Pázmány Péter Catholic University

Roska Tamás Doctoral School of Sciences and Technology (RTMTDI)

TRAINING PLAN

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PROVISIONAL TRANSLATION[1]

I. Introduction, basic principles of doctoral training at the Roska Tamás Doctoral School of Engineering and Natural Sciences (hereinafter: RTMTDI)

The training plan of the doctoral school is in line with the provisions of the PPKE's university-level quality assurance documents relating to doctoral training, and partly with the objectives set out in the doctoral school's quality assurance plan, using the tools and methods specified therein to continuously ensure the quality of training and, if internal and external circumstances allow, to raise its standard.

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

• **Multidisciplinarity**: Our doctoral programs focus on three classical disciplines (biology, electrical engineering, and computer science) with different emphases. We consider it important that our students are open to these fields of science and are able to systematically organize, further develop, and apply their results and connections in a creative manner.

• **Individual training programs**: We want to provide the greatest possible flexibility for supervisors in putting together individual training plans for students. This, of course, also highlights the responsibility of the supervisor.

• **The primacy of research**: We consider the most important goal of doctoral training to be the development of doctoral students' ability to conduct independent scientific research. Accordingly, we motivate and reward successful research work and the preparation and publication of related high-quality scientific publications.

[1] In the event of a dispute, the Hungarian language version shall prevail with respect to the training plan of the doctoral school.

• **International and domestic integration**: The quality of the program is also determined by existing international relationships, which include close cooperation with the University of Notre Dame in Indiana, the Catholic University of Leuven, the University of Seville, the Polytechnic University of Turin, the University of Bordeaux, the Autonomous University of Madrid, the IFOM Institute in Milan, and approximately ten other laboratories through joint work and project-level cooperation. In addition, we cooperate intensively with the ELKH KOKI, SZTAKI, TTK, and MFA institutes, as well as the OIKI institute and Semmelweis University, whose lecturers, researchers, supervisors, and laboratory capacities support high-quality doctoral training and world-class research for PPKE doctoral students.

• **The unity of education and research**: We support training activities related to the research topics of the doctoral school (presentation of contemporary topics and results in BSc/MSc education and thesis supervision), as well as work to promote the institution and science.

II. The cultivated disciplines and doctoral programs of RTMTDI

Cultivated disciplines:

• Biological sciences

• Electrical engineering

• Information science

Doctoral programs:

• Program 1: Bionics, bio-inspired wave computers, neuromorphic models

• Program 2: Computing based on kiloprocessor chips, analog computers with sensors and actuators, virtual cellular computers

• Program 3: Feasibility of electronic and optical devices, molecular and nanotechnologies, nano-architectures, nano-bionic diagnostic and therapeutic devices.

• Program 4: Human language technologies, artificial intelligence, and telepresence

• Program 5: Research into vehicle on-board navigation systems

III. Stages and elements of doctoral training

In accordance with the legislation in force, the eight-semester training program can be divided into two stages:

1. Study and research phase (maximum of 4 active semesters, 120 credit points)

2. Research and dissertation phase (maximum of 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**: minimum 30 credits, of which at least 24 credits must be earned during the study-research phase,

• **independent research**: maximum 80 credits,

• **publication activity**: minimum 80 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**: minimum 16 teaching credits for Hungarian state scholarship students during the study-research phase, maximum 32 credits,

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

• **attendance at events related to doctoral activities** (workplace discussions, PhD defense): minimum 2, maximum 8 credits

The details of the individual activities and the corresponding credit points are as follows.

III. 1. Completion of courses and research seminars

Courses and research seminars announced by the doctoral school are uniformly worth 6 credits. In addition to the selected courses, at least 2 research seminars must be completed during the study-research phase (12 credits in total). With the written support of the supervisor and the program director, doctoral courses or training announced outside the doctoral school (e.g., summer school) may also be recognized as course credits. The head of the doctoral school decides on their acceptance and the number of credit points associated with external training, based on the supervisor's recommendation and, if necessary, taking into account the opinion of the relevant program director. The administrative conditions for acceptance are credible proof of completion and the completion and submission of the course form related to the subject (training).

III. 2. Independent topic processing

Credit points may be awarded for the independent acquisition of additional professional knowledge, abilities, and skills necessary for scientific research work. 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

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

(1) Publications in English in peer-reviewed, international journals with an ISSN number, registered in the Web of Science, with an impact factor: 50 credits/article,

(2) Publication in English in an ISSN-registered, peer-reviewed, non-impact factor international journal registered in the Scopus database and with a Scimago SJR (Q1-Q4) rating: 30 credits/article,

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

(4) Oral or poster presentation in English at an international conference with a refereed conference article or abstract of less than 20,000 characters: 20 credits/article (abstract) for the presenter only.

In the absence of a co-author waiver, publication credits in categories (1), (2), and (3) will be distributed among authors who are not foreign (with Hungarian affiliation) and do not hold a PhD in engineering or natural sciences. Credit points can only be awarded for publications that appear in a journal or conference relevant to a discipline taught by the doctoral school. The condition for the acceptance of publication credits is that the publications are recorded in MTMT with the affiliation belonging (also) to the doctoral school, as well as institutional verification and approval. The referencing of international conferences must be confirmed by a letter of acceptance of the article/abstract. The presentation and the identity of the presenter shall be confirmed by a certificate issued by the conference organizers. If circumstances make it absolutely necessary (e.g., to obtain the minimum publication credit points in a given training phase), official editorial feedback (e-mail) on the acceptance of the article in its final form is acceptable. The desired characteristics and peer review status of the journals must be verified based on the data currently available in the MTMT. The subprogram director or the head of the doctoral school decides on the approval of publication credits, taking into account the scientific relevance and formal requirements. Publication credits may be counted in the manner described above for publications that appeared no more than three years prior to the start of doctoral training (in this case, it is not necessary to indicate institutional affiliation). Publication credits for verified and approved publications may be counted in any semester of the training that has not yet been completed.

III. 4. Completion of annual reports

In addition to short written reports at the end of each semester, doctoral students are required to report on their research activities to 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 before submission. Ten credit points are awarded for the timely submission of the conference paper and the presentation. Successful completion of a complex exam or institutional ÚNKP final report presentation during the academic year exempts the student from the oral part of the annual report organized in that academic year. Successful completion of a home defense (workplace discussion) during the academic year results in automatic acceptance of the annual report.

III. 5. Dissertation-related work

30 credit points may be awarded for the submission of a doctoral dissertation that meets the formal requirements for a workplace discussion.

III. 6. Teaching and teaching support activities

The following credit points may be awarded for this activity:

(1) Teaching

Two credits may be awarded for one contact hour of teaching per week (seminar, laboratory practice). At least 16 credits must be earned from teaching by Hungarian state scholarship students during the study-research phase.

(2) Activities supporting education

Upon written recommendation by the supervisor, a maximum of 3 credits may be awarded per semester for the following activities:

TDK supervision; *independent laboratory supervision*; *thesis/dissertation supervision*; *thesis supervision and correction* (in the case of subjects not currently taught); *examination*, *secretarial and/or organizational tasks* for independent laboratory reports; thesis and diploma defenses, TDK conferences, ÚNKP conferences; *other teaching support activities* (e.g. participation in conferences related to PPKE, organization and implementation of open days, giving external promotional lectures).

The rules for calculating the number of credits are based on the rules for calculating the teaching load.

III. 7. Attendance at events related to doctoral activities

In this area of activity, credit points can be earned as follows:

• Attendance at workplace discussions (internal defenses): 1 credit per event

• Attendance at PhD defenses: 1 credit per event

In addition to documented participation, credit points are awarded on the basis of a short written summary of the event in a specified format.

IV. Students' semester work plan and end-of-semester report

In the doctoral school, the doctoral students' individual curriculum and work are organized and supervised by their supervisor. The academic progress of doctoral students is based on individual sample curricula, which are documented in work plans and reports prepared each semester: both work plans and reports must be prepared by the doctoral student under the supervision of their supervisor and approved by the supervisor and the program director. The supervisor reviews the reports in writing and grades the student's semester performance on a traditional five-point scale.

V. The comprehensive exam

V. 1. Conditions for exam registration and approval

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

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

For individual candidates, the condition for applying for the comprehensive exam is the fulfillment of the minimum publication requirements for obtaining a degree. Applications for the comprehensive exam are approved by the MMTDHT.

V. 2. Supervisor evaluation and student report

The supervisor receives an invitation to the comprehensive exam and, prior to the exam, sends a short written evaluation of the examinee's activities to date to the Doctoral Office, in which he or she also states whether he or she recommends that the examinee begin the second phase of doctoral training under his or her supervision. At least one week before the exam, the examinee shall submit to the Doctoral Office, in electronic form, a brief summary of their academic achievements and ongoing research during the first phase of their training, broken down into thesis points, in approximately 2500-4000 characters, as well as their articles submitted for publication or already published.

V. 3. Conduct and evaluation of the comprehensive examination

The comprehensive examination must be taken in public before a committee. The examination committee shall consist of at least three members, at least one-third of whom shall not be employed by PPKE. The chair of the examination committee shall be a university professor or professor emeritus, or a lecturer or researcher holding a doctorate from the Hungarian Academy of Sciences. All members of the examination committee shall hold an academic degree.

The supervisor of the PhD student taking the exam may not be a member of the examination committee.

The first, "theoretical" part of the comprehensive exam covers at least two topics (one core subject and one secondary subject). These subjects may be chosen from among the courses completed with academic credit or topics related to the examinee's field of research. A core subject that the doctoral student has previously completed as a course may be selected for the comprehensive exam. The list of core subjects for each program is approved by the MMTDHT (Appendix 1).

In the theoretical part of the comprehensive exam, the examination committee evaluates each subject exam on a five-point scale (1

- unsatisfactory, ..., 5 - excellent). The theoretical part of the exam is evaluated on a two-point scale: 'pass' / 'fail'. The theoretical part of the exam receives a 'pass' grade if all subject evaluations are at least satisfactory

(2). The second part of the comprehensive exam is the 'dissertation part', where the examinee gives a presentation of approximately 20 minutes on their scientific progress: their knowledge of the literature, reports on their research results, and presents their research plan for the second phase of their doctoral training, as well as their schedule for completing their dissertation and publishing their results. The committee also evaluates the dissertation part on a two-level scale of ‘pass’ / ‘fail’. The comprehensive exam as a whole 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 comprehensive exam is prepared. Successful completion of the comprehensive exam is a prerequisite for entering the second stage of the program.

Individual candidates who meet the minimum publication requirements for obtaining a degree enter the second stage of the program after passing the complex exam and receive 120 credit points for their previous professional and scientific activities.

Appendix 1

Core subjects of the complex exam for the training programs

Program 1: Bionics, bio-inspired wave computers, neuromorphic models

• Bioinformatics

• Neurobiology

• Cell technology and cellular experimental models

Program 2: Computing based on kiloprocessor chips, analog computers with sensors and actuators, virtual cellular computers

• Neural networks

• Parallel computer architectures

Program 3: Feasibility of electronic and optical devices, molecular and nanotechnologies, nano-architectures, nano-bionic diagnostic and therapeutic devices

• Neural networks

• Physical foundations of nanotechnology

Program 4: Human language technologies, artificial understanding and telepresence

• Creation and applications of large language models

• Language technology and neural networks

Program 5: Research into in-vehicle navigation systems

• Neural networks

• Parallel computer architectures

• Modern tools of system and control theory