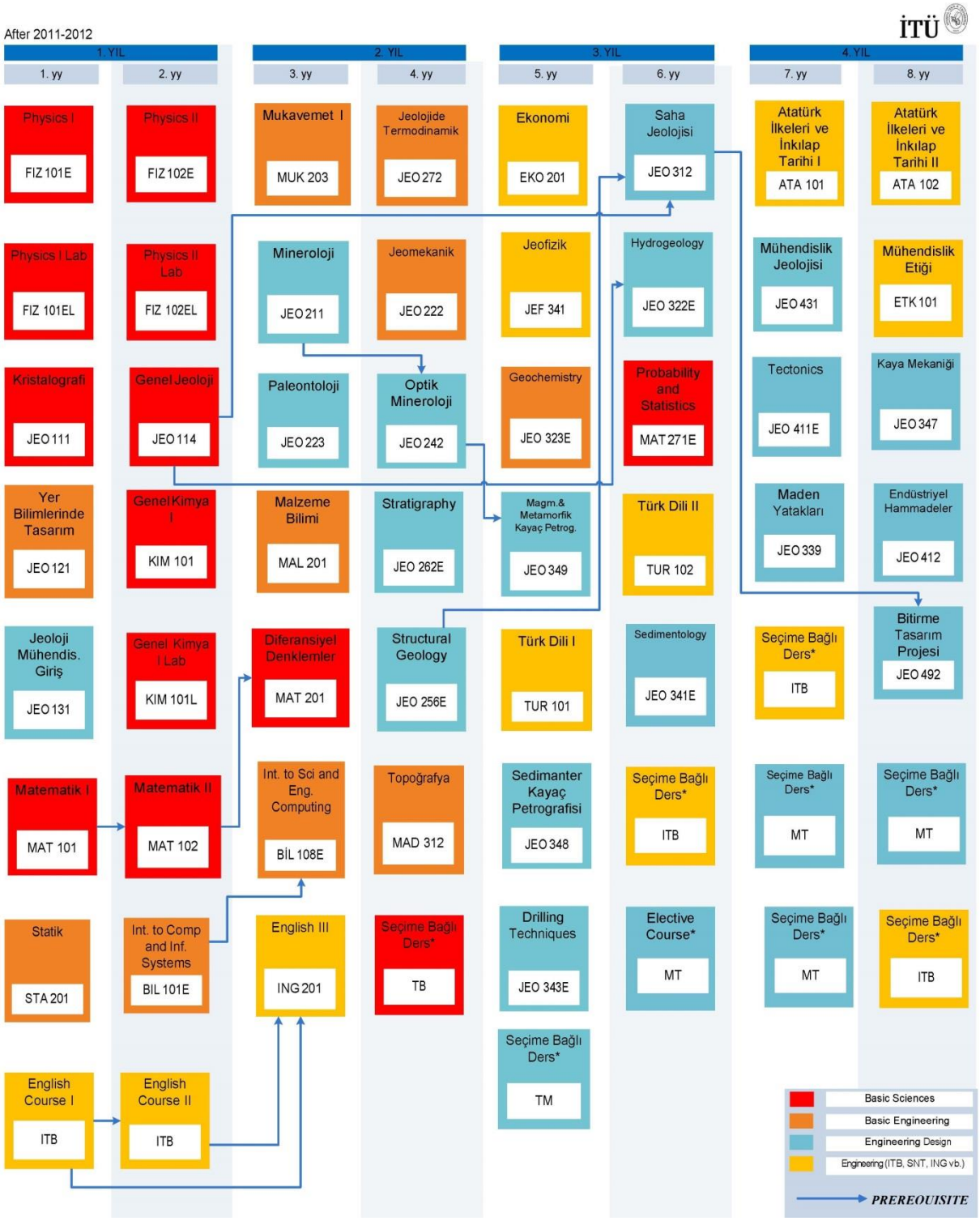
Based on the program outcomes, objectives and accumulation of decade's long educational experiences, Faculty members believe that the keystone of our graduate's future successes in both private industries and academic realm depend on their analytical thinking and good technical report writing ability. This analytical thinking ability in students mind can be developed during the undergraduate program by applying actual engineering problems and field studies using advanced mathematics including differential equations, physics, chemistry and strength of materials, general engineering knowledge' to design solutions to geological engineering problems. For such approaches, the keystone core courses including **Petrology** (**JEO 332E), Sedimentology (JEO 341E), Structural Geology (JEO 256E), Field Geology (JEO 312),** and **Hydrogeology (JEO 322E)** provide experience in combining various aspects of geological engineering: (i) focus on evaluation, develops students ability of 3-D analytical thinking, understanding and solving of engineering and scientific problems using computer modeling, (ii) exploration philosophies of mineral deposits, (iii) understanding of how the earth was formed from petrologist's point of views, (iv) gain a basic knowledge on the occurrence, distribution, movement, flow modeling and quality of groundwater (v) learn the quantitative methods to solve practical problems encountered in the field, (vi) be able to use computer as a tool in solving and analyzing geological problems (vii) teaches students how the sedimentary structures are recognized and systematically identified in field and laboratory for the interpretation of depositional environments and basin analyses, and (viii) provides means to students to organize and combine data obtained from the field and other sources in suitable ways in writing technical reports. Students are assigned group projects where these techniques are applied to industrial case analyses. The most important component of the undergraduate geological engineering education is a total of 60 working days of compulsory industrial training as a part of degree requirements, which is to be completed in at least two and at most three periods during the summer breaks. By this way, students can better prepare themselves for the future industrial applications. Geological Engineering cannot be learned without field practices such as geological mapping. So, field experience is vitally important. Various field trips are organized to selected sites where significant geological features are available and accessible and to industrial mineral deposits or coal mines in near vicinity of Istanbul. These field trips constitute the most important part of many junior courses.

Humanities, environmental, ethical, social, political, health and safety issues are incorporated in the curriculum through a combination of courses. Faculty members strongly believe that social development of the students, which will affect them throughout their lives, is one of the essential components of undergraduate education. Therefore, humanity and social sciences courses are covered world politics, history, human psychology, cost effectiveness, economic feasibility analysis of geological engineering systems, and exploration costs of mineral deposits and petroleum reserves. The students may select their humanities and social sciences electives from courses devoted to ethical, social and environmental issues, which are offered by the relevant departments. Nevertheless, these issues are also discussed in various required and elective departmental courses.

Preparation of the students begins with the first semester courses of **Introduction to Geological Engineering (JEO 131**) and **Crystallography (JEO 111)** and continues with **General Geology (JEO 114**) course during second semester in addition to the extensive mathematics and basic science courses, which are the main courses of the ITU degree requirements for any major. ITU is well-known reputation as an engineering university because of strong mathematics and basic science education in undergraduate programs since almost it was established. **JEO 131** is the first geology course in the curriculum, it is the most basic course to say "well come to the Department of Geological Engineering" to the students. The role of geological engineering in science, society and industrial applications are discussed in detail in terms of basic fundamental concepts of earth sciences and engineering. Geology deals with nature and therefore, daily 2 – 3 field trips in the vicinity of Istanbul city by bus are a part of the course requirements. By this way, students can better bridge between the scientific knowledge's learned in classroom and the actual case studies in nature. Consequently, they can better think and design the problems of nature under the light of basic science courses. **JEO 114** helps to the students to understand the basic knowledge of geological sciences, which are the keystone course in the department and to explain what geology deals with, what the role of geological engineers are, how the earth was formed and fundamental concepts of minerals, rocks, volcanoes, faults, folding, opening of ocean ridges and plate movements.

These two courses help the students to develop their decision-making process to think in three dimensions for the solution of geology problems using the basic sciences, mathematics, and the engineering sciences knowledge. Besides, these two introduction courses serve as the initial approaches of the Department's objectives and outcomes. **JEO 111** is an introductory course to recognize and understand the science of minerals and how crystals form. By this way, students can better understand crystal groups, chemical and physical properties of minerals and rocks, which are the fundamental concept of the geology. All other mineralogy, optical mineralogy, petrography and petrology courses will be constructed after the foundation of this course.

Table 5.4. Prerequisite Flow Chart for Department of Department



In the second year, basic geological engineering topics are introduced through a sequence of 8 core courses culminating in the senior keystone: **Mineralogy (JEO 211), Stratigraphy (JEO 262E), Paleontology (JEO 223), Geomechanics (JEO 222),** and **Optical Mineralogy (242)** courses, which help understanding of how minerals were formed from atoms, identifications of minerals and rocks, how life was originated, what was the history of the Earth billion years ago. Especially, five keystone field-related courses offered in fourth semester provide the most fundamental knowledge in geological engineering. These five courses contain significant field and laboratory experiences through lectures, homework assignments, field trips, individual or team project assignments, which emphasize diverse field problems ranging from microscope studies to mega geological structures. Several courses offered in the elective sequences, especially those in the engineering geology option; also contain significant laboratory testing of materials, experiments and computer modeling. Specialization fields in geology are too broad in contrast to other engineering. For this reason, department provided very large elective courses package to broaden students' knowledge and to prepare them future job opportunities and industry needs. Table 5.5a summarizes the departmental courses with significant actual problem solving components.

Table 5.5a. Technical Elective Courses

Course Code	Course Name
DNK 201	Dynamic
JEO 319	Basics of Mining
JEO 325	Computer Applications in Geology
JEO 335	Soil Mechanics
MEK 205	Engineering Mechanics
PET 418	Well Logging
JEO 326	Building Materials Geology
JEO 328	Geological Mapping & Cartography
JEO 413	Autocad for Geologists
JEO 334	Subsurface Geology

Geological Engineering students start to get involved in the fundamental design concepts of "Geological Engineering Design" in the context of two junior and three senior level courses, **Petrology (JEO 332) Mineral Deposits (JEO 339), Field Geology (JEO 312), Engineering Geology (JEO 431), Geochemistry (JEO 323),** and **Tectonics (JEO 411)**. These senior courses, MT electives and **Senior Thesis (JEO 492)** prepare students for the future industrial design applications and problem solving case studies.

Petrology (JEO 332) is one of the main design courses, which cover the total knowledge's of previously taught crystallography, mineralogy, optical mineralogy and petrography courses. **JEO 332** provides students with knowledge in fundamental concepts of magmatic processes and to teach petrogenesis of the magmatic and metamorphic rocks. This course teaches the origin of magmatic rocks where they originated from and involved partial melting and fractional crystallization, and also teaches students the relations between plate tectonics and origin of magmatic and metamorphic rocks. **JEO 332** requires basic chemistry and thermodynamics knowledge and course covers phase diagrams, phase relations of melting/fractional crystallization, mantle petrology, metamorphism and metamorphic facies, P-T-t evolution and metamorphic reactions. Every week continuously, homework is given to help to the students for the development of synthesis ability of petrological problems. Because, we expect that student's 3-dimensional thinking ability for the petrogenetic models, combining different concepts together, understanding of relationship among regional tectonism, magmatism and metamorphic belts abilities and proposing ability of petrogenetic models should be developed.

Mineral Deposits JEO 339 prepares students, if student wants to specialize in this field, for future mining industry and therefore, it is important from job opportunities point of view. This course is to introduce students to the general aspects of mineral economics, to provide them with the knowledge related to the ore bearing fluids and the different types of mineral deposits, to enable them to integrate this knowledge with those from various sophomore courses (e.g. mineralogy, petrography, structural geology), and to develop their ability to apply these theoretical aspects to the practical aspects of mineral deposit exploration using various geophysical techniques. At the end of the course, the students are expected to, have acquired the knowledge about ore and gangue minerals, grade and tonnage concepts, the

importance of mineral resources for the economy, and the information on structural controls of ore formation, be able to integrate their knowledge from previous courses with the information on the formation and the types of mineral deposits. **JEO 339** involves a project work as well. The format of the project is similar to that of **Structural Geology JEO 256**, but has some additional requirements regarding occurrence and geochemical constraints of ore deposits, genesis of hydrothermal fluids, alternative exploration techniques, relations between plate tectonics and mineral deposits, and replacements are discussed together with descriptive examples throughout the semester. The student groups are expected to estimate the occurrence of mineral deposits and their mineral processing its national import, export and consumption data (governmental and private sector based) as well as by considering the contemporary marketing issues that may impact the consumption trends. Upon completion of the stages between exploration selection and strategies, they asked to estimate the prices of raw materials and utility costs that will be used in are the estimation of total exploration cost and total capital investment by summing up the purchased costs of the individual processing units. The final phase of the project studies covers the discovering of mineral deposits, using geochemical and geophysical methods, and cost of exploration and profitability analyses of their mining investments.

The junior course, **Field Geology JEO 312**, which is the continuation of **JEO 256**, start with defining the stages involved in the reading topographic maps. Equipment used in geological mapping, organization and interpretation of geological maps. The course continues with lectures covering individual classes of preparation of generalized columnar sections and cross-sections and techniques of measuring stratigraphic sections. Student has to learn first aid and safety in the field and ethics in earth sciences. Topographic maps must be used with compass, altimeter and GPS in the field. Geological engineering cannot be done without field work and therefore, **JEO 312** is the most important design course in the curriculum and field projects cover the summary of knowledge of all the courses offered. Field description of rocks, minerals and geological features and field study of outcrop-scale geological features are essential. Measuring stratigraphic sections, sampling of representative rocks, preparation of geological illustrations, cross-sections, 3-D thinking of initial model of geological problems in the field and writing a geological report are the fundamental concept of geology. (Field studies

are carried out as daily trips on weekends within the semester and three weeks long field camps outside university campus following final exams of the semester in June.)

The senior course **Engineering Geology (JEO 431),** continuation of sophomore level **Geomechanics (JEO 222),** gives basic information for geological engineers on site investigation techniques and rock material/rock mass characteristics, integrates student's basic information on site investigation techniques, rock material and rock mass characteristics with previous background to solve engineering geological problems using knowledge's of basic sciences and properties of strength of materials and computer modeling techniques. Educate students to plan, execute and evaluate the results of site investigation techniques applied to a number of engineering geological problems. Besides, **JEO 431** educates students to deal with open-ended problems to enhance their thinking and problem solving abilities and engineering geological case studies. By the end of the course, students will (i) analyze problems from different viewpoints apply logic in solving problems, (ii) use knowledge from various courses in an integrated manner, (iii) integrate basic knowledge of other engineering disciplines within the scope of the design course's project and (iv) use appropriate engineering tools and methods to solve problems.

Hydrogeology (JEO 322E) is given in our Department with strong emphasize on thermal waters due to abundance of natural hot springs in Turkey, which were created by young tectonics and young volcanism. This course requires combination of geochemistry, stratigraphy, mathematics, computer modeling, fluid flow and fluid dynamics knowledge, and application of thermal waters are also important for medical geology and thermal tourism as other activities of society on these materials and processes, as appropriate to the program objectives. Principles of geology, elements of geophysics, geological and engineering field methods coordinates closely with **JEO 322E**. At the end of this course, the students are expected to have acquired knowledge on the general aspects of geothermal systems and have developed their ability to apply an integrated knowledge of basic, geological and engineering sciences to the solution of problems related to geothermal exploration and development.

Geochemistry (JEO 323E) provides students with background information on crystal chemistry and physicochemical factors fundamental to an understanding of element behavior during geologic processes using physico-chemical and inorganic chemistry knowledge, in order

to introduce students to the facts and ideas about the composition and chemical evolution of the Earth as a planet, and to develop students' ability to evaluate and quantitatively substantiate the source and the processes responsible for the formation of various rock types. At the end of this course, the students are expected to (i) acquire basic knowledge on crystal chemistry and the rules governing element behavior during geologic processes, (ii) develop ability to apply the principles of geochemistry to the solution, and quantitative evaluation of the problems related to petrogenesis and disposal of wastes and (iii) recognize the interrelation between various scientific disciplines within the context of evolution of the Earth as a planet. **Environmental Geochemistry (JEO 446E)** offers as an elective course during 8.-Semester, as a continuation of **JEO 323E**, and covers consequent remediation, disposal of wastes, and other activities of society on these materials and processes.

Tectonics (JEO 411E) uses the fundamental concepts of many courses thought in the curriculum. Students learn the main concept of history of science and philosophy, development of the concept of plate tectonics, interior structure and dynamics of the Earth, plate motions, mid-ocean ridges, transform faults, rift system, subduction and obduction zones, continental drifts, Evolution of Gondwanaland, continental deformation; all subjects required large scale design knowledge. In the frame of this course some basic information, that are great importance of large geological structures are given from literature to students for case analyses and they use these data in their design projects.

They are asked to (i) scan every published material such as journal publications, textbooks, web-based sources to identify the case studies from different part of the world that may be applicable to their project topics, (ii) make a formal description and correlating of these laboratory and field data by rating criteria including engineering and industrial impacts, (iii) generate the detailed geological model for better explaining of case story and (iv) correlate your solution model with other industrial applications. The student groups share their work in two (progress and final) reports and presentations. The reports are expected to follow a certain format as explained in the lecture and in the course textbook. These presentations have time limits (7-8 minutes for progress and 9-10 minutes for the final presentations) and two group members, selected just before the presentation on a random basis, present the report. The members who do not make the progress presentation become responsible for the final one.

Presentations are graded on group and on individual basis; this mechanism is expected to ensure equal contribution of each member to the project. Timely delivery of the reports is strictly controlled and graded to emphasize the importance of meeting the deadlines to implement the concept of time management during project execution.

These semester projects in various courses mentioned above try to simulate realistic design project executions on an industrial scale, are open-ended and are formulated with the objective of transforming the students into geological engineers by enabling groups/students to implement their past-three years undergraduate background into the design process. The students also experience how to select suitable exploration methods for each mineral deposits and their environmental, financial and health constraints as well as legal issues may affect the flow of a project. **Graduation Research Project (Senior Thesis) (JEO 492)** is mandatory course as a part of B.Sc. degree requirement in all departments in the ITU campus for an almost one century. However, this requirement is much stronger in Department of Geological Engineering, because Senior Thesis Project is vitally important to combine all the courses that students have learned until graduation. Faculty members expect that students should show "how well they can put many different concepts together" from design concepts point of views. Besides, there are two important properties of the Senior Thesis. First, Faculty members require field studies and geologic mapping from the study area. Second, thesis studies enhance student's scientific report writing abilities, which is very important for their future developments and promotions in private industries.

Finally, students are free to choose their **Graduation Research Project (Senior Thesis)** from one of faculty member's ongoing research projects. This approach helps students to prepare themselves for professional practice. Besides, the students join several student clubs for organizing professional seminars, meeting with industry managers, visiting of mineral quarries and many social events. Department, under the structure of Graduate School, is best known for its organization of "*Career Days*", in which major companies utilize as a medium for recruiting prospective employees.

The curriculum is generally planned so that the student can complete basic sciences and mathematics courses during the first, second and third semesters, the engineering sciences and

social sciences and humanity courses during third, fourth and fifth semesters and the problem solving in geological engineering design courses in fifth, sixth, seventh and eight semesters

The materials that will be available for the review during the ABET visit to demonstrate achievement related to this criterion.

1. Transcripts for each student in the graduating class of 2015 and 2016
2. Course folders for each course taught during the last academic year, including course syllabus, copies of selected course material, textbook(s), filled out copies of course and teacher evaluation forms, sample exams, quizzes, projects, reports and relationship between course learning outcomes and program objectives
3. The results of the student survey on course learning outcomes
4. Faculty survey on course contributions to program outcomes in their folders
5. List of Graduation Projects (2010 – 2016)
6. List of Publications
7. Graduated Student Surveys

Course folders will be available in the ABET Room for the inspection of ABET team during the visit.

CRITERION 6. FACULTY

Faculty Qualifications

Well-qualified faculty members teach all the basic and applied courses in the Geological Engineering Program. More than half of the members of the Department have gained their M.Sc. and/or Ph.D. degrees in European and American universities. Istanbul Technical University provides financial support to all faculty members to attend international scientific meetings at least once a year for making presentations on their ongoing researches. The faculty members are highly encouraged to publish their research results in peer-reviewed Science Citation Index (SCI) journals. TUBITAK and ITU Foundation provide financial awards separately depending on where paper was published and how many authors contributed to the paper. Those who publish four papers or more annually in internationally cited journals are rewarded with additional financial support.

The Department's research projects are supported by various state and private organizations. Joint team projects are proceedings in an increasing rate from years. Faculty members supervise a number of M.Sc. and Ph.D. students. Faculty members' research fields are listed in Table 6.1. Besides, detailed information about teaching loads of the faculty members are given in Table 6.2 and the current CV's of the faculty members are presented in Appendix B.

As seen in Table 6.2, the faculty has diverse backgrounds with Ph.D. degrees obtained from a variety of Turkish, European and North American Universities and most of them have more than 5 years of teaching experience. The curriculum vitas provided in Appendix B reveal that the faculty is also highly competent in their respective areas of expertise. The faculty members have a diverse background in the field of the Geological, Geophysical and Mining Engineering B.Sc. degrees. Many are prolific in publishing original research articles in refereed journals and have received prestigious awards from The Scientific and Technological Research Council of Turkey (TUBITAK; Turkish NSF) and Turkish Academy of Sciences (TUBA) for their scientific achievements. Hence, all of the curricular areas of the geological engineering program are covered adequately by the following faculty.

There are three former (A. M. Celal Şengör, Yücel Yılmaz) and one active TÜBA members (Aral I. Okay) in the field of Geological Engineering in Turkey and two of four are still the faculty member of our department. A. M. Celal Şengör is also a member of many national

and international societies, including the European Academy of Sciences, National Academy of Sciences, and Russian Academy of Sciences.

Istanbul Technical University provides financial support to all faculty members to attend international scientific meetings at least once a year for making presentations on their ongoing researches. The faculty members are highly encouraged to publish their research results in peer-reviewed Science Citation Index (SCI) journals. TUBITAK and ITU Foundation provide financial awards separately depending on where paper was published and how many authors contributed to the paper. Those who publish four papers or more annually in internationally cited journals are rewarded with additional financial support.

The Department's research projects are supported by various state and private organizations. Joint team projects are proceedings in an increasing rate from years. Faculty members supervise a number of M.Sc. and Ph.D. students. Faculty members' research fields are listed in Table 6.1. Besides, detailed information about teaching loads of the faculty members are given in Table 6.2 and Table 6.3. The current CV's of the faculty members are presented in Appendix B.

Table 6.1. Faculty Qualifications

Faculty Name	Highest Degree Earned-Field and Year	Rank [1]	Type of Academic Appointment[2] T, TT, NTT	FT or PT[3]	Years of Experience			Professional Registration/ Certification	Level of Activity[4] H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
H. Serdar Akyüz	PhD, Geology, 1995	P	T	FT		21	21		H	H	H
Şafak Altunkaynak	PhD, Geology, 1997	P	T	FT		19	23		H	H	M
Murat Budakoğlu	PhD, Geology, 2000	P	T	FT		25	25	2	M	H	M
M. Namık Çağatay	PhD, Geology, 1977	P	T	FT		38	26		H	H	H
Ziyadin Çakır	PhD, Geology, 2003	P	T	FT		11	11		H	H	M
Fahri Esenli	PhD, Geology, 1992	P	T	FT		31	31		H	H	M
Ş. Can Genç	PhD, Geology, 1993	P	T	FT		22	26		H	H	M
A. Haydar Gültekin	PhD, Geology, 1990	P	T	FT		32	32		M	M	M
Remzi Karagüzel	PhD, Geology, 1989	P	T	FT	0.5	26	10		H	M	M

Faculty Name	Highest Degree Earned-Field and Year	Rank [1]	Type of Academic Appointment[2] T TT NTT	FT or PT[3]	Years of Experience			Professional Registration/ Certification	Level of Activity[4] H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
Zekiye Karacık	PhD, Geology, 1995	P	T	FT	3	26	26		H	H	M
Boris A. Natalin	PhD, Geology, 1981	P	NTT	FT		35	23		H	H	H
Aral I. Okay	PhD, Geology, 1980	P	T	FT		36	36		H	H	H
Nilgün Okay	PhD, Geology, 1995	P	T	FT		20	20		H	H	H
Yüksel Örgün	PhD, Geology, 1993	P	T	FT		31	31	2	H	L	L
Ercan Özcan	PhD, Geology, 1994	P	T	FT		22	12		H	H	H
Fikret Suner	PhD, Geology, 1988	P	T	FT		35	35	4	H	M	M
A. M. Celal Şengör	PhD, Geology, 1982	P	T	FT		32	32		H	H	H
Okan Tüysüz	PhD, Geology, 1985	P	T	FT		31	31		H	H	H
Fuat Yavuz	PhD, Geology, 1993	P	T	FT		31	31		M	H	L

Faculty Name	Highest Degree Earned-Field and Year	Rank [1]	Type of Academic Appointment[2] T, TT, NTT	FT or PT[3]	Years of Experience			Professional Registration/ Certification	Level of Activity[4] H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
Cenk Yaltırak	PhD, Geology, 2003	P	T	FT		12	24		H	H	H
Nurgül Çelik Balcı	PhD, Geology, 2005	ASC	T	FT		11	11		H	H	M
Emin Çiftçi	PhD, Geology, 2000	ASC	T	FT		22	7		M	H	H
K. Kadir Eriş	PhD, Geology, 2007	ASC	T	FT		8	2		H	H	L
Mustafa Kumral	PhD, Geology, 2000	ASC	T	FT	6	20	20		H	M	M
Yılmaz Mahmutoğlu	PhD, Geology, 1995	ASC	T	FT		27	27		H	H	M
Gürsel Sunal	PhD, Geology, 2008	ASC	T	FT		6	18		M	H	M
H. Tolga Yalçın	PhD, Geology, 1997	ASC	T	FT		28	28		H	H	M
Enver Vural Yavuz	PhD, Geology, 1996	ASC	T	FT		30	30		M	H	M
Erkan Bozkurtoğlu	PhD, Geology, 2003	AST	TT	FT		5	5		M	M	M

Faculty Name	Highest Degree Earned-Field and Year	Rank [1]	Type of Academic Appointment[2] T, TT, NTT	FT or PT[3]	Years of Experience			Professional Registration/ Certification	Level of Activity[4] H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
Şenel Özdamar	PhD, Geology, 2009	AST	TT	FT		7	7		L	H	L
Gülsen Uçarkuş	PhD, Geology, 2010	AST	TT	FT		2	2		H	H	L
Demet Kıran Yıldırım	PhD, Geology, 2013	AST	TT	FT		2	2		M	M	M
Halis Manav	PhD, Geology, 1996	I	NTT	FT	9	27	27		H	M	L

Faculty Workload

The faculty workload can be summarized into three major groups: (a) teaching, (b) research, and (c) taking role on integration of industry and the academic research (e.g. consulting). Table 6.1 shows the distribution of each activity per faculty on these three major issues.

In terms of education, the department board decides on required elective courses to be offered first time based on various reasons such as demands by students, industry, changing trends in science and technology, etc. through an appointed committee. Contents of the courses or any modification on the existing required courses are made by the faculty members offering those courses. The course is then evaluated and approved by The Faculty of Mines Faculty Council and then by the ITU Senate. The Senate rigorously evaluates the entire proposal for new courses and modification through education sub-committee. This process ensures the consistency and the quality of the courses in the program.

The Dean's Office and the Provost's Office are responsible for coordinating the approval of new courses or the modification to exiting courses in the Faculty Council and the Senate, respectively.

The Provost's Office also coordinates the activities such as the allocation of the classrooms, the class hours and the final dates through the Student Affairs' Office. The Dean's Office, on the other hand, helps the improvement of the classrooms in terms of infrastructure and the technology.

Table 6.2. GE Faculty Workload Summary

Faculty Member (name)	PT or FT [1]	Classes Taught Course No./Credit Hrs. Fall and Spring (**bold**) Terms 2016	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
M. Sezai Kırıkoğlu	FT	1-JEO131/2-JEO316/3-JEO492/**4-JEO316/5-JEO412/6-JEO573**	20	20	60	100
H. Serdar Akyüz	FT	1-JEO223E / 2 - JEO 328E / 3- JEO 348/**4-JEO315E/5-JEO328E**	40	40	20	100
Şafak Altunkaynak	FT	1-JEO331E/2-JEO349E/3-JEO425/**4-JEO331E/5-JEO328E**	40	60		100
Murat Budakoğlu	FT	1-JEO323E/**2-JEO272/3-JEO616E**	30	40	30	100
M. Namık Çağatay	FT	1-JEO444E/2-JEO445E	30	70		100
Ziyadin Çakır	FT	1-JEO325E/2-JEO112E/**3-JEO254E/4-JEO448E**	30	40	30	100
Fahri Esenli	FT	1-JEO111	30	70		100
Ş. Can Genç	FT	1-JEO349/**2-JEO242**	40	40	20	100
A. Haydar Gültekin	FT	------	30	70		100
Remzi Karagüzel	FT	1-JEO431/**2-JEO438**	50	30	20	100
Zekiye Karacık	FT	1-JEO211/**2-JEO438**	40	60		100
Boris A. Natalin	FT	1-JEO112E/2-JEO411E/**3-JEO262E/4-JEO411E**	50	50		100
Aral I. Okay	FT	1-JEO417/2-JEO417E/**3-JEO256E/4-JEO342E**	30	40	30	100

Faculty Member (name)	PT or FT [1]	Classes Taught Course No./Credit Hrs. Fall and Spring (**bold**) Terms 2016	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
Nilgün Okay	FT	1-JEO112E/**2-JEO121E/3-JEO112E**	40	60		100
Yüksel Örgün	FT	1-JEO321	40	60		100
Ercan Özcan	FT	1-JEO223E/2-JEO223/**3-JEO336E**	50	50		100
Fikret Suner	FT	1-MAD361E/**2-JEO272E/3-JEO416/4-JEO315E/5-JEO602E/** **6-ETK101E**	20	80		100
A. M. Celal Şengör	FT	**1-JEO112E**	20	80		100
Okan Tüysüz	FT	1-JEO417/2-JEO417E7/3-JEO436E	20	80		100
Fuat Yavuz	FT	1-JEO325/**2-JEO325**	30	70		100
Cenk Yaltırak	FT	**1-JEO114**	40	60		100
Nurgül Çelik Balcı	FT	1-JEO421E/**2-JEO630E**	30	70		100
Emin Çiftçi	FT	1-MAL2015/2-JEO339E/3-JEO418E/4-JEO321E/5-JEO412E/6-JEO131E/7-CHZ323E/**8-JEO338E/9-JEO412E/10-JEO418E/11-JEO418E/12-JEO580E/13-JEO624/14-JEO626E**	70	30		100
K. Kadir Eriş	FT	**1-JEO112/2-JEO576**	50	50		100
Mustafa Kumral	FT	1-JEO435/2-MAD361/**3-JEO338/4-JEO618**	50	50		100
Yılmaz Mahmutoğlu	FT	1-JEO431E/2-JEO222/3-JEO431/**4-JEO222/5-JEO559**	70	30		100

Faculty Member (name)	PT or FT [1]	Classes Taught Course No./Credit Hrs. Fall and Spring (**bold**) Terms 2016	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholarship	Other[4]	
Gürsel Sunal	FT	1-JEO114E/**2-JEO254**	40	60		100
H. Tolga Yalçın	FT	1-JEO343E/**2-JEO322E**	70	30		100
Enver Vural Yavuz	FT	1-JEO121/2-JEO325/**3-JEO121/4-JEO564**	50	50		100
Erkan Bozkurtoğlu	FT	1-JEO413/2-JEO335/3-JEO222E/4-MAD362E/**5-JEOJEO413**	50	50		100
Şenel Özdamar	FT	1-JEO111E/2-JEO342E/3-JEO349/4-JEO570/5-JEO331/6-JEF232	40	60		100
Gülsen Uçarkuş	FT	1-JEO341E/2-JEO341E	30	30	40	100
Demet Kıran Yıldırım	FT	1-JEO423	20	80		100
Halis Manav	FT	1-JEO419/2-JEO211E/3-MAD211/4-MAD211E/**5-JEF232**	90	10		100

1. *FT = Full Time Faculty or PT = Part Time Faculty, at the institution*
2. *For the academic year for which the Self-Study Report is being prepared.*
3. *Program activity distribution should be in percent of effort in the program and should total 100%.*
4. *Indicate sabbatical leave, etc., under "Other."*
5. *Out of the total time employed at the institution.*

Faculty Size

The department has the following numbers of teaching, faculty and laboratory support staffs and their comparison with previous ABET visiting is summarized at below and distribution of faculty members are shown in Table 6.3.

Table 6.3. Summary of Faculty Members According to Three Consecutive Years

	2004	2010	2016
Professors	18	21	20
Assoc. Professors	9	5	8
Asst. Professors	6	10	4
Instructor	1	1	1

Our department is the largest GE department in Turkey with 33 faculty members (three faculties are still affiliated; these are Okan Tüysüz, Aral Okay, and A. M. Celal Şengör in Eurasia Institute of Earth Sciences), 24 research & support staff (assistant, lecturer, etc), 342 students (48 graduate, 294 undergraduate) along with Geological Engineering alumni, including academics across the country and leaders in industry.

Table 6.4 gives an overview of the interest area of the GE faculty members.

The quality of education in the department is in second score within all earth sciences departments in Turkey (Table 1.1). Department has strong ties with private companies, especially with coal, ceramic and porcelain and mining industries. Students are divided as separate groups of 8 - 10 and assigned to each faculty as advisor.

Table 6.4. Faculty Members And Their Areas Of Research Interests

Stratigraphy	Ercan Özcan, Boris Natalin
Crystallography	Fahri Esenli
Paleontology	Ercan Özcan
Mineralogy	Fahri Esenli, Işık Ece, Halis Manav, Emin Çiftçi, Şenel Özdamar
Clay Mineralogy	Işık Ece, Fahri Esenli, Şenel Özdamar
Magmatic Petrology	Can Genç, Zekiye Karacık, Şafak Altunkaynak
Metamorphic Petrology	Şenel Özdamar, Aral Okay, Gürsel Sunal
Sedimentary Petrology	Işık Ece, Serdar Akyüz, Nilgün Okay
Marine Geology	Nilgün Okay, Namık Çağatay, Cenk Yaltırak
Probability and Statistics	Sinan Özeren, Murat Budakoğlu
Biogeochemistry	Nurgül Balcı, Murat Budakoğlu
Biomineralization	Nurgül Balcı, Murat Budakoğlu
High-Temp. Geochemistry	Şafak Altunkaynak, Zekiye Karacık, Can Genç
Sedimentary Geochemistry	Namık Çağatay, Işık Ece, Tolga Yalçın, Fikret Suner
Clastic Sedimentology	Nilgün Okay, Namık Çağatay
Carbonates & Evaporates	Fikret Suner
Hydrogeology	Tolga Yalçın, Remzi Karagüzel
Engineering Geology	Remzi Karagüzel, Yılmaz Mahmutoğlu, Vural Yavuz
Hydrothermal Ore Deposits	Emin Çiftçi, Mustafa Kumral
Mineral Chemistry	Fuat Yavuz, Emin Çiftçi
Optical Mineralogy & Petrography	Can Genç, Fahri Esenli, Şenel Özdamar, Şafak Altunkaynak, Zekiye Karacık

Industrial Minerals	Sezai Kırıkoğlu, Fuat Yavuz, Emin Çiftçi, Mustafa Kumral
Structural Geology	Aral Okay, Serdar Akyüz, Cenk Yaltırak, Okan Tüysüz
Precious Minerals and Rocks	Sezai Kırıkoğlu, Halis Manav
Field Geology & Mapping	Serdar Akyüz, Aral Okay, Okan Tüysüz, Cenk Yaltırak
Regional Tectonics	Celal Şengör, Boris Natalin, Cenk Yaltırak, Aral Okay
Limnology & Oceanography	Namık Çağatay, Nilgün Okay
Organic Geochemistry	Murat Budakoğlu, Nurgül Balcı
Stable Isotope Geochem.	Murat Budakoğlu, Nurgül Balcı, Emin Çiftçi
Aqueous Geochemistry	Yüksel Örgün, Murat Budakoğlu, Emin Çiftçi
Rock Mechanics	Yılmaz Mahmutoğlu, Vural Yavuz
Geochronology	Gürsel Sunal, Şenel Özdamar, Zekiye Karacık, Can Genç, Safak Altunkaynak
Neotectonics	Okan Tüysüz, Ziyadin Çakır, Serdar Akyüz, Cenk Yaltırak
Petroleum Geology	Namık Çağatay
Environmental Geology	Remzi Karagüzel
Volcanology	Can Genç, Zekiye Karacık, Şafak Altunkaynak
Geomechanics	Vural Yavuz, Yılmaz Mahmutoğlu
GPS Systems in Geology	Vural Yavuz, Cenk Yaltırak, Okan Tüysüz
Geodynamics	Ziyadin Çakır, Boris Natalin
Sedimentary Ore Deposits	Emin Çiftçi, Fikret Suner, Mustafa Kumral, Ali Haydar Gültekin
Drilling Techniques	Tolga Yalçın
Geothermal	Tolga Yalçın

Professional Development

The Program encourages faculty development in education activities and research through various instruments such as,

- Professional society meetings and conference attendances,
- Professional society committee membership,
- Journal and conference refereeing and editorials,
- Organization member of international conference and meetings,
- Seminars held by the department,
- Relation with the industry

Sources which are available to support the faculty professional development include:

- ITU Development Foundation, ITU's "Research Fund" supports including $15,000 to $40,000 per research project, ITU's "Research Fund multidisciplinary research project" supports individual projects with much bigger budget, ITU Research Fund support for laboratory infrastructure development projects (typically channelized to meet the needs of Departments; may be in excess of $80,000 per project),
- ITU provides "travel support" (one travel per year for faculty to participate in a international conference), $3,000 per travel per year to the USA and $2,000 to European countries (young faculty have more priority but almost all faculty can get support),
- ITU Development Foundation supports "publication award" (maximum of $1,350 per each SCI/SCIE indexed journal paper),
- The faculty also receives project-based external research support (to varying amounts, upon merit-based evaluation of a research proposals), mainly from TUBITAK (Turkish National Scientific and Technical Research Council) as well as other scientific and professional institutions.
- The University Library purchases any textbooks if it does not exist in the library. Besides, if the ITU library is not a member of some e-journals from

publishers, specific papers upon demand can be ordered from interlibrary loan service.

Our faculty members and their interactions with other universities given in the list below.

ALTUNKAYNAK, Şafak	University of Nevada, Las Vegas, USA Open University, UK
ECE, Ö. Işık	University of Georgia, Athens, USA Georgia State University, USA Georgia Institute of Technology, USA Akita University, JAPAN University of North Carolina, Chapel Hill, USA
BALCI, Nurgül	University of California, Los Angeles, USA Colorado School of Mines, USA Max Planck Institute for Marine Microbiology, Bremen, GERMANY Cambridge University, UK
BUDAKOĞLU, Murat	University of Indiana, Bloomington, USA
ÇAĞATAY, Namık	University of Bonn, GERMANY University of Bremen, GERMANY Max Planck Institute for Marine Microbiology, Bremen, GERMANY INGV (Ist.Nazio.di Geofisica e Vulcanologia), Rome Institute of Marine Sciences, CNR, Bologna, ITALY Lamont-Doherty Earth Observatory, Columbia University, USA IREMER Collège, CEREGE, FRANCE Royal Belgium Observatory, BELGIUM
ÇAKIR, Ziyadin	University of Bristol, ENGLAND
ÇİFTÇİ, Emin	Missouri University of Science & Technology, USA University of Texas at Arlington, USA University of Maine, USA University of Georgia, Athens, USA Indiana University @ Bloomington, USA
GENÇ, S. Can	University of Istanbul, TURKEY Russian Academy of Sciences, RUSSIA
KUMRAL, Mustafa	University of Cincinnati, USA University of Georgia, Athens, USA

NATALINE, Boris	As a leader of IGCP-480 Project, Cooperation with the following universities; AGH Uni. of Science & Tech., Krakow, POLAND California State University, Long Beach, USA Curtin University of Technology, Perth, AUSTRALIA Johannes Gutenberg Universitat, Institut für Geowissenschaften, Mainz, GERMANY Mongolian Technical University, Ulaanbaatar, MONGOLIA National Taiwan University, Taipei, TAIWAN Syracuse University, Syracuse, USA Universitaet Wuerzburg, Wuerzburg, GERMANY University of California, Los Angeles, USA University of Leicester, U.K. University of Mainz, Mainz, GERMANY Universite d'Orleans, Orleans, FRANCE University of Sciences and Technology of China, Hefei, CHINA University of Utah, Salt Lake City, USA
OKAY, Aral	University of Bologna, ITALY University of Tubingen, GERMANY Open University, ENGLAND
OKAY, Nilgün	University of Bologna, ITALY
ÖZCAN, Ercan	NKTH (Nemzeti Kutatasi es Technological Hivatal), HUNGARY Indian Institute of Technology, Powai, Mumbai, INDIA University of Road, Tainan, TAIWAN
ÖZDAMAR, Şenel	University of Georgia, Athens, USA University of Auburn, Alabama, USA
ŞENGÖR, A.M. Celal	Distinguished Professor World-wide authority on Plate Tectonics Numerous cooperation's with world's top universities
YALTIRAK, Cenk	Memorial University of Newfoundland, CANADA
YAVUZ, Vural	ETH, Zurich, SWITZERLAND University of Bern, SWITZERLAND
YILDIRIM, Demet	University of Cincinnati, Ohio, USA

Authority and Responsibility of Faculty

Main administration structure of Istanbul Technical University is summarized in the chart presented in Figure 6.1. Faculty of Mines is the oldest mining school in Turkey. The Department of Geological Engineering is the second oldest geology department in Turkey. The department is administrated by the Department Chairman, who reports to the Dean of Faculty of Mines, and has two Associate Chairs. The academic issues are decided by the Departmental Board, and approved by the Faculty of Mines Faculty Council and the Senate of the University, if necessary. The administrative issues, on the other hand, are handled by the department chair and the faculty members, the Faculty of Mines Executive Board, and then the University Executive Council. The organizational structure of the Faculty of Mines and Department of Geological Engineering are given in Figures 6.1 and 6.2.

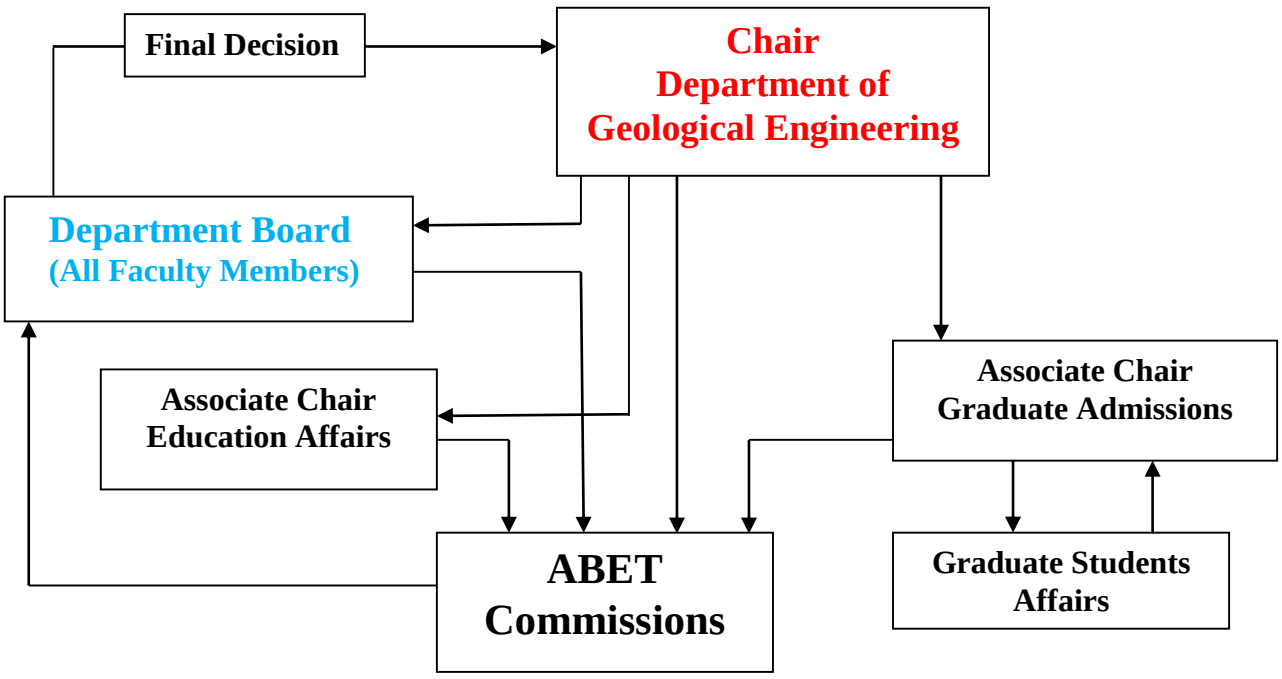


FIGURE 6.1. ADMINISTRATIVE AND ORGANIZATIONAL STRUCTURE OF THE DGE

ABET Commissions and Responsibilities

The Department of Geological Engineering has arranged various ABET Committees and appointed them to following responsibilities.

ABET Accreditation Commission

Prof. Dr. Sezai KIRIKIOĞLU sezai@itu.edu.tr

Assoc. Prof. Dr. Emin ÇİFTÇİ eciftci@itu.edu.tr

Assist. Prof. Dr. Kayhan DEVELİ kayhan kayhan@itu.edu.tr

Res. Assist. Hüseyin KOCATÜRK kocaturkhu@itu.edu.tr

Dr. Eng. Cengiz ZABCI zabci@itu.edu.tr

Res. Assist. Alp ÜNAL alp.unal@itu.edu.tr

Responsibilities

- Coordination of ABET activities according to the schedule set by the Dean of the Faculty of Mines
- Sustain the Mission, Vision and Objective of the department
- Discuss and develop the strategies of the department related to evaluation, improvement and reorganization of the outcomes

ABET Education and Ethics Commission

Prof. Dr. Şafak ALTUNKAYNAK safak@itu.edu.tr

Prof. Dr. Murat BUDAKOĞLU budak@itu.edu.tr

Assoc. Prof. Dr. Nurgül Çelik BALCI ncelik@itu.edu.tr

Dr. Vildan ESENLİ esenli@itu.edu.tr

Responsibilities

- Prepare and evaluate the undergraduate courses systematically
- Assess the need for course improvement and for new courses
- Discuss the decisions in Department Board

Student Relations and Questionnaire Commission

Prof. Dr. Ali Haydar GÜLTEKİN gultekin@itu.edu.tr

Assoc.Prof. Dr. Emin ÇİFTÇİ eciftci@itu.edu.tr((Dept. Adaptation Commission)

Prof. Dr. Dr. Zekiye KARACIK zkaracik@itu.edu.tr

Dr. Vildan ESENLİ esenli@itu.edu.tr

Res. Assist. Murat Şahin sahinmurat2@itu.edu.tr

Responsibilities

- Organize systematically every semester student relations and questionnaires
- Evaluate and advice students on major, minor and double major programs
- Encourage students to visit foreign universities with ERASMUS and other programs
- Organize and assist with the course folders

Internship Period and Questionnaire Commission

Assist. Prof. Dr. Şenel ÖZDAMAR ozdamarse@itu.edu.tr

Assoc. Prof. Dr. Gürsel SUNAL sunal@itu.edu.tr

Res. Assist. Mehmet KORKUT korkutm@itu.edu.tr

Responsibilities

- Search suitable industrial opportunities for student's summer experience
- Organize student field work with faculty

Geology Club Commission

Assist. Prof. Dr. Şenel ÖZDAMAR ozdamarse@itu.edu.tr

Res. Assist. Alp ÜNAL alp.unal@itu.edu.tr

Işık Su YAZICI (Student Club President)

Responsibilities

- Evaluate and discuss the results of the outcomes related to mission and objectives of the Department
- Assess the curriculums' achievements according to the mission and objectives of the Department
- Choose Student Advisors and define Student Advisory responsibilities
- Organize activities

Scientific and Social Organization Commission

Prof. Dr. Aral OKAY okay@itu.edu.tr

Prof. Dr. Fahri ESENLİ esenlif@itu.edu.tr

Assoc. Prof. Dr. Mustafa KUMRAL kumral@itu.edu.tr

Assoc. Prof. Dr. Yılmaz MAHMUTOĞLU yilmazm@itu.edu.tr

Assist. Prof. Dr. Gülsen UÇARKUŞ ucarkus@itu.edu.tr,

Assist. Prof. Dr. Şenel ÖZDAMAR ozdamarse@itu.edu.tr

Responsibilities

- Organize faculty meeting for social activity and culture tourism
- Invite lecturers from inside and outside the campus
- Organize national and international meetings

Laboratory Commission

Prof. Dr. Murat BUDAKOĞLU budak@itu.edu.tr

Prof. Dr. Namık ÇAĞATAY cagatay@itu.edu.tr

Assoc. Prof. Dr. Emin ÇİFTÇİ eciftci@itu.edu.tr

Assoc. Prof. Dr. Mustafa KUMRAL kumral@itu.edu.tr

Assoc. Prof. Dr. Yılmaz MAHMUTOĞLU yilmazm@itu.edu.tr

Responsibilities

- Define and evaluate the physical resources of the department and Faculty for laboratory usage
- Develop logistics for better uses, suggest remedies for laboratory facilities
- Define the rules for proper and safe laboratory usages
- Search proper instruments for our needs and check continuously safety regulations

WEB Commission

Dr. Eng. Cengiz ZABCI zabci@itu.edu.tr (Department WEB Coordinator)

Responsibilities

- Develop the communication tools for the department
- Organize department web pages in internet
- Communicate the results of the outcomes of ABET to the members of department

Graduate Relations and Questionnaire Commission

Prof. Dr. Serdar AKYÜZ akyuz@itu.edu.tr

Prof. Dr. Fahri ESENLİ esenlif@itu.edu.tr

Prof. Dr. Fuat YAVUZ yavuz@itu.edu.tr

Prof. Dr. Remzi KARAGÜZEL karaguzel@itu.edu.tr

Assoc. Prof. Dr. Yılmaz MAHMUTOĞLU yilmazm@itu.edu.tr

Assist. Prof. Dr. Demet Kıran Yıldırım kirand@itu.edu.tr

Responsibilities

- Evaluate and improve the results of outcomes from graduates
- Prepare an address list of graduates
- Keep Alumni contacts with their old school

Industry and Outcomes Relations Commission

Prof. Dr. Sezai KIRIKOĞLU sezai@itu.edu.tr

Prof. Dr. Murat BUDAKOĞLU (Associate Dean) (Coordinator)

Assoc. Prof. Dr. Mustafa KUMRAL kumral@itu.edu.tr

Assist. Prof. Dr. Şenel ÖZDAMAR ozdamarse@itu.edu.tr

Assist. Prof. Dr. Erkan BOZKURTOĞLU erkan@itu.edu.tr

Assist. Prof. Dr. Kayhan DEVELİ kayhan@itu.edu.tr

Res. Assist. Hüseyin KOCATÜRK kocaturkhu@itu.edu.tr

Responsibilities

- Prepare and evaluate the results obtained from the industry
- Continuously analyze and evaluate the outcomes between from industry with the Department's mission and objectives

CRITERION 7.

FACILITIES, OFFICES, CLASSROOMS AND LABORATORIES

Five departments (Geological, Mining, Petroleum, Geophysical and Mineral Processing Engineering) share the Faculty of Mines Building which is a three-storey building with a surface area of **21,618 square meters**. Department of Geological Engineering almost occupies 30 % of offices in the building and classrooms mutually use together with other department's staffs and students. Dean's Office and Student's Office of Records and EURASIA Institute of Earth Sciences are located inside the Faculty of Mines Building. Our facilities are adequate to support the educational objectives and outcomes of the program.

There are 36 offices occupied by faculty members, one office for ABET studies, 3 offices for the departmental secretaries, five offices for emeritus professors and some storage rooms, excluding administrative staff members that have separate offices under the structure of the Dean's Office in the same building. The teaching and research assistants have either separate small office or desk space in the respective research laboratories while the technical staff members are stationed in the workshop. Every teaching or research assistant have own desktop and/or laptop. There are four meeting and seminar rooms and some more space for photocopying and storage in the Department of Geological Engineering. Moreover, there is a large conference room for scientific convention inside the Faculty of Mines Building which is open to use of all departmental organizations.

All of the departmental courses (undergraduate and graduate) are taught in classrooms in the Faculty of Mines Building. This provides the students the opportunity for more intimate contact with the faculty, the teaching assistants and the members of the upper and lower classes and immediate access to the undergraduate laboratories. These classrooms are listed in the tables 7.1a and 7.1b given below. All classrooms are equipped with portable overhead and data show projectors. These classrooms are adequate for the needs of the department.

Table 7.1a. Classrooms in Fall 2015 Semester

Room Number	Purpose of Laboratory Including Courses Taught	Number Students (Approximately)	Area (m^2)
B 205 A 303	Crystallography JEO 111 Mineralogy Lab.	50 30	127 120
B 205	General Geology JEO 112E	70	127
A 301	Design in Earth Sciences JEO 121	50	127
A 201	Intr. to Geological Eng. JEO 131	50	122
A 205 A 303	Mineralogy JEO 211 Mineralogy Lab.	55 30	102 120
A 201	Paleontology JEO 221 Paleontology Lab.	55	122
A 205	Geomechanics JEO 222	35	102
A 301	Precious Min. and Rocks JEO 316	10	127
B 203 E 413	Ore Deposits JEO 321 Ore Lab.	45 30	102 40
B 205 E 413	Ore Deposits JEO 321 Ore Deposits Lab.	25 30	102 40
B 207	Computer Application in Geology JEO 325	30	127
B 206 B 304	Petrography JEO 331 Petrography Lab.	45 35	106 100
A 203	Soil Mechanics JEO 335	6	102
B 206	Sedimentology JEO 341E	65	102
A 205	Tectonics JEO 411E	25	127
B 207	AutoCAD for Geologists JEO 413	15	127
A 302	Geology of Turkey JEO 417	10	127
A 105	Geochemistry JEO 421E Lab	25	195
B 205 E 217	Engineering Geology JEO 431 Lab	25 30	127 60
A 204	Petroleum and Natural Gas Geology JEO 445E	60	100
			TOTAL 2.712

Table 7.1b. Classroom in Spring 2016 Semester

Room Number	Purpose of Laboratory Including Courses Taught	Number Students (Approximately)	Area (m^2)
A 201	General Geology JEO 112	90	122
B 206	General Geology JEO 112	102	106
A 301	Design in Earth Sci. JEO 121	70	127
A 204	Thermodynamics in Geology JEO 212	96	100
A 102	Geomechanics JEO 222	132	195
A 102	Optical Mineralogy JEO 242 Lab	132	195
A 203	Stratigraphy JEO 262E	90	102
A 205	Structural Geology JEO 252E	102	90
B 204	Intro. to Structural Geology JEO 254	90	105
B 204	Hydrogeology JEO 322E	60	105
A 301	Petrology JEO 332E	70	127
A 201	Field Geology JEO 312	90	122
A 204	Field Geology JEO 312	96	100
A 205	Geology of Construction Mat. JEO 326	90	102
A 301	Environment and Mineralogy JEO 318	70	127
B 205	Subsurface Geology JEO 334	120	127
A 201 B 305/2	Petrog. of Sedimentary Rocks JEO 324 Lab	90 30	122 24
A 203	Historical Geology JEO 336	90	102
A 204	Mineral Exploration JEO 338	96	100
A 205	Rock Mechanics JEO 346	90	102
B 204	Industrial Raw Materials JEO 412	90	105
A 205	Environmental Geochem. JEO 446E	90	102
A 302	Volcanology JEO 424	70	127
A 201	Environmental Geology JEO 438	90	122
B 205	Marine Geology JEO 444E	120	127
A 301	Neotectonics JEO 448E	70	127
A 202	Mapping and Field Techniques in Geology JEO 315	120	122
			TOTAL 3.889

Laboratories

The department has fourteen laboratories for experimental work, all of which are also located on the respective floors of the Faculty of Mines Building. These are summarized in Table 7.2 given below. Four of the laboratories (Sample Preparation, XRD-Clay Mineralogy, Crushing-Grinding, Geochemistry and Ore Microscopy) were established at the department between 2005 and 2009.

The five largest laboratories (optical mineralogy, mineralogy, petrography, paleontology, and rock mechanics) are the main laboratories used for undergraduate instruction whereas the remaining 8 are research laboratories, which also serve undergraduate instruction through JEO 492 Senior Thesis projects. Currently, the laboratory spaces can be considered as adequate for the undergraduate and graduate studies in the department. Lab and multi-purpose facility rooms are as follow:

- 1 study room (Hamdi Bozdağ Library)
- 1 auditorium for conference organization (İhsan Ketin Conference Hall)
- 2 meeting room (ABET Coordination Center and Faculty Meeting room)
- 3 seminar room (Galib Sağıroğlu, Kemal Erguvanlı and Mineralogy Rooms)
- 2 computer rooms (B 207 and B 315)
- 23 laboratories
- 2 research center
- 1 student geology club
- Thin Section and Polishing Lab.
- Ore Specimen Lab.
- Gemology Lab.
- Engineering Geology Lab.
- Hydrogeology Lab.
- Mineralogy & Petrography Lab.
- Paleontology Lab.
- Optical Mineralogy Lab.
- Advanced Petrography Lab.

There are two big Research Center inside the Department of Geological Engineering
A) Eastern Mediterranean Centre for Oceanography and Limnology Objectives:
1. To establish state-of-the-art laboratory and field infrastructure that will be used extensively in marine and lake studies, including natural hazards and environmental changes, so that the output will be comparable with that from European, American, and other worldwide centres of excellence,

2. To develop highly qualified first- and second-generation researchers in interdisciplinary marine and lake studies at ITU, covering a wide range of fields such as underwater earthquake geology, tsunamis, submarine land slides, floods, climate change and environmental pollution, and

3. To enhance interactions in projects and idea exchanges between ITU researchers and those in the EU countries.

B) JAL (Geochemical Researches Laboratory) Objectives:
1. To establish state-of-the-art laboratory and to use these facilities in mineral deposits exploration studies and to get international certification.

2. To develop highly qualified precious metals (Au, Ag, PGEs) and REE analysis at ITU, covering a wide range of fields for the benefits of private mining industries and

3. To enhance multi-institutional and multi-disciplinary research projects.

JAL has the following laboratories:
1) Geochemistry Laboratory
2) Rock Crushing and Grinding Laboratory for sample prep for the geochemical analyses
3) X-Ray Diffraction and Clay Mineralogy Laboratory
4) Geochemical Instrumental Laboratory (AA, ICP-MS and XRF)
5) Advanced Petrographic Research – Cathodoluminescence –EDX & Fluid Inclusion Laboratory

Table 7.2. Ge Laboratories In The Faculty Of Mines Building.

Details of instruments are listed in Appendix-C.

Room No	Laboratory	Area (m^2)	Instruments
B 303	JAL Geochemistry	120	AA, Flame Photometer, Deionized Water X-Ray Fluorescence
B 304	JAL Geochemical Instrumental	25	LA-ICP-MS
A 304	Clay Mineralogy and Sample Preparation	30	Drying, Oven, Mixing, Centrifuge
Basement Floor	Thin Section & Polishing	25	Struers Brand name Machines
B 303	Rock Crushing & Grinding	10	Retch RM100
B 305/2	Optical Mineralogy	34	18 Polarizing Microscopy
A 303	Mineralogy & Petrography – I	55	Mineral Specimens
B305	Mineralogy & Petrography - II	60	Mineral Specimens
E 413	Ore Deposits	45	Ore Specimens
Basement	Engineering Geology	112	Pressure Testing Units
“	Rock Cutting & Sample Preparation	18	Retch RM 200
“	Index Properties Measurements	40	Light Reflectance
“	Rock Mechanics	38	Strain Measurement
B 306	Advanced Petrographic Research Cathodoluminescence-EDX &Fluid Inclusion Lab	20	Leica Res. Microscopy CITL CLM-EDX Linkam Fluid Inclusions System
E 317	X-Ray Diffraction	30	Bruker 8D XRD
B 307	Geomicrobiology and Biogeochemistry	20	Deep Freezer, anaerobic chamber, laminar flow, autoclave, centrifuge, incubator
E 318	EMCOL	60	Core Analysis Instruments
E 324	Hydrogeology	40	Permeameter Spectrophotometer

The Department of geological Engineering has two computer laboratories; both are open for the undergraduate and graduate students. ITU Computer Center purchased license of MICROSOFT and LINUX software's which all faculty members used in their desktops and laptops. The lists of available hardware and accessories in these laboratories along with the research laboratories are given below

The current system specification for students joining the program in the Fall semester 2009 includes:

• Platform: Tablet PC Convertible
• Operating System: Windows Vista Enterprise Edition
• Processor and speed: Core 2 Duo (dual core processor) 2.2 GHz or higher
• Memory (RAM): 4 GB (minimum)
• Hard Disk Drive: 240 GB or bigger ; 5400 RPM spindle speed or better
• Video RAM:1 gb
• CD/DVD drive: DVD+-R writeable DVD
• Wireless: 802.11 a/g
• NIC/Ethernet Card: 10/100/1000 Ethernet Card
• Printer: Any Microsoft Windows compatible inkjet or laser printer
• Warranty: 3 year onsite with accident coverage (recommend 4 years)
• External Backup Drive: USB external hard drive of 160GB or more.

Computing Resources

Department have a separate computer laboratory for GIS studies and moreover, there are several fully-networked desktops installed in each of the aforementioned laboratories which are made available for all student uses. The PC laboratory operates continuously for all ITU undergraduate and graduate students five days a week and during the weekends, especially mid-term and final exam periods. Students may be allowed to use special software in their JEO 492 project. Generally speaking, the graduate students in their first years usually have their own computers. The undergraduate students have the opportunity to learn many general purpose and/or special computer software through a series of homework and project assignments in several required and/or elective courses. MATLAB, EXCEL, WORD are the most commonly used general purpose software while special software such as

CORELDRAW, GRAPHER, AUTOCAD are extensively used in design and drawing courses. In summary, the numbers of desktops of the department are considered as more than adequate for executing of the undergraduate program.

Guidance

ITU Computer Center provides technical service for software applications and maintenance in of all type of computers. Some research assistants handle the minor installation and maintenance activities and seek the help of the experts in the university Computer Center and vendors of hardware and software. The department has a full-time technical manager for **EMCOL** laboratory, Mr. Dursun Acar, who is highly qualified electronic technician dedicated to his job. Besides, Ms. Serena Uzaşçı is chemists and responsible for **MIL** laboratory including LA-ICP-MS laboratory, procurement of equipment, accessories and analysis of advanced analyses in research laboratories. The regular maintenance and servicing of the laboratories is provided by technical person of the distributor of each instruments in Turkey. The department also has a full time administrative secretary, Mrs. Medine Çal who is responsible for handling routine administrative operations, and she is assisted by a full-time Department secretary, Mrs. Aliye Yiğit. Mr. Mehmet Ali Oral is thin section and polishing technician and Yüksel Ilgar is responsible from engineering geology laboratories.

The students have the opportunity to learn and use modern techniques such as analytical methods, field techniques, mineral identification, data acquisition and engineering design. Students working on JEO 492 Graduation Project projects are also covered to general design methods such as atomic absorption spectroscopy, field studies, petrography, ore microscopy, thermal analysis and engineering geology methods while working in one of the research laboratories. Besides, we have portable field equipment set for water sampling procedures.

Maintenance and Upgrading of Facilities

The educational laboratory equipment was planned by the instructors of relevant courses with the coordination of Chairman of the Department. The educational infrastructure equipment is usually purchased by the purchasing department of the

university, depending on the funds available in main budget for educational equipment. Also, infrastructure analytical equipment grants are available through State Planning Organization (DPT). The maintenance of the equipment is carried out by the vendors or the technician of the department, as explained in the next section. The maintenance of major advance technology required equipments can be done under the research grant of the relevant faculty member. Equipment and accessories in most laboratories are procured via research projects funded by ITU Research Fund, State Planning Organization (DPT) and TUBITAK are available.

Library Services

The ITU Library purchases any textbooks if it does not exist in the library based on the demands by the faculty members. For the periodic journals, if it is not on the subscription list, it can be ordered by the library based on demand through the interlibrary loan system.

Overall Comments on Facilities

The appointed and authorized personnel administer each facility. Authorized personnel of these facilities have responsibilities about the management, safety and educational functionalities. Extents of these are decided by the Rector. However, some of these may require approval of the ITU Senate.

CRITERION 8. INSTITUTIONAL SUPPORT

Leadership

The Geological Engineering Program Educational Objectives are consistent with the ITU, the Faculty of Mines and Geological Engineering Department missions. Consistent with the mutual missions of ITU, the Department has historically been and is currently an integral part of the Faculty of Mines producing engineering graduates, conducting research on critical problems, and performing outreach activities to meet the needs of industry, government, and the nation. The Geological Engineering Department has developed a set of objectives with its mission statement. The objectives are more specific than the department mission, elucidating the expected

results of study of our program. The program objectives describe the means to close encounter with both the missions of the Faculty of Mines and Geological Engineering Program, and also shows abilities and skills of the graduates should have. The second and third clauses of the objective statement, which are related to the analytical thinking and engineering problem solution ability, were also indirectly covered by the mission of the ITU through historical reputation of strong basic sciences and mathematics education. The fourth clause of the program objective statement matches more comprehensively than other clauses with the mission of ITU due to achievement efforts to the technological leadership, globalization, professional and ethical responsibilities. By preparing our graduates who have a strong basis in the fundamentals of engineering, the ability to design systems, field experience, and industry practices, and who have developed knowledge and skills to function professionally. The Geological Engineering Department mission is also congruent with these missions and objectives, as evidenced by the assessment and evaluation processes. The Geological Engineering Program is focused on three basic objectives:

(1) Teaching: undergraduate curriculum is designed to produce well-educated geologists and engineers for the workforce of industry's needs; (2) Research: our department is currently #1 research department in Turkey in terms of Science Citation Index group publications and we want to keep this performance in the future. Student and faculty collaborate on research for the development of scientific knowledge and applications; and (3) Service/Extension: the transfer of knowledge to the nation's needs in public and private sectors; in other means, close relationship in the industry-university cooperation.

Program Budget and Financial Support

ITU is a public university and therefore, university budget is mainly supported by the government. Department of Geological Engineering doesn't have a separate budget, like any other department in the ITU campus. The principal financial support for the Department of Geological Engineering comes from the Faculty of Mines budget. The last year's income was about 68,000 USD, excluding all academic and support personnel salaries, construction and major building expenses for the five departments in the Faculty of Mines. The main part of the Faculty of Mines' budget covers operational expenses and building maintenance. All salaries of academic, technical and support personnel came from the university main budget. Hence, the program budget is determined in accordance with the strict regulations imposed by the government. Major expenditures are categorized as stipulated by the government and should be kept within the limits predetermined by the Ministry of Finance. This greatly simplifies the processes used to determine the program budget for the forthcoming year, and ensure the continuity of the support. The budget plan is based on the previous year's final operational budget, the short-term and long-term strategic educational activities, and the attention of on-going projects. The budget is based on the ITU strategic plan format, conforms to published educational objectives, outcomes and goals, and responds to the particular department needs. The Istanbul Technical University has no flexibility about the salaries of the faculty members. The academic performance and promotions of the faculty members are monitored through "Academic Performance Reports", which every faculty member must submit annually. Promotions of academic personnel have been evaluated according to point system, which is decided based on publication, research and teaching performances, by the university administration. Our major financial source is the government. The university administration also provides additional institutional support through ITU Development Foundation and ITU Research Fund. Additional research grants are available through TUBİTAK (=Turkish NSF) (Turkish National Scientific and Technical Research Council) for the faculty members. Infrastructure grants to purchase new analytical instruments are also available from State Planning Organization (DPT) and Department of Geological Engineering recently renovated all laboratories under the financial support of DPT during 2009 and 2010. **EMCOL**

(Eastern Mediterranean Centre for Oceanography and Limnology) laboratory was established from the project which was supported by European Union during 2006 – 2008. **JAL** (Geochemical Analyses Labs) is established under the support of DPT during 2009 – 2010 and all kinds of sophisticated analyses except for the isotope analyses can be done in this laboratory. Incomes generated through the analyses keep the **JAL** self-running, which provides financial independence. Thin section and rock cutting-polishing laboratory is renovated and purchased new instruments under the support of ITU Research Fund in April 2009. Major income of the Foundation of Faculty of Mines are small to medium industry projects which come continuously from the private companies and a part of this income can be used to purchase laboratory items and chemical consumables. In some case, students Graduation Projects support with these industry projects. In addition to these sources, the projects supported by private sector, institutional and governmental agencies are the other irregular financial sources for the department. The additional incomes for the ITU main budget are various incomes of ITU Development Foundation, donation to the Foundation, tuitions, industrial projects and financial supports and other sources from scientific research institutions and private companies.

Faculty Hiring and Retention

The building is managed by the university within the central structure while the equipment, computers for education and research are managed by the department. The present facilities and equipment are in good condition and adequate for achieving the program objectives since the competent support staff is available as explained in Section 7.A. The major insufficiency of resources is in receiving extended service of vendors for the equipment due to some state regulations. However, this problem is solved using the Foundation of Faculty of Mines during the operation of recently establishing Mineral Analysis Center. The operation cost of the Center is handled by the incomes coming through private services from the outside of the campus. All buildings and facilities is ret state-owned

Staffing

Staffing can be considered as adequate. The department has a strong human resource team made up of the faculty, administrative assistants, technicians, clerical and other support personnel. Administrative manager of the Faculty of Mines building is responsible from the maintance of the building and Construcion Office in President's Administration is also responsible from small or major construction works.

Support of Faculty Professional Development

Faculty members are being supported for years from the general University Budget to participate in international scientific meetings. The papers which were published in international journals, mainly in SCI, are awarded by both the University and Faculty of Mines budgets. Besides, the main expenses of the Faculty of Mines budget goes to supporting of field works, travelling for scientific meetings and symposiums, equipment purchasing, maintenance and other similar expenditures. The support from the Foundation of the Faculty of Mines is the other additional income for the budget and the book-keeping of Foundation has been monitored and checked out by the Dean and Foundation Executive Board. Junior faculty members are provided with the necessary support for professional development through ITU Foundation and ITU Research Fund. ITU Research Fund gives priority to research proposals submitted by new faculty and the financial support provided is usually adequate for the procurement of computer and laboratory equipment necessary for launching their own research programs. Participation in national and international scientific events is also sponsored through research projects covering travel expenses and registration fees. The faculty is expected to give an oral presentation in these conferences. The ITU sponsors a variety of international seminars, meetings, training workshops, and other formal and informal activities, with the participation of local and invited speakers and resources to provide alternatives to the faculty for their continuous professional development.

PROGRAM CRITERIA

Program Criteria stipulated for geological engineering programs including "sedimentology", "stratigraphy-paleontology", "regional tectonics", "mineralogy-petrology", "geochemistry", "mining geology", industrial raw materials", "earthquake geology", "engineering geology", "hydrogeology" and similar modifiers in their titles are limited to the following curricular topics: "The program must demonstrate that graduates have: (1) the ability to apply mathematics including differential equations, calculus-based physics, and chemistry, to geological engineering problems; (2) proficiency in geological science topics that emphasize geologic processes and the identification of minerals and rocks; (3) the ability to visualize and solve geological problems in three and four dimensions; (4) proficiency in the engineering sciences including statics, properties/strength of materials, and geomechanics; (5) the ability to apply principles of geology, elements of geophysics, geological and engineering field methods; and (6) engineering knowledge to design solutions to geological engineering problems, which will include one or more of the following considerations: the distribution of physical and chemical properties of earth materials, including surface water, ground water (hydrogeology), and fluid hydrocarbons; the effects of surface and near-surface natural processes; the impacts of construction projects; the impacts of exploration, development, and extraction of natural resources, and consequent remediation; disposal of wastes; and other activities of society on these materials and processes, as appropriate to the program objectives".

In regards to these program requirements, all criteria set forth by ABET for geological engineering programs are met or exceeded by the Geological Engineering Program at ITU. Our Self-Study Report covers them including the Program Criteria within our Program Outcomes and highlighting the required faculty qualifications within our faculty summaries and curriculum vitas. Besides, Program Criteria covers applying fundamental knowledge of key technical areas appropriate to geological engineering, to conduct geological engineering experiments, interpret the resulting data, to design a system, analyses or 3-D conceptual model development of geological engineering problems, to explain the importance of engineering ethics professional licensure and to explain basic concepts in leadership.

In addition, students in worlds' the most developing concept of geological engineering option is free to take geochemistry with laboratory and/or medical geology. For being continuous updating in curriculum and program criteria, we have to catch up with world's leading institutions; that proposal has stalled in the university approval process due to resource concerns in engineering and applied sciences. The program continues to develop the students' abilities to apply engineering to all aspects of geological systems throughout the curriculum.

Relation of Program Criteria to Curricular Topics and Faculty

The program criteria of the Department of Geological Engineering are:

- Ability to be able to apply mathematics through differential equations, calculus based physics, general chemistry, and probability and statistics through applications to geological engineering applications; and sufficient knowledge in the application of these basic sciences to enable design, analyze and examine geological processes consistent with the program educational objectives,

- Proficiency in geological science topics that emphasize understanding of geological principles and processes, the identification of minerals and rocks, elements of geophysics, field geology, and the ability to visualize and solve geological problems of 3-D nature,

- Proficiency in engineering science including statics, properties/strength of materials, geomechanics,

- Ability to apply the principles of geology to design solutions for geological engineering problems, which include one or more of the following considerations: the physical properties of the materials of the earth's crust including hydrogeology, engineering geology; the effects of the processes that form the earth's crust; and the impacts of construction projects, exploration and exploitation of resources, disposal of wastes, and other activities of society on these materials and processes, as appropriate to the program objectives.

The relationships between the Geological Engineering Program Criteria and the Curriculum and the related Department-Faculty interaction are shown in Table 8.1. The Current Curriculum in Geological Engineering Program is listed in Table 8.2.

- The curriculum provides a thorough background in the genesis of magmatic and metamorphic rocks through **JEO 121** Design in Geology and **JEO 131** Introduction to Geological Engineering, and advanced knowledge in **JEO 111** Crystallography, **JEO 211** Mineralogy, **JEO 242** Optical Mineralogy, **JEO 331** Petrography and **JEO 332E** Petrology. Further coverage is provided by **JEO 424** Volcanology.

- In addition, the Geological Engineering includes courses such as **JEO 421E** Geochemistry and elective **JEO 446E** Environmental Geochemistry and **JEO 418** Hydrogeochemistry, which provide advanced knowledge in geochemistry.
- The students are required to take two physics courses: **FIZ 101E** and **FIZ 102E** together with laboratories **101EL** and **102EL** to acquire the knowledge in physics necessary for the courses in the program.

- Fundamental concepts of structural geology is first introduced in **JEO 252E**, **JEO 312** Field Geology is continuation of structural geology, followed by Field Camp, a prerequisite to **JEO 252E** and **JEO 411E** Tectonics, which is dedicated to application of regional tectonics and plate motions and continental drifts.

- Basic principles of equilibrium thermodynamics are covered in **JEO 212** Chemical Equilibrium in Geology, a prerequisite to **KIM 101** General Chemistry. Then, the application of these principles to geological engineering systems, such as high temperature petrology application and phase diagrams, including ternary diagram, multi component phases and chemical equilibrium is studied in **JEO 332E**.

- Engineering geology and hydrogeology are thoroughly covered in a three semester sequence starting with **JEO 222** Geomechanics in the fourth, **JEO 322E** Hydrogeology in the sixth and **JEO 421** Engineering Geology in the seventh semester.

- Continuous set of courses are introduced starting with **JEO 221** Paleontology, **JEO 262E** Stratigraphy and **JEO 341E** Sedimentology. Further coverage is provided by several specialization option electives, e.g., **JEO 438** Environmental Geology, **JEO 445E** Petroleum and Natural Gas Geology, **JEO 447E** Petrology of Sedimentary Rocks, **JEO 334** Subsurface Geology and **JEO 336** Historical Geology.

- A fundamental of mineral deposits is a combination the occurrence of ore deposits, genesis of hydrothermal fluids, exploration techniques, combination with geophysical knowledge's and geochemistry with prerequisite to mineralogy, petrography and petrology courses, as course codes are given at above, which provides in-depth coverage of mining geology.

- **JEO 316** Precious Minerals and Rocks and **JEO 412** Industrial Minerals provide industrial applications almost all natural resources which have been used for centuries by the humankind for the benefit of the society and our civilization. Fundamental principles of industrial minerals, applied mineralogy and geochemistry knowledge are the essential tools.

- Introduction to modern computation techniques starts with **BIL 101E** Introduction to Computation and Information Systems in second semester and **BIL 108E** Introduction to Science and Engineering Computation in third semester continues throughout the program where the students are required to use software such as CORELDRAW, GRAPHICS, MATLAB, EXCEL, and AUTOCAD in several required or elective departmental courses.

-Also relationships between course learning outcomes and the Geological Engineering Program is shown in Table 5.2.

Table 8.1. Relation Of Program Criteria To Curricular Topics And Faculty

Program Criteria	Courses in the Curriculum	Offering Department
1) the ability to apply mathematics including differential equations, calculus-based physics, and chemistry, to geological engineering problems	STA101, JEO222, MUK203, MAT101, MAT102, FIZ101, KIM101, STA101, BIL101E	Mathematics (Science and Letters) Chemistry (Science and Letters) Physics (Science and Letters)
2) proficiency in geological science topics that emphasize geologic processes and the identification of minerals and rocks	JEO325, JEO121, JEO331, JEO421	Geological Engineering (Engineering)
3) the ability to visualize and solve geological problems in three and four dimensions	JEO221, JEO112E, JEO252E, JEO242, JEO332, JEO341E, JEO262E, JEO331, JEO421E, JEO262E, JEO312, JEO411E	Geological Engineering (Engineering)
4) proficiency in the engineering sciences including statics, properties/strength of materials, and geomechanics	JEO423, JEO427, JEO334, BIL102E, MAL201, MUK203	Geological Engineering (Engineering) Materials Engineering
5) the ability to apply principles of geology, elements of geophysics, geological and engineering field methods	JEO329, JEO431E, JEO492, JEO412, JEO435, JEO446E, JEO445E, JEO423, JEO326, JEO338, JEO337, JEO416, JEO418, JEF341	Geological Engineering (Engineering)
6) engineering knowledge to design solutions to geological engineering problems, which will include one or more of the following considerations: the distribution of physical and chemical properties of earth materials, including surface water, ground water (hydrogeology), activities of society on these materials and processes, as appropriate to the program objectives	JEO431E, JEO421, JEO322, JEO 492, JEO262E, JEO411E, JEO321, JEO332E, JEO446E, JEO445E	Geological Engineering (Engineering)

Table 8.2. The Current Curriculum In Geological Engineering Program

Semester	Course	Language (TR/ENG)	Type (TB/TM/ ITB/MT)*	Credit Hours	Lecture	Lab.
1	MAT101 Mathematics 1	TR	TB	5	4	2
1	FIZ101E Physics 1	ENG	TB	4	3	2
1	FIZ101EL Physics 1 Lab	ENG	TB	-	-	-
1	JEO111 Crystallography	TR	TB	2½	2	1
1	STA201 Statics	TR	TM	3	3	0
1	JEO121 Design in Earth Sciences	TR	TM	2	1	2
1	JEO131 Intro. to Geol. Engineering	TR	MT	1	1	0
1	English Course	-	ITB	3	3	0
2	MAT102 Mathematics 2	TR	TB	5	4	2
2	FIZ102E Physics 2	ENG	TB	4	3	2
2	FIZ102EL Physics 2 Lab	ENG	TB	-	-	-
2	KIM101 General Chemistry	TR	TB	4	3	2
2	KIM101 General Chemistry Lab	TR	TB	-	-	-
2	JEO112 General Geology	TR	TB	3	3	0
2	BIL101E Int. to Comput. & Information Systems	ENG	TM	2	1	2
2	English Course	-	ITB	3	3	0

Semester	Course	Language (TR/ENG)	Type (TB/TM/ ITB/MT)*	Credit Hours	Lecture	Lab.
3	MAT201 Differential Equations	TR	TB	4	4	0
3	BIL104E Intro. to Sci & Eng. Computation (C)	ENG	TM	3	2	2
3	MAL201 Material Science	TR	TM	3	3	0
3	MUK203	TR	TM	3	3	0

	Strength of Materials					
3	ING201 English 3		ITB	3	3	0
3	JEO211 Mineralogy	TR	MT	2	1	2
3	JEO221 Paleontology	TR	MT	2½	2	1
4	JEO212 Chemical Equilibrium in Geology	TR	MT	2½	2	1
4	JEO222 Geomechanics	TR	TM	3	2	2
4	JEO 232 Topography	TR	TM	3	2	2
4	JEO242 Optical Mineralogy	TR	MT	2	1	2
4	JEO252E Structural Geology	ENG	MT	2½	2	1
4	JEO262E Stratigraphy	ENG	MT	2	2	0
4	Elective	TR	TB	3	3	0

Semester	Course	Language (TR/ENG)	Type (TB/TM/ ITB/MT)*	Credit Hours	Lecture	Lab.
5	JEF341 Geophysics	TR	TM	3	3	0
5	JEO321 Ore Deposits	TR	MT	3	2	2
5	EKO201 Economics	TR	ITB	3	3	0
5	TUR101 Turkish 1		ITB	2	2	0
5	JEO331 Petrography	TR	MT	2½	2	1
5	JEO341E Sedimentology	TR	MT	2½	2	1
5	Elective	TR/ENG	TM	3	3	0
6	MAT271E Probability and Statistics	ENG	TB	3	3	0
6	TUR102 Turkish 2		ITB	2	2	0
6	JEO312 Field Geology	TR	MT	3	2	2
6	JEO322 Hydrogeology	TR	MT	3½	3	1
6	JEO332E Petrology	ENG	MT	2	2	0
6	Elective	TR	MT	3	3	0
6	Elective	TR	ITB	3	3	0

Semester	Course	Language	Type	Credit	Lecture	Lab.

		(TR/ENG)	(TB/TM/ ITB/MT)*	Hours		
7	ATA101 Principles of Ataturk and Revolutionary History 1	TR	ITB	2	2	0
7	JEO411E Tectonics	ENG	MT	2½	2	1
7	JEO421E Geochemistry	ENG	TM	3	2	2
7	JEO431E Engineering Geology		ITB	3.5	3	1
7	Elective	TR/ENG	MT	3	3	0
7	Elective	TR/ENG	MT	3	3	0
7	Elective	TR/ENG	ITB	3	3	0
8	ATA102 Principles of Ataturk and Revolutionary History 2	TR	ITB	2	2	0
8	JEO412 Industrial Raw Materials	TR	MT	2	1	2
8	JEO492 Graduation Research Project	TR	MT	3	0	6
8	ETK101 Engineering Ethics	TR	MT	1	1	0
8	Elective	ENG	MT	3	3	0
8	Elective	TR	ITB	3	3	0

(TR: Turkish; ENG: English)
TB - Math & Basic Sciences
TM - Basic Engineering
ITB – Human & Social Sciences
MT - Professional Design

APPENDICES

APPENDIX A – COURSE SYLLABI

APPENDIX B – FACULTY VITAE

APPENDIX C – EQUIPMENT

APPENDIX D – INSTITUTIONAL SUMMARY