UNIVERSITY OF PARDUBICE FACULTY OF TRANSPORT ENGINEERING	
Directive No. 16/2024	
Subject:	**Rules for admission to doctoral study programmes for the academic year 2025/2026**
Applicable to:	Applicants for study
Issued on:	11. 12. 2024
Effectiveness:	11. 12. 2024 - 28. 2. 2026
Prepared by:	Ing. Veronika Fričová, Department for Research and Foreign Cooperation
Submitted by:	doc. Ing. Ladislav Řoutil, Ph.D., Vice-Dean for Research and Foreign Cooperation
Approved by:	doc. Ing. Libor Švadlenka, Ph.D., Dean

Article 1
Introductory Provisions

(1) The Dean of the Faculty of Transport Engineering (DFJP) of the University of Pardubice (UPCE) announces, in accordance with Section 49 of Act No. 111/1998 Sb., on Universities, as amended, and Article 7 of the DFJP Statutes for the academic year 2025/2026, the admission procedure for the first year of doctoral study programmes "Transport Means and Infrastructure" and "Technology and Management in Transport".

(2) Anticipated number of admitted applicants according to study programmes and forms of study:

Study Programme	**Form of study**	
	Full-time	**Combined**
Transport Means and Infrastructure	10	10
Technology and Management in Transport	10	10

Deadlines for submission of applications: **23. 5. 2025 (First Round)**
22. 8. 2025 (Second Round)
16. 1. 2026 (Third Round)

Dates of the admission procedure: **20. 6. 2025 (First Round)**
5. 9. 2025 (Second Round)
26. 1. 2026 (Third Round)

Article 2
Admission

(1) The application for study can be submitted preferably in electronic form published at http://eprihlaska.upce.cz, **no later than May 23, 2025** (**or August 22, 2025, or January 16, 2026,** as relevant), including instructions.

The following documents must be sent by post to **the Faculty of Transport Engineering, Research and Development, Studentská 95, 532 10 Pardubice** no later than the closing date for applications:

a) dissertation topic

b) curriculum vitae

c) certified copies of the Diploma and the Diploma Supplement

d) if submitting a proposal for their own topic of the dissertation, applicants need to provide an abstract, a proposal of methods of solution to be used in the dissertation, and the approval of the training place for which the student applies. Topics will be approved by the respective DFJP branch boards.

(2) Applicants who complete their Master's degree in the academic year 2024/2025 may submit the Diploma with the Supplement subsequently. Those who do not complete their Master's degree at DFJP UPCE will, at the latest at the date of the admissions, submit at least the school's confirmation of successful completion of the Master's degree programme.

(3) The application form can also be filled in on the prescribed form (SEVT form "Application for study at a university in the doctoral study programme") and sent to the address mentioned above together with the above-mentioned attachments. The topic of the dissertation thesis is to be stated directly in the application form.

An administrative fee shall be paid by bank transfer or payment order (exclusively by Type A) to the University of Pardubice's account **no later than May 23, 2025** (**or August 22, 2025, or January 16, 2026** as relevant).

University of Pardubice International Bank Account Number	CZ29 0100 0000 0000 3703 0561
variable symbol	5920
specific symbol	applicant's branch number (in the case of e-application)
	the applicant's birth number (in the case of the printed form)
constant symbol	379 for postal order payment
	308 for wire transfer
amount	600 CZK (Czech study program)
	2000 CZK (English study program)

(4) The printed application form must be accompanied by a proof of payment of the administrative fee (copy of the last part of the type A bill, a copy of an account statement or a payment notification if using wire transfer). If submitting the electronic application, applicants do not have to send a confirmation of payment. The administrative fee is non-refundable.

(5) An application without the attached proof of payment of the fee (if the printed form is used) or an application with formal shortcomings will not be registered and the applicant will be asked for immediate completion. If the applicant fails to remove the shortcomings within the specified deadline, he/she will be excluded from the admission procedure. A medical certificate is not required for the application.

(6) An applicant whose application has been registered but who fails to provide the required documents (see above) by the closing date for the applications will not be eligible for the entrance examination, will not be invited to it and will not be admitted.

(7) On the basis of a duly registered application and the timely submission of the required documents, the applicants will be invited to the entrance examination.

Article 3
Entrance Examination

(1) The first round of the entrance examination has been set **for June 20, 2025, the second round for September 5, 2025 and the third round for January 26, 2026**. The entrance examination will take

place at: University of Pardubice, Faculty of Transport Engineering, Studentská 95, 532 10 Pardubice. The room, time and form of the entrance examination will be specified in the invitation. The entrance examination can be carried out by means of remote access (eg Skype, MS Teams, etc.).

(2) The English language entrance exam consists of a written test in English and a personal interview in connection with the professional content of the specific topic of the dissertation. The admission exam requires at least B2 Level English according to the Common European Framework of Reference for Languages (CEFR), i.e. the applicant uses the language independently and effectively using the appropriate linguistic means. It assumes the ability to work independently with professional literature. The professional interview requires the professional knowledge of the applicants for inquiring into the issues of the submitted topic of the doctoral dissertation.

(3) If multiple applicants register the same topic of the doctoral dissertation, the admission committee determines the order of the applicants for admission according to the result of the admission procedure.

Article 4
Evaluation of the entrance examination results

(1) The foreign language is evaluated in relation to the percentage of the applicant's success rate in each part of the examination. The maximum number of points is 40, of which 30 in the written test and 10 in the oral part. The condition is to pass the written test with at least 50 percent (15 points) and the total score at least 60 percent, i.e. 24 points.

(2) The applicant may also apply for recognition of a language test on the basis of a completed State Final Examination in that language or another level-appropriate examination.

(3) Based on the result of the English language entrance examination and the following oral interview, the admission committee *recommends or does not recommend the admission of the applicant to doctoral studies*. The applicant will be informed about the result of the oral interview immediately after the interview, which will be confirmed by his/her signature on the entrance examination report, which is part of the application form.

The result of the admission procedure will be the basis for the Dean's decision on the *admission or non-admission of the applicant to doctoral studies*.

(4) Failure to attend the admission procedure for medical or other serious reasons will be subject to further discussion only if the faculty sends invitations for an alternative date for admission procedure.

(5) The results of the admission procedure will be published on the UPCE website - www.upce.cz under the applicant's registration number (the applicant's university number is on the first page of the e - application form at the top right) or the applicant's birth number and initials, **no later than June 27, 2025 (or September 12, 2025, or February 2, 2026, as relevant)**. The manner of publishing the results of the admission procedure must respect the principle of the protection of personal data. Documentation on the admission procedure will be deposited with the DFJP Scientific Research Department, and will be made available to every participant in the admission procedure on request for 15 days after the admission exam. **The Dean's written resolution on the results of the admission procedure** will be received to the applicants electronically (in the case of ticking the appropriate box in the application - granting consent), upon enrollment in the study or by registered mail.

In case of non-admission to the study, the decision will be delivered by registered mail to their hands within 14 days of the date of entrance examinations.

Article 5
Final Provisions

(1) This directive has been discussed and approved in accordance with § 27 para. 1, Letter (e) of the Act by the Academic Senate of the DFJP on 11. 12. 2024.
(2) This Directive shall enter into force on 11. 12. 2024.

doc. Ing. Libor Švadlenka, Ph.D. m. p.
Dean of DFJP

Annex:
Topics for doctoral dissertation theses for the academic year 2025/2026 in the study programmes "Transport Means and Infrastructure" and "Technology and Management in Transport".

Doctoral Dissertation Thesis Topics for academic year 2025/2026
Study program: Transport Means and Infrastructure

Performance assessment of lubricants and friction modifiers for the wheel-rail interface
Supervisor: Assoc. Prof. Petr Voltr, Ph.D.
Supervisor specialist: Ing. Stanislava Liberová, Ph.D.
Form od study: full-time/part-time

Annotation
In railway operation, materials for lubrication or, more generally, modification of friction conditions at the wheel–rail interface are used. Laboratory assessment of performance of these materials (i.e. if and to what extent they display the required effect on friction conditions) employs twin-disc machine testing. Testing methods exist and are even reflected in European standards; in practical use, however, some uncertainties and imperfections show up. The dissertation should aim at improvement and clear definition of methodology for twin-disc testing or possibly propose new procedures. The research should also include finding correlation between results of these tests and full-scale roller rig measurements.

Transient phenomena and combined factors in wheel–rail adhesion
Supervisor: Assoc. Prof. Petr Voltr, Ph.D.
Form od study: full-time/part-time

Annotation
Conditions determining the adhesion performance of rail vehicles in operation result from a superposition of many factors which, in addition, can change in time. It is desirable to deal particularly with the cases of opposite effects, e.g. contamination and HPF modifier or conditioning by sliding. These phenomena are often studied in a constant slip setup, however real vehicle performance depends on realistic scenarios with variable slip. The aim of the dissertation should be to progress knowledge on combined and non-stationary adhesion phenomena with the use of roller rig experiments and modelling.

Modelling of longitudinal train dynamic effects
Supervisor: Assoc. Prof. Petr Voltr, Ph.D.
Supervisor specialist: Ing. Tomáš Michálek, Ph.D.
Form od study: full-time

Annotation
The effects of longitudinal dynamics of freight trains represent one of the factors that influence the maximum permissible loading of couplers, as well as the running safety of the vehicles forming the train. The problem is related to both traction and braking of trains. Currently, there are efforts to increase the weight and length of freight trains in the Czech Republic; moreover, Europe is considering the introduction of a new type of central coupler (DAC – Digital Automatic Coupling). In this context, the issues of longitudinal train dynamics gain importance. The aim of the research is to create a computational model allowing assessment of various factors that impact the intensity of the longitudinal dynamic effects, considering the safety of railway transport.

Research of selected dynamic and transient phenomena in electromechanical system of rail vehicle drives

Supervisor: Assoc. Prof. Michael Lata, PhD.

Form od study: full-time/part-time

Annotation

In electromechanical systems, such as the individual drive of a rail vehicle, a number of dynamic processes arise in connection with the very properties of the motor on the one hand and adhesion phenomena on the other side of this system. For a more detailed knowledge of these processes, which should be the output of this work, it is possible to use simulation calculations or use a tram wheel-rail stand and simulate these conditions here, with wide variations of parameters. This is, for example, the response of the electromechanical system to the change of selected parameters in a short period of time.

Analysis of the context of torsional dynamics of driving rail vehicles and rail surface defects (corrugation)

Supervisor: Assoc. Prof. Michael Lata, PhD.

Form od study: full-time/part-time

Annotation

In railway operation, there are regular defects in the surface of rail tracks, both in curves and in straight track. The output of the work should be to clarify whether there is a connection between these defects and the torsional dynamics of the wheelset drive. The solution to this problem should be mainly in the field of simulations and modeling, a detailed description of the adhesion parameters between the wheel and the rail and the conditions of self-excited oscillations are also assumed.

Fatigue curve determination using non-destructive method

Supervisor: Assoc. Prof. Bohumil Culek, Ph.D.

Form od study: full-time/part-time

Annotation

Content of the thesis will be:

- statistical comparison of different approaches to determination of the material characteristics as parameters of fatigue curves;
- proposal of methodology for determination of the fatigue curve of the construction node by means of a non-destructive method;
- use of computer models and simulations to determine fatigue life of steel structures;
- verification of the methodology by experimental testing.

The aim will be to develop a methodology for determination of material characteristics of the fatigue curve by non-destructive method, to verify this methodology by experimental testing.

Identification of fatigue crack propagation

Supervisor: Assoc. Prof. Bohumil Culek, Ph.D.

Form od study: full-time/part-time

Annotation

Content of the thesis will be:

- literature search of current state of knowledge, identification method of fatigue crack propagation;
- Sensitivity analysis of the Beach Mark method;

- Proposal of methodology focused on using Beach Mark method with regard to material grade and sample geometry.

The aim will be to develop a methodology of evaluation of the fatigue crack propagation by identifying the fracture surface based on the change in loading shape during the fatigue test (Beach Mark method).

Construction of analytical fragility functions with stochastic nonlinear backbone curve modeling parameters
Supervisor: Assoc. Prof. Ladislav Řoutil, Ph.D.
Supervisor specialist: Ing. Özgür Yurdakul, Ph.D.
Form od study: full-time/part-time

Annotation
The nonlinear modeling parameters for constructing the backbone curve of the vulnerable reinforced concrete (RC) members are investigated by considering the inherent uncertainties. The creation of a dataset by collecting the available experimental results for the specific RC member is followed by obtaining the nonlinear modeling parameters for the backbone curve. The scatter in the nonlinear backbone curve model is characterized by a probabilistic approach. The model parameters with stochastic character are then implemented at the building level to develop the analytical fragility functions. Those demonstrate the quantification of the risk losses with probabilistic approaches. Overall, a potential risk-assessment tool is obtained for reliable estimations of the strong ground motions on the fragility of the structures together with expected damage and losses. An application of the fragility functions within a performance-based engineering framework for quantifying expected losses is demonstrated.

Retrofit of deficient structures with shear-thickening fluid
Supervisor: Assoc. Prof. Ladislav Řoutil, Ph.D.
Supervisor specialist: Ing. Özgür Yurdakul, Ph.D.
Form of study: full-time/part-time

Annotation
The retrofit of deficient reinforced concrete (RC) members with premature failure is investigated. The RC specimens constructed from low-strength concrete and plain round bars with improper reinforcement details simulating non-engineered structures are tested. Owing to the phase transformation capability of shear-thickening fluid, the RC member is damped, which can eliminate premature failure and upgrade the performance of RC members. To do so, the mechanical characteristics of the shear-thickening fluid are first determined and followed by developing a functional sample. The prototype is then implemented for deficient RC members to enhance the engineering demand parameters of prime interest. The overall response of the RC member is also simulated in the numerical environment.

Axial failure of footing-to-column joints due to low level of confinement at footing
Supervisor: Assoc. Prof. Ladislav Řoutil, Ph.D.
Supervisor specialist: Ing. Özgür Yurdakul, Ph.D.
Form of study: full-time/part-time

Annotation
Field reconnaissance after recent earthquakes revealed severe damage in the footings of the side or corner reinforced concrete (RC) columns, where the concrete is crushed, and the reinforcement steel is buckled right after the footing-to-column interface. The presence of adequate transverse reinforcement prevented the axial failure of the column. However, axial failure occurred in footings where transverse reinforcement does not confine the column's longitudinal bars in the footing. This

thesis will evaluate the performance of current standards and guidelines where the extension of transverse RC columns to footings is compulsory. Additionally, preventive actions for existing footings without confinement will be proposed. Numerical and parametrical studies will provide insight into the effect of different parameters on the overall response. The parameters of interest include the level of confinement, length of the transverse reinforcement extension into foundation, column position in the direction of loading, and the axial load ratio.

Bond-Slip Model for Fan Anchors in FRP jacketed RC columns
Supervisor: Assoc. Prof. Ladislav Řoutil, Ph.D.
Supervisor specialist: Ing. Özgür Yurdakul, Ph.D.
Form of study: full-time/part-time

Annotation
The thesis aims to investigate the effectiveness of carbon fiber fan anchors as anchoring elements for externally bonded reinforcement (EBR), typically composed of carbon fiber-reinforced polymers (CFRP). This retrofitting strategy will be applied to reinforced concrete (RC) columns where slip could be a critical factor. The goal is to develop a mathematical model for the interaction between the fan anchor and concrete, which will later be implemented in the numerical model. It's worth noting that the fan anchor comprises two parts: the anchor component, a bar-type dowel pre-impregnated with epoxy and inserted into epoxy-filled holes in the foundation; and the fan component, impregnated in situ, fanned out, and then bonded to the column with EBR. Subsequently, an analytical relationship for the anchor part dowelled into the concrete will be evaluated. The mathematical model for the fan component will be developed by subjecting an RC column, strengthened with fan anchors and externally bonded reinforcement (EBR), to pull-out tests. Parameters of interest include the size and number of anchors, anchor distance, fan angle, and fan length.

Impact of electromagnetic compatibility in transport on safety
Supervisor: Prof. Jan Leuchter, Ph.D.
Form of study: full-time

Annotation
The aim is to analyze the effects of electromagnetic compatibility on safety in transport. It will be necessary to analyze the legislative requirements for the electromagnetic compatibility of electrotechnical equipment and to determine critical points that may be caused by the effects of electromagnetic interference and the electromagnetic resistance of the electrical equipment used in transport from the point of view of safety in transport. It will be necessary to support the analyzes required above by verifying individual parameters of electromagnetic compatibility and to design an automated workplace for measuring these effects using the LabVIEW environment.

Doctoral Dissertation Thesis Topics for academic year 2025/2026
Study program: Technology and Management in Transport

Research on artificial intelligence methods for solving the problem of delivering parcels in the last and penultimate mile
Supervisor: Assoc. Prof. Libor Švadlenka, Ph.D.
Supervisor specialist: Ing. Stefan Jovčić, Ph.D.
Form of study: full-time

Annotation
In the last decade, an annual growth of approximately 15% can be observed in the volume of e-commerce shipments that need to be delivered to end customers in the final stage. Especially in cities, this trend causes problems manifested mainly by congestion, air pollution, noise and other negative externalities. Therefore, it is necessary to look for and implement ways of long-term sustainable delivery of parcels within the last mile (use of e-cargo bikes, urban micro-depots, self-service delivery boxes, low-emission zones, etc.).

The resulting measures reflect the different expectations of the individual interested parties – specifically the city management, then the deliverers of the parcels (logistics companies), the final customers (recipients of the parcels) and, last but not least, the residents living in the city centers or the operators of shops in these areas.

Research in this area will aim to create a predictive and decision-making model using the potential of MCDM (multi-criteria decision-making) techniques, e.g. ARAS, VIKOR, WASPAS, CODAS, COPRAS, BWM, MARCOS, EDAS, AROMAN, FullEX, etc. For to create the model, AI techniques (machine learning, neural networks, etc.) and IoT elements (devices equipped with sensors, software and other technologies for mutual data exchange) will be applied. Employing the mentioned techniques in combination with the properties of IoT devices, it will be possible to comprehensively manage (especially) delivery/collection routes in city centers, the capacity of transshipment points, etc., about different means of transport or to different sizes of cities. To achieve the stated goal, the doctoral student will analyze the current state of the problem in the Czech Republic and abroad.

Rail-enabled urban logistics
Supervisor: Assoc. Prof. Libor Švadlenka, Ph.D.
Supervisor specialist: Ing. Libor Bauer, Ph.D.
Form of study: full-time

Annotation
Urban logistics is essential for cities but contributes to congestion, emissions, noise and inefficiency. Integrating rail into urban logistics provides an opportunity to enable cleaner and more efficient distribution of goods. Urban freight faces pressing challenges including rising costs, negative environmental impacts, inefficient operations and congestion. Rail offers advantages for freight movement including economies of scale, lower externalities per ton-km and avoidance of road congestion.

This PhD thesis will analyze the current role and potential of rail in urban logistics through an extensive literature review, evaluation of global best practices, collaborative design process, simulation modeling and real world pilot projects. It will provide data, models, and guidelines to support adoption of sustainable urban rail logistics.

The aim of the PhD thesis will be to create a functional urban logistics system implementing rail transport.

Research will apply a mixed methods approach (Fuzzy Logic, Multi-Criteria Decision-Making, Deep Learning, Machine Learning, Global Information System, etc.) combining literature analysis, case studies, collaborative design and simulation modeling.

Decision Making Models for Transportation Issues based on Uncertainty
Supervisor: Assoc. Prof. Jiří Křupka, PhD.
Supervisor specialist: will be specified
Form of study: full-time

Annotation
The dissertation will deal with decision making modelling of a selected problem that touches on transportation issues. The thesis summarizes and analyses the available information on methods that are able to deal with uncertainty. A set of models will be proposed based on a systems approach and soft systems methodology. The core of which uses e.g. fuzzy and rough set theory, and a combination of these. The models will be verified by a case study.

Decision Support System for Sustainable Mobility in Smart City Context
Supervisor: Assoc. Prof. Jiří Křupka, PhD.
Supervisor specialist: Ing. Monika Skalská, Ph.D.
Form of study: full-time

Annotation
The aim of the dissertation will be to design models based on Machine Learning, Soft Computing or Artificial Intelligence to support decision making in the field of sustainable mobility in the context of Smart Cities. The models will reflect the relationships and changes in the public and private sectors. These changes in urban/regional infrastructure as well as changes in business activities, mainly due to Industry 4.0, are expected to influence sustainable mobility in the city/region. This includes impacts e.g. on transport and land-use planning, the implementation of new smart systems, energy savings, human resource development, satisfaction of transport users or residents, safety, etc. The proposed models can operate with data describing positive and negative externalities of transport activities in relation to the sustainability of the territorial unit.

Modelling of Logistic Processes within the Selected Unit of the Logistic Chain
Supervisor: Assoc. Prof. Jiří Křupka, PhD.
Supervisor specialist: Ing. Roman Hruška, Ph.D.
Form of study: full-time

Annotation
The aim of the dissertation is to research the influence of selected parameters of logistic processes on the behaviour of the logistic system within the researched unit of the logistic chain to minimize costs and duration of logistic processes.
The dissertation will deal with the issue of modelling of logistic processes within the selected unit of the logistic chain. The units of the logistics chain are production companies, warehouses, logistics centres, shops, airports, seaports, railway stations, etc. Logistics is a complex system in the context of supply chain management whose behaviour is influenced by a few parameters (order cycle, delivery time, stock management system etc.). The logistics chain connects the consumption market with the resource markets (materials, raw materials, semi-finished products, etc.).
The developed model will be used to support decision-making on logistic processes in accordance with the concept of sustainable logistics. The proposal of the simulation model will be based on the analysis of the national and foreign approach to this issue.

Student will use dynamic simulation methods to analyse and subsequently optimise selected logistic processes. He/She will have at the disposal of WITNESS Horizon simulation software.