

Bilkent University



Electrical and Electronics Engineering Department Graduate Handbook

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Latest version is in effect until a new revised document is published

1. Introduction

The purpose of this handbook is to provide the Electrical and Electronics Engineering (referred to as EEE hereafter) Department's graduate program students and candidates of the program with various policies and regulations at the EEE. This document *does not* replace the Graduate Regulations of the Graduate School of Science and Engineering (GSES), which are available (in Turkish) at

http://www.bilkent.edu.tr/bilkent-tr/admin-unit/hukukm/lisansustu_yonetmelik.html,

but is instead complementary. The students of the EEE graduate program and their advisors are required to make sure that the students' progress in the program is in line with the regulations described in the current document in addition to the requirements set forth in the Graduate Regulations of the Institute and compliance to the abovementioned regulations is enforced by the EEE Department chair.

2. Application and Admission to the Degree Programs

The EEE department offers M. S. and Ph. D. degrees.

2.1. M. S. Program

Admission to the M. S. program may be granted in two ways:

- *Direct admission* is granted to qualifying applicants who have completed their B.S. degrees in electrical and electronics engineering or in a closely related program such as computer engineering.
- Admission to the *Deficiency Program* is granted to qualifying applicants whose B.S. or B.A. degrees are from programs whose curricula significantly differ from the EEE undergraduate program. If admitted to the deficiency program, students are required to take at most two semesters of courses from the EEE undergraduate program as recommended by the Department.

All admissions are granted to qualifying candidates based on their previous performance, LES or GRE scores, reference letters, statements of purpose, results of the interview, and the availability of a faculty member who is willing to supervise the applicant's thesis. Scholarships and financial aid are available for qualifying applicants. The application package consists of an application form, transcripts, LES scores for Turkish and GRE scores for international applicants, proof of proficiency in English (e.g. TOEFL score), two letters of reference (names of two faculty members from the department are sufficient for Bilkent EEE graduates), a statement of purpose, and other materials that may additionally be required by the Institute. Applicants will be called for an interview subsequent to the application deadline.

The deadline for submission of the application package to the graduate program for the Fall semester is generally the first week of June. For information on the application package please refer to the GSES web site:

<http://www.bilkent.edu.tr/~mfbe/>

2.2. Ph.D. Program

Students can apply to the Ph.D. program either after obtaining an M.S. degree or directly after obtaining a B.S. degree. All students applying for the Ph.D. program need to submit a proof of proficiency in English (e.g. TOEFL, ÜDS, KPDS, IELTS scores). Students who received a B.S. or M.S. degree from an institution in a country where the official language is English are not required to take these exams provided that their degrees are certified by YÖK. The minimum requirements for English proficiency can be found at

<http://www.bilkent.edu.tr/~mfbe/>

2.2.1. Doctor of Philosophy (Direct)

This option is offered to outstanding applicants upon the completion of a B. S. degree in electrical and electronics engineering or in a closely related program. Application criteria and procedure for direct admission to the Ph.D. program are the same as those of the M.S. program but the admission criteria are up scaled.

2.2.2. Doctor of Philosophy (with M.S. degree)

Applicants must have an M.S. degree in electrical and electronics engineering or in a closely related field. All other admission requirements are the same as those of the M.S. program from applicants whose M.S. degrees are not from EEE Department. All students applying from outside should follow the graduate admission process

<http://www.bilkent.edu.tr/~mfbe/>

Students who graduated from EEE Department are admitted (upon the student's will) to the Ph.D. program provided that an EEE faculty accepts to supervise the student.

Note. Admission as a *Special Student* may be granted under special circumstances only to outstanding applicants who are well above most of the admission requirements but not necessarily all.

3. Course Requirements

3.1. Areas and Basic Courses

An “area” is defined to be one of the following fields for which there is teaching and research emphasis at the EEE Department:

1. Electronics
2. Signal Processing
3. Waves
4. Optics and Photonics
5. System Theory and Control
6. Telecommunications
7. Computer Engineering/Networks
8. Biomedical Engineering
9. Nanotechnology
10. Robotics

A single course is designated as the “basic course” of the associated area. The designated “basic courses” are provided in Table 1.

Area	Basic Course
Electronics	EEE 511 Telecommunication Electronics
Signal Processing	EEE 525 Advanced Signal Processing
Waves	EEE 603 Advanced Electromagnetic Theory I
Optics and Photonics	EEE 528 Optics
System Theory and Control	EEE 501 Linear System Theory
Telecommunications	EEE 533 Random Processes
Computer Engineering/Networks	EEE 538 Communication Network Analysis
Biomedical Engineering	EEE 581 Biomedical Signals and Instrumentation
Nanotechnology	EEE 560 Nanoengineering and Nanodevices
Robotics	EEE 547 Robotics and Sensing

Table 1 Areas and basic courses for each area.

3.2. MS Degree Course Requirements

The passing (satisfactory) grade for a course is “C” for M. S. students. A course with an unsatisfactory grade must be repeated. Additionally, for satisfactory performance, the semester GPA **must** be at least 2.5 for M. S. students. A student having a GPA below the required level for satisfactory performance is put into *probation* status for that semester. Students with two consecutive probation semesters are dismissed from the program. To graduate from the M. S. program, the student must have a cumulative GPA of at least 3.00 in the required coursework.

All the following course requirements **should** be met. Students are expected to take courses from the four groups listed below:

1. At least 3 course from the list of basic courses given above
2. At least 3 courses from the list of restricted elective courses defined below
3. At least 2 courses from the list of free elective courses defined below
4. EEE 591 seminar course.

Additionally students are expected to take EEE 599 and GE 590 courses within the general rules of the Graduate School of Engineering and Science (GSES).

The list of restricted elective courses:

All 5xx and 6xx numbered 3 credit courses in EEE, CS, IE, ME, PHYS and MSN551.

Free elective courses:

All 5xx and 6xx numbered 3 credit courses in the GSES.

Special Cases:

- i. A student can replace a basic course with a restricted elective course if he/she has already taken this course and passed with a grade of B or better (including EEE4xx/5xx coded basic courses) during his/her BS studies.
- ii. A 4xx coded course within the Faculty of Engineering or Faculty of Science can be taken to replace a free elective (subject to the approval by the advisor and the program chair).
- iii. All basic courses must be taken at Bilkent University.
- iv. All graduate courses offered at Bilkent University, including those outside of the GSES, can be taken free electives subject to approval by the advisor, program chair and GSES.

The normal duration of the M. S. study is 4 semesters but an extension of up to two semesters might be granted by the Institute based on the advisor's request. However, the required coursework **must** be completed in 4 semesters.

3.3. PhD Degree Course Requirements for those who hold an MS degree

The passing (satisfactory) grade for a course is "B" for Ph. D. students. A course with an unsatisfactory grade must be repeated. Additionally, for satisfactory performance, the semester GPA **must** be at least 3.0 for Ph. D. students. A student having a GPA below the required level for satisfactory performance is put into *probation* status for that semester. Students with two consecutive probation semesters are dismissed from the program.

In addition, all the following course requirements should be met. Students are expected to take courses from the four groups listed below:

1. At least 1 course from the list of basic courses given below
2. At least 2 courses from the list of restricted elective courses defined below
3. At least 5 courses from the list of free elective courses defined below
4. EEE 592 seminar course

Additionally students are expected to take EEE 699 and GE 690 courses within the general rules of the Graduate School of Engineering and Science (GSES).

The list of basic courses:

EEE 511, EEE 525, EEE 603, EEE 528, EEE 501, EEE 533, EEE 538, EEE 581, EEE 560, EEE 547.

The list of restricted elective courses:

All 5xx and 6xx numbered 3 credit courses in EEE, CS, IE, ME, PHYS and MSN551.

Free elective courses:

All 5xx and 6xx numbered 3 credit courses in the GSES.

Spacial Cases

- i. A student can replace the basic course with a restricted elective course if he/she has already taken 4 basic courses and passed all of them with a grade of B or better (including EEE4xx/5xx coded basic courses) during BS and MS studies.
- ii. All basic courses must be taken at Bilkent University.
- iii. All graduate courses offered at Bilkent University, including those outside of the GSES, can be taken free electives subject to approval by the advisor, program chair and GSES.

The required coursework for Ph. D. students **admitted with M. S. degrees must** be completed within the first 4 semesters. The normal duration for this program is 8 semesters (excluding the time spent in deficiency program). Under special circumstances, GSES may grant up to 4 semesters of extension based on the advisor's request.

3.4. Course Requirements for direct PhD (for those who hold a BS degree)

The passing (satisfactory) grade for a course is "B" for Ph. D. students. A course with an unsatisfactory grade must be repeated. Additionally, for satisfactory performance, the semester GPA **must** be at least 3.0 for Ph. D. students. A student having a GPA below the required level for satisfactory performance is put into *probation* status for that semester. Students with two consecutive probation semesters are dismissed from the program.

In addition, all the following course requirements should be met. Students are expected to take courses from the four groups listed below:

1. At least 4 course from the list of basic courses given below
2. At least 5 courses from the list of restricted elective courses defined below
3. At least 7 courses from the list of free elective courses defined below
4. EEE 591 and EE592 seminar courses.

Additionally students are expected to take EEE 699 and GE 690 courses within the general rules of the Graduate School of Engineering and Science (GSES).

The list of basic courses:

EEE 511, EEE 525, EEE 603, EEE 528, EEE 501, EEE 533, EEE 538, EEE 581, EEE 560, EEE 547.

The list of restricted elective courses:

All 5xx and 6xx numbered 3 credit courses in EEE, CS, IE, ME, PHYS and MSN551.

Free elective courses:

All 5xx and 6xx numbered 3 credit courses in the GSES.

Spacial Cases

- i. A student can replace a basic course with a restricted elective course if he/she has already taken this course and passed with a grade of B or better (including EEE4xx/5xx coded basic courses) during his/her BS studies.
- ii. All basic courses must be taken at Bilkent University.
- iii. All graduate courses offered at Bilkent University, including those outside of the GSES, can be taken free electives subject to approval by the advisor, program chair and GSES.

The required coursework for direct Ph. D. students **must** be completed within the first 6 semesters. The normal duration for the direct Ph. D. program is 10 semesters (excluding the time spent in deficiency program). Under special circumstances, GSES may grant up to 4 semesters of extension based on the advisor's request.

4. Deficiency Program

Graduate students accepted to the deficiency program are required to take one or two semesters of courses, as necessary, from the undergraduate EEE program. The courses to be taken are initially decided by the advisor, revised as necessary by the EEE Graduate Committee, and approved by GSES.

Time spent in the deficiency program cannot exceed two semesters and will not count towards the duration requirements of the specific graduate program it precedes. A number of graduate courses may also be taken in the deficiency program with the Department's permission and GSES's approval, in which case, these courses will count towards degree requirements. The student must have a GPA of at least 3.00 and not receive an "F" grade in any of the courses taken during the deficiency program.

5. Ph. D. Qualifying Exam

Students accepted to the EEE Ph. D. program with an M. S. degree and those accepted with B.S. degrees (i.e., direct doctoral program) should take and pass the qualifying exam in four and six semesters, respectively, after admission into the EEE graduate program. For a student to be eligible to take the qualifying exam, he/she should provide proof of proficiency in English. This condition is fulfilled if the student scores

- at least 80 points in ÜDS, or
- at least 80 points in KPDS, or
- at least 213 points in TOEFL, or
- at least 6.5 points in IELTS.

The exam scores are considered valid if taken within the last two calendar years. The procedure for the qualifying exam is as follows:

1. A candidate for the Ph. D. Program applies for the Ph. D. qualifying exam by filling in Form I within the first four (six) semesters for the Ph. D. program (direct Ph. D. program), by the application deadline announced by the EEE Department.
2. The qualifying exam consists of a written and an oral part, referred to as Ph.D. written exam and Ph.D. oral exam, respectively. The examination is administered by the *PhD Qualifying Examination Committee*.
3. A Ph. D. written exam is given once every semester. The candidate answers five of the seven questions in the written exam and the written exam is evaluated by the faculty members who prepare the corresponding questions and the pass-fail decision is taken by the PhD Qualifying Examination Committee. If the student fails the written examination, he/she must take the written exam the following semester. If a student fails twice the written part of the qualifying examination then the student is dismissed from the Ph. D. program.
4. For each student who passed the written examination, the oral exam is given within two to six weeks of the announcement of the written exam result. The PhD Qualifying Examination Committee assigns an oral exam jury consisting of five faculty members whose expertise are in the candidate's intended field of Ph.D. study as indicated in Form I. One member of the oral exam jury is selected from outside the EEE Department. At the end of the oral examination, jury members forward their scores and comments to the PhD Qualifying Examination Committee, and then the committee meets and takes pass-fail decision within three days of the oral examination.
5. The Oral Exam consists of two parts:
 - (optional) brief presentation by the candidate of his/her M. S. Thesis,
 - oral examination of the candidate on
 - general topics of fundamental significance to electrical engineering, and
 - specific topics on or close to the candidate's intended field of Ph. D. study.
6. The final decision to qualify the candidate or not resides fully within the authority of the PhD Qualifying Examination Committee.
7. A candidate failing the Ph. D. oral exam must re-take the oral exam the following semester. If a student cannot pass the written and oral examination in the second attempt, then the student is dismissed from the PhD program.
8. The committee may recommend the student to take a number of courses. In cases where additional coursework is needed beyond the course requirement set, the committee may recommend for extension of up to two semesters for completion of the coursework.

6. Thesis/Dissertation

6.1. Advisor

Each student in the graduate program is assigned to a faculty member who will guide the student through the program as well as supervise his/her thesis or dissertation. The initial assignment is primarily based on shared research interests between the faculty member and the student as well as willingness for collaborative work. It is possible to change the advisor later if such a need arises. In such cases, a written request letter should be submitted to the department for advisor change and this request is to be approved by the Department head.

6.2. M. S. Thesis

An M. S. student who has completed his/her thesis work must defend the thesis. The jury consists of 3 or 5 faculty members. One of the members should be the advisor and one should be from outside the EEE Department. The jury may find the thesis satisfactory or may reject the thesis. The jury may also ask for a revision in which case the revised thesis must be defended in front of the same jury within 3 months.

6.3. Ph. D. Thesis Monitoring Committee

Within a month after the qualifying exam, a Ph. D. Thesis monitoring committee is formed to monitor the progress of the thesis upon the recommendation of the Department chair and the approval of the Institute. This committee has 3 members; the thesis advisor, a faculty from the EEE department who works in a related field and a faculty outside the EEE department.

6.4. Ph. D. Thesis Proposal Defense

Within six months of passing the Ph. D. qualifying exam, the candidate defends a Ph. D. thesis research proposal including the goal, scope, methods, and preliminary results (if available) of his/her planned Ph. D. thesis research work in front of the Ph. D. thesis monitoring committee. A written report for the research proposal needs to be provided fifteen days before the proposal defense. The committee decides to accept or reject the proposal. Students whose research proposals are rejected either have to defend their research proposal with the same advisor within three months or with another advisor and with a different research proposal within the next six months. In the latter case, a new Ph. D. thesis monitoring committee may be formed. A student failing in both cases is dismissed from the program.

6.5. Ph. D. Thesis Monitoring

Subsequent to the acceptance of the student's research proposal, the Ph. D. thesis monitoring committee starts meeting every 6 months: once in the January-June, and once in the August-December time frames. The student reports his/her progress thus far and presents a work plan for the subsequent year. The committee finds the progress either satisfactory or unsatisfactory. The student is dismissed from the program if his/her progress is found unsatisfactory either for two consecutive semesters or for three non-consecutive semesters.

6.6. Ph. D. Thesis Defense

A candidate that is successful in the Ph. D. thesis proposal defense may defend his/her thesis after at least one semester. The thesis is to be defended in front of a Ph. D. thesis defense jury consisting of 5 members in the candidate's field of study, one from outside the Department and one from outside Bilkent University and including the three members of the thesis monitoring committee. All candidates are required to have (co-) authored at least one journal publication in the topic of their thesis in an SCI listed journal approved by the Provost Office of Bilkent University before defending their thesis work. A candidate submits copies of his/her thesis at least two weeks before the defense date to Jury members. The Institute announces the defense time and date and keeps a copy of the thesis for inspection of any interested faculty member. The Jury takes its decision of accepting or rejecting the thesis by a majority vote. The Jury may also require a major revision in the thesis that should be completed by the candidate in at most six months and defended before the same Jury. A candidate's study is terminated when he/she is unable to successfully defend a thesis.

6.7. How to Write Thesis

The thesis (M. S. or Ph. D.) should be written according to the guidelines provided in

www.ee.bilkent.edu.tr/thesis/

along with templates for LATEX 2e and WORD. For preparation of thesis and dissertation work, students are encouraged to use LATEX together with the style files that are provided by Bilkent University.

7. Financial Assistance

Currently over 95% of the graduate students in the Department as well as in the Graduate School of Engineering and Science receive financial support. Financial assistance is provided in the form of a tuition waiver or a tuition waiver plus a monthly stipend. The Graduate Scholarship Committee (GSC) regulates the Programme's rules of financial support. GSC is a standing committee of the Department appointed by the Department head. The GSC sets forth policies, criteria, and procedures for all graduate scholarships in the Department.

7.1. Graduate Scholarships

The Department may grant its graduate students tuition waiver and/or stipend as scholarship. There are four basic types of scholarships:

- half tuition waiver
- full tuition waiver
- full tuition waiver + half stipend
- full tuition waiver + full stipend

In addition, the Department may grant on-campus lodging as part of a scholarship. Upon request, the Department provides private health care benefits to graduate students receiving half or full stipend scholarships. All new students admitted for

graduate study are considered for scholarship. The Department makes the final decision on what type of scholarship, if any, each student is offered.

7.2. Graduate Scholarship Rules and Expectations

Graduate students receiving scholarships (in the form of a monthly stipend and/or tuition waiver) from our department, through externally funded projects or internal funds, may have the following duties:

teaching assistantship (TA duties),

research assistantship (RA duties),

departmental service and other possible duties in professional societies.

Additionally, they are expected to complete the course requirements in a timely manner and prepare their thesis, which is part of the degree requirements.

Although most of our current students are receiving tuition waiver, this is not automatic. The tuition waiver status of the students is determined by the graduate scholarship committee, with the approval of the Institute of Engineering and Science.

All graduate students are expected to spend 1040 hours per year to course work (including thesis preparation). For the scholarship students, course performances are evaluated by the graduate scholarship committee in their biannual meetings to determine the continuation or termination of the tuition waiver status.

Teaching assistantship is assigned to all graduate students in the department receiving scholarship. Although it is not listed as a graduate degree requirement, teaching assistantship is an important component of a graduate education: teaching methods are learned from the instructor who is an experienced faculty member. The teaching assistantship load is adjusted yearly so that it will not be more than 320 hours per year per TA. The graduate scholarship committee evaluates the students' teaching performance in their biannual meetings and determines the tuition waiver status.

The graduate students on scholarships are expected to spend 100 hours per year for department service. The service duties may include tasks related with undergraduate education such as laboratory management and proctoring in the examinations. Department believes that these duties are also part of graduate education. Students are expected to be good citizens, to take responsibility and understand tasks in the academic environment. The student's service performance is another factor in the evaluation of the tuition waiver status.

Another important component of the graduate education is research assistantship. Therefore, the department encourages graduate students to work as RAs whenever an appropriate opportunity arises. The scholarship students receiving monthly stipend, in addition to tuition waiver, are expected to work as research assistants. The RAs are expected to work on their research projects 620 hours/year. This work is an essential part of the graduate scholarship program and the student's stipend is primarily determined by the performance shown in this task.