UNIVERSITY OF PARDUBICE	
Directive No. 11/2024	
Subject:	Admission rules to the 1st year of doctoral study programme P0788D060002 Electrical Engineering and Informatics for the academic year of 2025/2026
Scope of authority:	Faculty of Electrical Engineering and Informatics and doctoral programme applicants
In effect from:	Date of issue
Elaborated and submitted by:	Ing. Daniel Honc, Ph.D., Vice-Dean for Education and Performance
Approved by:	prof. Ing. Petr Doležel, PhD., Dean

Dean of the Faculty of Electrical Engineering and Informatics of the University of Pardubice invites applicants for the entrance exam for the first year of Doctoral Programme for the academic year of 2025/2026 in accordance with the Article No. 48, 49, Act No. 111/1998 Coll. on higher education institutions and on the amendement and supplementto some other acts and sections 6, 7, 9 and 10 on the statuses of the University of Pardubice:
P0788D060002 Electrical Engineering and Informatics

Article 1
Application for studies

(1) Applications for study may be submitted electronically at http://eprihlaska.upce.cz.

(2) The deadline for submitting applications for the academic year 2025/26, including payment of the administrative fee, is from **01 January 2025** to **30 May 2025**.

(3) It is not necessary to send a copy of the electronic application form (hereinafter referred to as the "e-application") by post, and it is not necessary to prove payment of the admissions fee (hereinafter referred to as the "fee") by using the correct payment symbols generated at the end of the e-application.

(4) In addition to the programme of study and the form of study, the application form must list the topic of the dissertation and the name of the supervisor. The list of topics is attached to this Directive.

(5) Applicants for the PhD study programme P0788D060002 Electrical Engineering and Informatics are obliged to send to the Study Department of the Faculty of Electrical Engineering and Informatics of the University of Pardubice the annexes to the application form in paper form, i.e. a structured CV in English, proof of the level of knowledge of the English language, officially certified proof of a previous master's degree and a copy of the passport (in the case of a foreign national applicant).

(6) Address for sending mandatory attachments:

University of Pardubice
Faculty of Electrical Engineering and Computer Science
Study Department
Studentská 95
532 10 Pardubice

(7) If the application for studies does not have the prescribed requirements or suffers from other defects, the applicant will be asked to remove them. If the applicant fails to remedy the defects within the time limit set, he/she will not meet the conditions for the opening of the admission procedure and the procedure will be terminated by resolution.

(8) On the basis of the registered application form, applicants will be invited in writing or electronically to take an entrance examination.

(9) A medical certificate is not required.

Article 2
Administrative fees

(1) Administrative fees for the procedure of admission in study programme in English P0788D060002 are:

Application fee: CZK 2000
University Account Name: Univerzita Pardubice
Account number: 37030561/0100
Variable symbol: 6921
Constant symbol: 308
Specific symbol: personal university number (generated by e-application)
Banks Name: Komercni banka Pardubice
Bank Address: nam. Republiky 222, 530 78 Pardubice
IBAN: CZ2901000000000037030561
SWIFT: KOMBCZPPPXX

(2) The fee for the admission procedure is non-refundable.

(3) Fee for the assessment of education in the admissions procedure in accordance with the Directive No. 11/2019 Rules for the assessment of foreign secondary and higher education within the admission procedure at the University of Pardubice:

Recognition fee: CZK 600
University Account Name: Univerzita Pardubice
Account number: 37030561/0100
Variable symbol: 6929
Constant symbol: 308
Specific symbol: personal university number (generated by e-application)
Banks Name: Komercni banka Pardubice
Bank Address: nam. Republiky 222, 530 78 Pardubice
IBAN: CZ2901000000000037030561
SWIFT: KOMBCZPPPXX

(4) The fee for the admission procedure is non-refundable.

Article 3
Conditions for admission to study

1) A candidate who successfully completes the study of a follow-up master's degree programme and successfully passes the entrance examination may be admitted to study. If the

applicant does not have a certified copy of the diploma by the date of the entrance examination, he/she shall provide a confirmation of the date of the state final examination. The certified copy of the diploma shall be presented immediately after receipt of the diploma, at the latest at the time of enrolment.

2) Applicants for study at the university who have obtained their previous education elsewhere than in the Czech Republic or Slovak Republic are admitted to study in the Czech language under the same conditions as other applicants, provided that
a) their education has been recognised as the education required by law for admission to a doctoral programme
(b) they have complied with the conditions of the admission procedure laid down for other applicants

Applicants' higher education may be recognised for the purposes of the admission procedure in accordance with the Directive No. 11/2019 - Rules for the Assessment of Foreign Higher Education in the Admission Procedure at the University of Pardubice.

(3) Applicants for study at the University with citizenship other than that of the Czech Republic and the Slovak Republic shall be admitted to study in the Czech language under the same conditions as other applicants, provided that
(a) they have demonstrated, no later than on the date of enrolment, linguistic competence for study in a study programme in the Czech language
(b) they have complied with the conditions of the admission procedure laid down for other applicants.

Article 4
Admission procedure

(1) The regular date of the entrance examination is **25 June 2025**.

(2) A condition for admission to study in a doctoral study programme is proper completion of studies in a master's study programme and successful completion of the admission procedure, which includes:
-an oral examination in English,
-an oral professional examination according to the focus of the doctoral study programme.

The English language entrance exam assumes an entry level of B1+ SERR (formerly Intermediate). The exam will take the form of a motivational interview. The candidate will demonstrate the ability to communicate with some degree of independence in oral interaction in a personal and educational areas of language use, using relevant linguistic resources and structures. In terms of topics, the interview will focus primarily on previous study or work experience and motivation for further study and research in the chosen field in the doctoral programme. During the interview, the candidate will also be able to briefly inform about the chosen topic and the aims of his/her dissertation.

The professional examination requires professional knowledge at the level of a completed master's degree programme with a focus on the topic of the doctoral dissertation and the presentation of a thesis on the expected dissertation topic.

(3) In the case of foreign applicants, the Admissions Committee may determine the form and conditions of the entrance examination which do not require the personal presence of the applicant.

(4) If more than one applicant applies for the same doctoral dissertation topic, the committee shall determine the order of the applicants according to the result of the admission procedure. If the next applicants in order successfully pass the entrance examination, the committee shall offer them the unfilled topics or diversify the topic in agreement with the supervisor. In the event that no agreement is reached on the dissertation topic, the candidates will be selected in order of preference.

(5) Absence from the admission procedure will be the subject of a further hearing only if the applicant duly apologises and the faculty announces an alternative date for the admission procedure.

(6) In the event of a change in the form of study within the doctoral study programme Electrical Engineering and Informatics, the candidate will be admitted to the study outside the regular admission procedure and will have the examinations recognised in accordance with the Directive No. 8/2017 of the FEI UPa Rules for Recognition of Completed Courses.

Article 5
Method of deciding on admission

(1) A maximum of 5 applicants will be admitted to study in the order determined during the admission procedure.

(2) The admission decision will be issued within 30 days of the admission examination in accordance with the provisions of Section 50(4) of the Higher Education Act.

(3) The results of the admission procedure will be published on the publicly accessible www server of the University of Pardubice at https://www.upce.cz/studium/pro-uchazece/prijimacky.html. The publication of the results will respect the principles of personal data protection.

(4) The faculty delivers the decision to applicants for study itself or through a postal service provider. If the decision grants the applicant's application for admission to study, the decision may be delivered to the applicant via the University's electronic information system if the applicant has agreed to this method of delivery in advance in his/her application; in such a case, the date of delivery and notification of the decision shall be the first day following the date on which the decision is made available to the applicant in the University's electronic information system.

In Pardubice, 10th December, 2024

prof. Ing. Petr Doležel, Ph.D.
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Doctoral Thesis Topics 2025/2026

1.

Supervisor: prof. Ing. Petr Doležel, Ph.D.

Multimodal Analysis of Temporal and Spatial Movements of Objects in Video Sequences

The dissertation will focus on the development of advanced methods for analyzing the movement of individuals and crowds in videos, with an emphasis on temporal and spatial aspects. The goal is to analyze not only the overall movement of individual objects (e.g., walking persons), but also the detailed movements of their parts (e.g., hands, head) during various activities using computer vision methods. The interactions between individuals in crowds and their influence on behavior will also be studied. The work may focus on applications such as security monitoring, sports performance analysis, or interactions in social situations. The aim of the dissertation is to design, implement, and validate new approaches for combining temporal and spatial analysis of individuals' movements, their parts, and groups of individuals. Emphasis will be placed on developing techniques that enable detailed motion tracking in real-time, particularly in dynamic scenes with multiple objects. The project also explores how to better interpret the results for behavior prediction and anomaly detection. Methods of deep learning (e.g., Long Short-Term Memory and Transformer-based architectures) will be used for temporal analysis, and convolutional neural networks will be employed for detecting objects and their parts. Hybrid methods integrating spatial and temporal analysis will also be applied, including advanced techniques for pose estimation, optical flow evaluation, and object tracking. Modifications of these methods will aim to improve both accuracy and processing speed. The results will be verified through experiments on publicly available and custom datasets focused on movement analysis in various environments. Comparisons will be made with results from other authors in similar areas using standard metrics such as detection accuracy, processing speed, and prediction capability.

2.

Supervisor: prof. Ing. Antonín Kavička, PhD.

Methodology for rapid prototyping of agent-based simulators

The objectives of the thesis are to design and test a methodology for rapid prototyping of software agent-oriented simulators reflecting service, transport or logistics systems. The rapid prototyping of simulation models will be based on the application of declarative approaches (based, for example, on Petri nets) applied in the formalization of the agent-oriented simulators being built. For the verification of the proposed methodology, it is assumed to use a custom software demonstrator, which will include a suitable integrated development environment supporting both the rapid construction of the corresponding simulation system and its formal verification and subsequent implementation of simulation experiments. In solving research and development tasks related to the dissertation, it is expected that the following methods and formalisation approaches will be used: computer simulation; Petri nets; mathematical statistics. The proposed methodology will be validated on a non-trivial case study focused on the construction and application of a simulator of a selected operational system.

3.

Supervisor: doc. Ing. Dušan Kopecký, Ph.D.
Supervisor - specialist: Ing. Tomáš Zálabský, Ph.D.

Adaptive signal generation for pulsed radar systems

The dissertation will aim to propose algorithms for the adaptive generation of pulse signals with intra-pulse modulation for contemporary primary monostatic radar systems. The optimal design of transmitted radar signals is based on design criteria (required radar parameters such as range, range resolution, speed resolution, and many others) but also, to a significant extent, on models of the radar targets of interest, their environment, and interference. The assumption for adaptive radar systems is that clutter is dependent on the transmitted signal. These are mainly reflections of the signal from the ground (ground clutter) and the surrounding environment (spatial clutter). Therefore, the amount of clutter can be varied depending on the transmitted signal. Therefore, the student will focus in their dissertation on the use of currently applied design criteria, which are based on the maximum Signal-to-interference plus Noise Ratio (SINR), Maximum Detection Probability (MDP), Minimum Mean Square Error (MMSE) or Maximum Mutual Information (MMI). Based on the selected criteria, an algorithm will be designed for the joint optimization of the transmitted pulse signal waveform with intra-pulse modulation in time while optimizing the impulse response of the receiver.

4.

Supervisor: doc. Ing. Dušan Kopecký, Ph.D.
Supervisor - specialist: Ing. Tomáš Zálabský, Ph.D.

Radar resource allocation optimization

The dissertation aims to find a suitable radar resource allocation algorithm for modern multifunction radar systems. Such radar systems can perform multiple radar functions simultaneously. An example is tracking multiple targets (with different effective reflecting surfaces - aircraft, drones, missiles, etc.) simultaneously in combination with active search of the area of interest. If multiple tasks are required to be performed simultaneously, resources (frequency band, power, time and spectrum waveform, shape and deflection of antenna beams, etc.) must be allocated to these tasks in a structured manner. As such, Radar Resource Management (RRM) requires task prioritization and scheduling, parameter selection, and resource allocation within a multifunction radar. The student will focus on so-called adaptive algorithms, applying elements of artificial intelligence and machine learning within the framework of their dissertation. In this area, algorithms based on fuzzy logic, methods based on information theory, algorithms based on dynamic programming, algorithms based on QoS (Quality of Service) optimization and algorithms adaptively shaping the transmitted signal appear to be promising. Thus, the output will be an optimized algorithm adaptively assigning radar sources to a sequence of radar tasks.

5.

Supervisor: prof. Ing. Jan Mareš, Ph.D.
Supervisor - specialist: Ing. Jan Kohout, Ph.D.

Analysis of Motion Data and EMG Signals Using Machine Learning Methods

The aim of this dissertation is to design and implement a system for the analysis of motion data and EMG (electromyography) signals to improve diagnostics and rehabilitation

processes. The system will utilize modern machine learning methods, including deep learning, to analyze complex datasets obtained from measurements of muscle activity and motion sensors. Data will be sourced from clinical sources and experimental measurements at the University Hospital of Královské Vinohrady and the Hospital of the Pardubice Region. The resulting system will serve as a support tool for healthcare professionals in assessing muscle dysfunctions and designing optimized rehabilitation plans.