BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
Doctoral School of Electrical Engineering Sciences
Training Plan
2024

I. BACKGROUND

Pursuant to Act CCIV of 2011 on National Higher Education and its amendment, Act CXXXI of 2015, the main framework of doctoral education from 1 September 2016 is as follows:

- The doctoral programme comprises 8 semesters.
- The number of credits required for the absolutorium is 240.
- The programme has two stages:
  (i) the first, a 4-semester "training and research phase", based primarily on contact hours;
  (ii) the second, also a 4-semester "research and dissertation phase", at the end of which the actual award of the doctoral degree takes place. During this period the student can deepen their knowledge in the research field and pursue the scientific activity that underpins the dissertation.
- At the end of the 4th semester, passing the comprehensive examination (screening) is mandatory; depending on the result, the State Scholarship may be withdrawn and the programme may be terminated. After the screening to be completed at the end of the 4th semester, the completed dissertation must be submitted within 3 years. This deadline may be extended by an additional 1 year on equitable grounds.
- A student may remain in student status for only 8 semesters (with 2 passive semesters possible).
- Doctoral education may also be entered by a person who has individually prepared for the degree, provided that they have fulfilled the admission and doctoral training requirements. In this case, the student relationship is established upon acceptance of the application for the degree procedure and successful completion of the comprehensive examination.

II. PROFESSIONAL COMPETENCES TO BE ACQUIRED

An electrical engineer holding a PhD degree

a) knowledge

Interprets and handles, in a creative manner, the specific mathematical, natural science and social science principles, rules, relationships and procedures required for practicing the technical field. Creatively interprets the expected directions of development of the technical field. Creatively interprets the boundaries, requirements and expected directions of development of other fields related to the technical discipline (e.g. logistics, management, environmental protection, quality assurance, information technology, legal, economic, occupational safety, fire protection and security fields). Possesses the research methodology knowledge necessary for independent research in the technical field. Is familiar with modern teaching methods in higher education.

b) abilities

Applies mathematical and natural science principles, rules, relationships and procedures innovatively in order to extend the community's knowledge with new elements. Is capable of conducting research in the field, solving specific emerging problems, and creating and applying new interdisciplinary methods. In research work, is able to organize and lead the work of interdisciplinary research groups. In the given scientific field, is capable of creating and gaining recognition for new research techniques and approaches. Is able to apply ICT tools and methods creatively to solve technical problems. Is able to contribute to teaching tasks in higher education within the field.

c) attitude

Committed to and critical of professional and technological development and innovation in the technical field. Proactive and critical in developing new methods and tools related to the technical field. Committed to quality requirements.

d) autonomy and responsibility

Solves engineering problems creatively. Assumes a leading role in solving technical processes and problems. Participates in professional cooperation in a leading capacity. Creatively initiates research in new areas of knowledge. Participates as an equal discussion partner in professional exchanges with experts from neighbouring fields. Assumes responsibility for the entire system of activities under their direction.

III. COMPONENTS OF THE PHD PROGRAMME

Independent research activity carried out in topics announced by the doctoral school constitutes the most important part of doctoral education. Each doctoral student has one and only one supervisor, who directs and supports, with full responsibility, the student's studies, research work, publication of results and preparation of the dissertation. Dual supervision involving a co-supervisor is permitted only in the case of training carried out within an international cooperation framework or an interdisciplinary topic, on the basis of a topic announcement accepted by the Doctoral School Council (DIT) and approved in advance by the University Habilitation Committee and Doctoral Council (EHBDT). In the case of external supervision based on an agreement with the Doctoral School, the DIT appoints an internal consultant who assists the supervisor on behalf of the University and monitors the student's professional progress.

During the doctoral programme, in addition to doctoral courses announced for the given semester, students may choose MSc or PhD courses, including those offered by another university, which are accepted and recognized for credit by the Doctoral School Council. The range of courses is further broadened by lectures delivered in English by invited speakers in each semester. Credits earned for courses are concentrated in the first 4 semesters of the two-stage programme. International activities and related skill-building efforts are also recognized during the programme; study credits may be awarded for participation in

international intensive courses or thematic summer schools (or winter schools), provided that participation is certified and supported by the supervisor.

Guided teaching is part of the programme, during which the student develops presentation and communication skills under the supervision of a designated instructor. The course and the associated credits are designated - in consultation with the supervisor - by the head of the supervisor's/consultant's department; completion is accepted and graded by the head of department based on the recommendation of the course coordinator. Teaching activity exceeding the amount prescribed in the doctoral programme must be remunerated in accordance with Section 179 of the BME Study and Examination Regulations.

The tutorial nature of the programme is emphasized by regular consultations recognized with credit points, as well as support for research and publication activity. Each semester, the supervisor evaluates the student's preparedness and activity shown in consultations with research and publication credits. The proposed credit for research work recognizes proportionate progress in the doctoral topic. Publication credit may be awarded for publishing new results in international journals or presenting them at international conferences, including preparatory work (i.e. acceptance/publication of the paper is not required). The annual evaluation of research performance includes presenting the results achieved during the reporting period in a lecture given on a professional day organized by the research laboratories operating in the departments.

IV. MODEL CURRICULUM

PhD model curriculum									
Course	Total contact hours/credits	Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
Elective course 1	4/5	4/5							
Elective course 2	4/5	4/5							
Elective course 3	4/5		4/5						
Elective course 4	4/5		4/5						
Elective course 5	4/5			4/5					
Elective course 6	4/5			4/5					
Teaching activity	24/30	4/5	4/5	4/5	4/5	4/5	4/5		
Research	96/120	8/10	8/10	8/10	12/15	12/15	16/20	16/20	16/20

Publication	48/60	4/5	4/5	4/5	8/10	8/10	4/5	8/10	8/10
Total:	***192/240***	***24/30***	***24/30***	***24/30***	***24/30***	***24/30***	***24/30***	***24/30***	***24/30***

It is recommended that the credits earned for course attendance be concentrated in the first 4 semesters. The last 4 semesters should focus on research and intensive publishing.

Training credits

According to the model curriculum, 30 training credits must be earned by completing courses, taking into account the following:

- 2 courses, totaling 10 credits, must be discipline-based foundation courses belonging to two different professional blocks. The professional blocks and the courses assigned to them are available on the doctoral school's website.
- In addition to the discipline-based foundation courses, at least a further 10 credits must be completed from doctoral courses aligned with the doctoral research topic. For courses offered outside the faculty, approval by the DIT is required.
- Non-professional courses aimed at research methodology or other soft-skill development may be taken up to a maximum of 5 credits; no DIT approval is required for these.
- Up to 5 credits may be earned through an individually designed course with independent preparation. The application to be submitted to the DIT must include the number of credits, the syllabus prepared by the doctoral student's supervisor, and the literature to be covered. If supported by the DIT, the doctoral student prepares independently for the end-of-semester examination, which is taken before the supervisor and a DIT-appointed member.

Beyond the two discipline-based courses and the two doctoral courses, credits may also be earned from the course offerings of other doctoral schools (without credit limit), from professional courses announced in master's programmes (up to 10 credits), or by completing summer/winter schools (up to 5 credits). DIT approval is required to take such courses. Credit recognition may also be requested for courses previously completed during a master's programme if these credits were earned in excess of the number required for issuing the master's degree.

The language of the doctoral school's courses is English. With the agreement of the students and the instructor, classes may also be held in Hungarian.

Research activity

The programme has a tutorial character. For this reason, within research activity, 'supervisory consultation' (preparation for it and the activity shown there) is recognized with credit points. Most research credits recognize research work, but this category may also include conference/workshop participation, study visits, institute visits, etc.

Publication activity

The objective is that by earning publication credits, the minimum requirements of the VIK Doctoral School of Electrical Engineering are automatically fulfilled. This must occur in two steps:

- at the end of the fourth semester, the total publication credits for the first 4 semesters (25 credits) may only be obtained if the doctoral student has fulfilled at least half of the minimum publication requirements necessary for obtaining the degree;
- at the end of the eighth semester, the total publication credits for all 8 semesters (60 credits) may only be obtained if the doctoral student has fully met the minimum publication requirements necessary for initiating the degree procedure.

Publication activity credits may not be split. To ensure continuous progress from the publication perspective, it is recommended that credits be earned according to the following criteria:

- The publication credit for semester 1 is awarded if the student already has any published publication, or by the end of the semester has at least a draft of one foreign-language conference or journal paper.
- The publication credit for semester 2 is awarded if the student already has any published publication, or by the end of the semester has at least one submitted foreign-language conference or journal paper.
- The publication credit for semester 3 is awarded if the student has at least one already published foreign-language conference or journal publication.
- The publication credit for semester 4 is awarded if the student has at least one already published foreign-language conference or journal publication and at least one submitted WoS- or Scopus-indexed journal paper. At the same time, the candidate has obtained at least half of the minimum publication points required for the doctoral degree.
- The publication credit for semester 5 is awarded if the student has at least one already published foreign-language conference or journal publication, has at least one submitted WoS- or Scopus-indexed journal paper, and has a draft of an additional conference or journal paper.
- The publication credit for semester 6 is awarded if the student has at least one already published foreign-language conference publication and one WoS- or Scopus-indexed journal publication, and has at least one additional submitted foreign-language refereed journal paper and one additional submitted conference paper.
- The publication credit for semester 7 is awarded if the student has at least one already published foreign-language conference publication and one WoS- or Scopus-indexed journal publication, and has at least one additional submitted foreign-language refereed journal paper.
- The publication credit for semester 8 is awarded if, from the publication perspective, the student has obtained at least the minimum points required to initiate the degree procedure.

Verification of the criteria for publication credits and the awarding of credit points are the responsibility of the supervisor.

V. PROVISIONS AFFECTING STUDENT STATUS

The doctoral student's status is terminated if, in an active semester, they do not earn at least 15 credits (BME TVSZ Section 186 (2)).
A state-scholarship student who does not earn at least 20 credits in an active semester may, by decision of the dean based on the proposal of the DIT, be reclassified to self-financed training (BME DHSZ Section 13 (8)).
Students participating in self-financed training may, upon request and with the supportive opinion of the DIT, be reclassified to state-scholarship status (details: BME DHSZ Section 13 (8)).
If a student submits their doctoral dissertation at any time during the second stage of training and the Habilitation Committee and Doctoral Council (HBDT) admits it to the review procedure, the research and publication credits for the semester are recognized on the date of the HBDT decision. A student who thereby fulfils all the study and examination requirements prescribed in the curriculum and completes the required 240 credits obtains the absolutorium on the date of the HBDT decision, while their student status - and, in the case of a scholarship holder, scholarship entitlement - remains until the last day of the semester (Act CCIV of 2011, Section 59 (1) d)).

VI. COMPREHENSIVE EXAMINATION

1. General information – EHBDT recommendation

A prerequisite for admission to the comprehensive examination is the completion of at least 120 credits during the first four semesters of doctoral training and the acquisition of all 'training credits' prescribed in the doctoral school's training plan (except for those who prepared individually for the doctoral degree, whose student status is established upon applying for and being admitted to the comprehensive examination).

The comprehensive examination must be taken publicly before a committee. The examination committee consists of at least three members, at least one third of whom are not employed by the institution operating the doctoral school. The chair of the examination committee is a full professor, Professor Emeritus, or a faculty member/researcher holding the title Doctor of the Hungarian Academy of Sciences. All members of the committee hold a scientific degree. The supervisor is a non-voting member of the committee. At least one week before the examination, the supervisor sends the chair of the committee an electronic evaluation of the student's performance.

The comprehensive examination consists of two parts: in one part the theoretical preparedness of the examinee is assessed ("theoretical part"), and in the other part the examinee reports on their scientific progress ("dissertation part").

In the theoretical part of the comprehensive examination, the examinee is examined from two professional blocks. The list of courses belonging to the professional blocks and the comprehensive examination topics are available on the doctoral school's website.

In the second part of the comprehensive examination, the examinee gives a presentation on

their literature knowledge, reports on research results, presents the research plan for the second phase of doctoral training, and the schedule for completing the dissertation and publishing the results. In the presentation, the examinee addresses the scientific significance and innovation content of the results and - where relevant - the technological motivations of the research and the practical applicability of the results. At least one week before the examination, the examinee submits electronically to the committee a brief summary of the results achieved so far, as well as the papers submitted for publication and/or already published.

The members of the examination committee assess the theoretical and dissertation parts separately. The comprehensive examination is successful if the majority of the committee members deem both parts successful. The doctoral candidate may repeat the unsuccessful theoretical part once within the same examination period.

Minutes containing a written evaluation are prepared on the comprehensive examination. The result of the examination must be announced on the day of the oral examination.

The result of the comprehensive examination does not count toward the final classification of the doctoral degree, but successful completion is a prerequisite for entering the second phase of the programme.

2. Faculty implementation – structure of the comprehensive screening examination

2.1. Conditions for admission to the comprehensive screening examination (hereinafter: Examination), as set out in the training plans of the doctoral schools, are as follows:

- Admission to the comprehensive examination is decided by the DIT. The credit requirement for admission is the completion of at least 120 credits in the first four semesters of doctoral training (hereinafter: Training) and all course credits prescribed in the model curriculum of the doctoral school (except for those who prepared individually for the doctoral degree, whose student status is established upon application for and acceptance to the Examination).
- The publication requirement for admission to the Examination is at least one scientific paper published in, accepted by, or submitted to a journal indexed in the "Web of Science" or Scopus database, and at least one scientific paper published in, accepted by, or submitted to a conference with full-paper review. Formal fulfilment of the condition does not in itself guarantee admission; the DIT substantively examines the level of publication of the new scientific results and the candidate's contribution to the published results. The DIT records and justifies admission to the examination or its rejection in the minutes.
- Both parts of the comprehensive examination ("course" and "thesis" examination) are taken by the student on the same occasion before a committee of the same composition.

2.2. Courses/subjects to be chosen for the comprehensive examination

Given the discipline-group-based nature of doctoral training, the possible examination syllabi are linked to so-called Professional Blocks (SZB). Each SZB contains the subjects of one overarching professional field (minimum 3, maximum 5 subjects). Each SZB has an examination syllabus consisting of 36 to 60 points and a recommended reading list to

support preparation.

Since the SZBs contain the integration of several subjects, the candidate needs to select only 12 topic areas out of the (maximum) 60 when applying for the examination. For example, if someone has studied only one of the subjects included in the SZB, they select only the 12 topics related to that subject. If, however, the candidate has completed several subjects within the given SZB, they have greater freedom in choosing 12 topics according to their own interests for preparation.

In order to verify the comprehensive nature of the candidate's knowledge, candidates must select 12 topics from each of two SZBs.

The list of SZBs and the related subjects is available on the doctoral school's website. Since students have completed at least two of the subjects making up the SZBs before the comprehensive examination, they are able to prepare with an appropriate background knowledge, as they have already acquired the knowledge covering the selected part of the examination syllabi by completing those subjects.

2.3. Content elements of the examination and the method of evaluation:

The requirements regarding the composition of the examination committee are contained in the training plan.

Elements and scoring of the course examination

The candidate takes an examination before the examination committee based on syllabi containing 12 selected elements from each of 2 Professional Blocks. Each member of the examination committee evaluates the answers given from the Professional Blocks separately on a scale from 1 to 5 (at least 70% is required).

Criteria and scoring of the "thesis examination"

- On the basis of the literature of the topic, describe the results achieved so far in the field where the research was carried out and the open questions.
- Formulate the theses/results you have achieved so far in your research work (or whose achievement will take place within the next 1 year) (at least two such results).
- Summarize the content of your publications to date and explain what publications you plan in the future.
- Present your plans, tasks and schedule for completing the dissertation for the next two years.

Suggested scoring of the thesis examination:

- Doctoral studies (max. 30 points):
    - (earned credits/90) * (grade average/5) * 30, or max. 30 points if this would exceed 30 points (not only grades but also completion of the credits according to the model curriculum are taken into account).
- Publication performance (max. 40 points):
    - For published publications: (points received according to doctoral scoring / 6) * 40, or max. 40 points if this would exceed 40 points.

- If someone did not reach 40 points in the previous item but already has an accepted publication, then they may bring at most one already submitted but not yet accepted publication, with proof of submission):
    - (points received according to doctoral scoring for all publications (published + submitted)) / 2 * 30, or max. 30 points if this would exceed 30 points.

- Knowledge of the topic and formulation of theses based on the oral presentation (max. 30 points)

The comprehensive examination is successful if all of the following conditions are met:

- The candidate has received at least 15 points for doctoral studies.
- In each of the two subjects, the average of the points received in the examination reaches 3.5.
- The candidate has achieved at least 20 points in the part 'knowledge of the topic and formulation of theses based on the oral presentation'.
- The candidate has achieved at least 15 points in the Publication Performance part.
- The total score of the thesis examination exceeds 50 points.

2.4. Application for the examination and the method of conduct

Before applying, it is definitely advisable to consult the supervisor on the selected Professional Blocks and syllabi, as well as the background materials for the thesis examination.

The screening examination must be applied for in the second year after the start of doctoral studies (for studies starting in September, no later than 15 May, and for studies starting in February, no later than 6 December) by submitting an application to the Doctoral Council together with the uploaded materials (see the list of materials related to the application below). The application form is available electronically on the faculty website.

The following information must be provided and attached to the application:

- all publications published to date (if any) must be entered into MTMT,
- all publications must be uploaded to the webpage available on the website (those already published, those submitted, any acceptance notifications received in the meantime, or those already completed but not yet submitted),
- a brief thesis-booklet-style summary of the results achieved so far (approximately max. 4-5 pages, following the structure: background – objectives – new scientific results – publications),
- the list of the two selected Professional Blocks and the 12-12 selected syllabus elements from them,
- a brief summary (max. 1 page) by the supervisor about the applicant's work

The Doctoral Council decides on the designation of the examination committee related to the

student's research topic and course examination, and the student and the supervisor are notified accordingly.

The date of the examination is determined by the Doctoral Council (holding further consultation with the applicant if justified); the Dean's Office sends notification of the date to the persons concerned.

The supervisor is invited to the examination but is not a voting member of the examination committee.

Budapest, 25 April 2024