Pázmány Péter Catholic University

Roska Tamás Doctoral School of Sciences and Technology

TRAINING PLAN[1]

2026

Effective: April 1, 2026 (Approved by: University Doctoral and Habilitation Council; Resolution No. 31/2026 (III.17.))

Planned review: 2027

[1] Provisional translation. In case of dispute, the Hungarian text shall prevail.

I. Introduction, principles of doctoral education at the Roska Tamás Doctoral School of Sciences and Technology (hereinafter: RTMTDI)

The doctoral school's training plan is consistent with the provisions of the PPKE's university-level quality assurance documents regarding doctoral training, and it utilizes the tools and methods specified in the doctoral school's quality assurance plan, utilizing the tools and methods specified therein to continuously ensure the quality of the program and—where internal and external circumstances permit—to raise its standards.

In accordance with our mission statement and best practices, we place great emphasis on the following principles in our doctoral program:

· **Multidisciplinarity**: Our doctoral program encompasses three classical disciplines (biology, electrical engineering, and computer science). We consider it important

that our students approach these fields with an open mind, able to organize, further develop, and demonstrate their applications in a way that highlights their findings and interconnections.

· **Individual study programs**: We aim to provide supervisors with the greatest possible flexibility in designing students' individual study plans. This naturally also emphasizes the supervisor's responsibility.

· **Priority of research work**: We consider the primary goal of the doctoral program to be equipping doctoral students with the ability to conduct independent scientific research. Accordingly,

we motivate and reward successful research work, as well as the preparation and publication of high-quality scientific papers related to it.

· **International and domestic integration**: The quality of the program is also defined by our existing international partnerships, which involve close collaboration with the University of Notre Dame in Indiana, the Catholic University of Leuven, the University of Seville, the University of Bordeaux, the Autonomous University of Madrid, and the IFOM Institute in Milan, as well as with approximately ten other laboratories, through joint work and project-level collaborations. In addition, we collaborate intensively

with the ELKH KOKI, SZTAKI, TTK, and MFA institutes, as well as the OIKI and Semmelweis University, whose faculty, researchers, thesis advisors, and laboratory

capacities support high-quality doctoral training and the pursuit of world-class research topics for PPKE doctoral students as well.

· **The Unity of Education and Research**: We support training activities for the next generation related to the doctoral school's research topics (incorporating cutting-edge topics and results into BSc/MSc education and thesis supervision), as well as efforts to promote the institution and popularize science.

II. RTMTDI's Disciplines and Research Focus Areas

Disciplines:

· Biological Sciences

· Electrical Engineering

· Information Science

Research Focus Areas:

1. Bionics

2. Physical and Virtual Cellular Computers

3. Optical devices, nanoelectronic technologies

4. Human language technology

5. On-board vehicle navigation systems

Stages and components of the doctoral program

In accordance with current regulations, the 8-semester program can be divided into two stages:

1. Study and research phase (up to 4 active semesters, 120 credit points)

2. Research and dissertation phase (up to 4 active semesters, 120 credit points)

During the doctoral program, at least 240 credits must be earned, broken down as follows:

· **completion of courses and research seminars**: a minimum of 30 credits, of which at least 24 credits must be earned during the study-research phase,

· **independent research**: a maximum of 80 credits,

· **publication activity**: minimum 50 credits, of which at least 20 credits must be earned during the study-research phase,

· **dissertation-related work**: maximum 30 credits

· **teaching and teaching-support activities**: for students with Hungarian state scholarships, a minimum of 16 teaching credits during the study-research phase, maximum 32 credits,

· **completion of annual reports**: maximum 40 credits,

· **attendance at events related to doctoral proceedings** (workplace discussion, PhD defense): minimum 2, maximum 8 credits

The details of each activity and the corresponding credit points are as follows.

III. 1. Completion of courses and research seminars

Research seminars announced by the doctoral school are uniformly worth 6 credits. In addition to the selected courses, completion of at least 2 research seminars is mandatory during the study-

research phase (12 credits in total). The doctoral school supports doctoral students in gaining external (domestic or international) experience that is justified from the perspective of their academic and professional development, and in having the work performed there counted toward their training. Based on this, with the written approval of the supervisor, the completion of a doctoral course or program (e.g., summer school) offered outside the doctoral school may also be recognized with course credits. The head of the doctoral school decides on the acceptance of these and the number of credit points associated with the external training, taking into account the opinion of the relevant disciplinary coordinator if necessary. The administrative requirements for acceptance are credible proof of completion and the completion and submission of the course form related to the subject (training).

III. 2. Independent Study of a Topic

Credit points may be awarded for the independent acquisition of additional professional knowledge, skills, and abilities required for scientific research. The activity is recognized and certified by the supervisor in accordance with the amount of work invested. A maximum of 10 credit points may be awarded for this activity in a given semester.

III. 3. Publication activity (including patents)

The doctoral school recognizes work devoted to research and the dissemination of results primarily through publications with the following credit points:

(1) A publication in English in a peer-reviewed, international journal with an ISSN number, registered in Web of Science, and having an impact factor: 50 credits/article,

(2) Publications in English in an international journal with an ISSN number, peer-reviewed, without an impact factor, indexed in the Scopus database and classified as Scimago SJR (Q1-Q4): 30 credits/article,

(3) Full-text article (minimum 20,000 characters) published in a peer-reviewed conference proceedings in English: 20 credits/article,

(4) Oral or poster presentation in English at an international conference accompanied by a peer-reviewed conference paper or abstract of less than 20,000 characters: 20 credits/paper (abstract) for the presenter only.

(5) Granted patent or submitted patent with a positive novelty search: 30 credits/patent

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In the absence of a waiver statement from co-authors, the publication credit points in categories (1), (2), (3), and (5) will be distributed among the number of non-foreign (with a Hungarian affiliation) authors in the fields of engineering or natural sciences who do not hold a PhD degree. Credit points may only be awarded for publications appearing in journals or at conferences relevant to a discipline taught by the doctoral school. The condition for the acceptance of publication credits is the registration of the publications in MTMT with the affiliation (including) the doctoral school listed, as well as institutional verification and approval of this. The refereed

status of international conferences must be verified by a letter of acceptance for the article/abstract. The identity of the presenter are verified by a certificate issued by the conference organizers

. If circumstances absolutely require it (e.g., to obtain the minimum number of publication credits for a given stage of the program), an official editorial confirmation (email) of the article's acceptance in its final form is acceptable. The desired characteristics and peer-review status of journals must be verified based on the data currently listed in the MTMT. The decision on the approval of publication credits is made by the discipline coordinator or the head of the doctoral school, taking into account both disciplinary relevance and formal requirements. Publication credits may be claimed for publications appearing within a maximum of 3 years prior to the start of the doctoral program in the manner described above (in this case, indication of institutional affiliation is not required). Publication credits for verified and approved publications may be claimed in any unfinished semester of the program.

III. 4. Submission of Annual Reports

In addition to the short written reports submitted each semester, doctoral students are required to report on their research activities annually before a committee in the form of a presentation of at least 15 minutes in English at the doctoral school's "PhD Proceedings" conference. The presentation must be accompanied by a conference paper of at least 4 pages in length in the format specified by the doctoral school, which must be approved by the supervisor prior to submission. Submitting the conference paper by the deadline and delivering the presentation earns 10 credit points. A successfully completed complex exam or institutional ÚNKP final report presentation during the academic year exempts the student from the oral portion of the annual report organized for that academic year. A successfully completed thesis defense (workplace defense) during the academic year results in the automatic acceptance of the annual report.

III. 5. Work Related to the Dissertation

For the preparation of a doctoral dissertation that meets the formal requirements, 15–30 credit points may be awarded upon submission for the workplace defense.

III. 6. Teaching and Activities Supporting Education

The following credit points may be awarded in this area of activity:

(1) Teaching

Two credits may be awarded for one contact hour of teaching per week (leading a seminar or laboratory exercise). Students receiving Hungarian state scholarships must complete at least 16 credits from teaching during the study-research phase.

(2) Activities supporting teaching

Based on a written recommendation from the supervisor, a maximum of 3 credits may be awarded per semester for the following activities:

TDK supervision; *independent lab supervision*; *thesis/dissertation supervision*; *supervision and grading of papers* (for courses not currently being taught); *examination*, *performing secretarial and/or organizational duties* during independent laboratory reports; thesis and dissertation defenses, TDK conferences, ÚNKP conferences; *other activities supporting teaching* (e.g., participation in the organization and conduct of conferences and open houses related to PPKE, delivering external promotional lectures).

When determining the number of credits, the accounting rules for the faculty member's teaching load statement shall apply.

III. 7. Attendance at events related to doctoral proceedings

In this category of activities, credit points may be earned as follows:

· attendance at a workplace seminar (internal defense): 1 credit per event,

· attendance at a PhD defense: 1 credit per event.

In addition to documented attendance, the awarding of credit points is contingent upon the preparation of a brief written summary of the event in a specified format.

IV. Students' Semester Work Plan and End-of-Semester Report

In the doctoral school, the supervisor organizes and directs the doctoral students' individual curriculum and work.

Doctoral students' academic progress follows an individual study plan, which is documented by work plans and reports prepared each semester: both the work plans and the reports must be prepared by the doctoral student under the supervision of their supervisor, and the contents must be approved not only by the supervisor(s) but also by the relevant disciplinary coordinator.

The supervisor provides a written evaluation of the reports and assigns a grade for the student's semester performance on a traditional five-point scale.

V. The Comlex Examination

V.1. Conditions for Exam Registration and Approval

The conditions for registering for the exam for participants in the organized doctoral program are as follows:

1) completion of at least 90 credit points in the first phase of the doctoral program, including at least 20 publication credits, 2) a statement of support from the thesis advisor for registration for the complex examination.

For self-studying candidates, the requirement for applying to the complex exam is

the fulfillment of the minimum publication requirements for degree conferral. Applications for the complex exam are approved by the MMTDHT.

V. 2. Supervisor's Evaluation and Student Report

The supervisor receives an invitation to the complex examination and, prior to the examination, submits a brief written evaluation of the candidate's work to date to the Doctoral Office, in which the supervisor also specifically states whether they recommend that the candidate begin the second phase of the doctoral program under their supervision. At least one week before the examination, the candidate shall submit to the Doctoral Office, in electronic form, a brief summary of the scientific results achieved during the first phase of the program and of their ongoing research, broken down into key points and ranging in length from approximately 2,500 to 4,000 characters, as well as any articles submitted for publication or already published.

V. 3. Conduct and Evaluation of the Complex Examination

The complex 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 in an employment relationship with PPKE. The chair of the examination committee is a university professor, a Professor Emeritus, or a faculty member or researcher holding the title of Doctor of the Hungarian Academy of Sciences. All members of the examination committee hold an academic degree. The supervisor of the PhD candidate taking the exam may not be a member of the examination committee.

The first, 'theoretical part' of the complex exam covers at least two subject areas (one core subject and one supplementary subject). These subjects may be selected from courses completed for academic credit or from topics related to the candidate's research area. The core subject of the complex exam must also be completed as a credit-bearing course. The list of core subjects for each discipline is approved by the MMTDHT (Appendix 1).

In the theoretical part of the complex exam, the examination committee grades each subject exam on a five-point scale (1 – failing, …, 5 – excellent). The theoretical sub-exam is graded on a two-point scale: 'pass' / 'fail'. The theoretical part of the exam receives a 'pass' grade if every subject evaluation is at least satisfactory (2). The second part of the complex exam is the 'dissertation section,' where the candidate reports on their academic progress in the form of an approximately 20-minute presentation: their knowledge of the literature, reports on their research findings, outlines their research plan for the second phase of the doctoral program, and presents a timeline for completing the dissertation and publishing the results. The dissertation section is also evaluated by the committee on a two-tiered 'pass' / 'fail' scale. The complex examination is considered successful ("pass") if both the theoretical part and the dissertation part are evaluated as "pass." A report containing a written evaluation of the complex examination is prepared. Successful completion of the complex examination is a prerequisite for admission to the second phase of the program.

Individual candidates who meet the minimum publication requirements for degree conferral enter the second phase of the program upon passing the complex exam and receive 120 credit points for their prior professional and scientific activities.

PPKE RTMTDI

Curriculum

Appendix 1

Compulsory and elective theoretical subjects in the complex exam, by discipline

Biological Sciences

· Bioinformatics

· Neurobiology

· Cell technology and cellular experimental models

Computer Science

· Language technology and neural networks

· Creation and Applications of Large Language Models

· New Methods in Neural Network Design and Training

· Parallel Computer Architectures

Electrical Engineering Sciences

· The Physics of Computing

· Modern Tools of Systems and Control Theory

· Parallel Computer Architectures

· New methods in the design and training of neural networks

Students beginning their doctoral studies in September 2025 or earlier may choose whether to select a complex exam core subject based on the current or previous version of the curriculum (effective as of September 23, 2025).

PPKE RTMTDI

Curriculum

Appendix 2

Learning Objectives and Outcomes

In the development and refinement of the RTMTDI curriculum, we place the greatest emphasis on the following level descriptors from MKKR Level 8.

Knowledge

Objective / Outcome Method of Achieving and Assessing the Objective / Outcome

Possesses research-level knowledge of the subject area of engineering and natural sciences, its general and specific characteristics, its most important directions, and

its precisely defined boundaries, as well as its established and debated interrelationships. During their studies, doctoral students must earn at least 30 credit points from doctoral courses and active participation in research seminars. The acquisition of the required professional knowledge is demonstrated through exams, the delivery of seminar presentations, and the completion of a complex exam.

They possess the necessary research methodology skills in the fields of engineering and natural sciences. Students may earn the majority of the credits required throughout the entire program through supervised and independent research and the writing of scientific publications in connection with this. Research is conducted in close collaboration with the advisor and members of the research group, in accordance with the doctoral school's field of study, who effectively impart the necessary research methodology skills through this collaborative work.

Final verification of this is provided by the publication of the papers required for the degree and the successful completion of the degree conferral process.

Skills

Objective / Outcome Method of achieving and verifying the objective / outcome

Capable of creatively analyzing the given field, formulating complex and specialized relationships in a synthetic, innovative manner, and engaging in appropriate evaluative and critical activities based on these. An important part of the doctoral dissertation is the critical review and analysis of the relevant scientific field, the details of which are already reflected in

the published articles. The primary measure of the novelty of the results achieved is publication in high-quality, rigorously peer-reviewed journals and at conferences

, as well as positive novelty assessment results for submitted patents. Students must also formulate their new results in the form of theses, which must be accepted by the thesis reviewers and the members of the defense committee degree must be accepted by the thesis reviewers and the members of the defense committee.

The ability to construct and communicate new relationships that are significant from the perspective of the field of study, as well as complex connections relevant to personal and communal existence. During doctoral studies, completion of at least 2 multidisciplinary research seminars is mandatory, where a broader

understanding and communication of interrelationships is required. Successful research work conducted at domestic and international partner institutions and the resulting multi-authored publications also demonstrate the acquisition of this ability.

Attitudes

Goal / Outcome Method of Achieving and Assessing the Goal / Outcome

Possesses the curiosity and learning ability necessary to identify and solve research problems in the field that are currently unclear and unpredictable. The doctoral courses to be completed focus primarily not on the current technological environment, but

timeless fundamental scientific knowledge (in mathematics, physics, computer science, and biology)

. Through collaborative work with their advisor

, students will reach the point where they can independently formulate or significantly refine research problems even when information, master the methodology of formulating and reviewing hypotheses, and are able to further develop the applied research methodology. The success of this is evidenced by the publication of the papers required for the degree and the successful completion of the degree conferral process.

Autonomy and Responsibility

Goal / Outcome Method of Achieving and Assessing the Goal / Outcome

Capable of engaging as an equal and a discussion partner with experts in the field Successful completion of mandatory research seminars, regular progress reports, the internal defense, and the public defense ensures that the graduate doctoral candidate can situate their work within an academic debate, defend their scientific position, challenge unsubstantiated claims when warranted, and evaluate scientific

results not based on hierarchy but on actual merit and contribution.

Through a leadership role and high-level cooperation. Work carried out within the research groups of PPKE-ITK and the Jedlik Laboratories (or even across multiple research groups in the case of multidisciplinary topics) effectively fosters the

development of a cooperative attitude. The training plan encourages and rewards with credit points teaching, thesis, and TDK supervision activities for doctoral students,

which prepares them for mentoring and future leadership roles.