

Masaryk University	
Faculty	Faculty of Science
Procedure field	Mathematics - Mathematical Analysis
Applicant	Mgr. Peter Šepitka, Ph.D.
Applicant's home unit, institution	Faculty of Science, Masaryk University
Habilitation thesis	Riccati Matrix Differential Equations and Sturmian Theory for Linear Hamiltonian Systems
Board members	
Chair	prof. RNDr. Zuzana Došlá, DSc. <i>Faculty of Science, Masaryk University</i>
Members	prof. RNDr. Pavel Drábek, DrSc. <i>University of West Bohemia, Pilsen</i> prof. RNDr. Stanislav Hencl, Ph.D. <i>Charles University, Prague</i> Prof. Dr. Stefan Siegmund <i>Dresden University of Technology, Germany</i> Prof. Gerald Teschl <i>University of Vienna, Austria</i>

Evaluation of the applicant's scholarly/artistic qualifications

Peter Šepitka received his Ph.D. in 2014 in Mathematical Analysis at the Faculty of Science of Masaryk University, under the supervision of professor Roman Šimon Hilscher. During his PhD studies he was awarded dean's prize (2x) for excellent results and research achievements and for outstanding PhD thesis. In addition, during his pre-gradual studies at the Faculty of Science of University of Žilina (Slovakia), he was awarded rector's prize and dean's prize for excellent study results. His professional experience includes the positions of an assistant professor at the Department of Mathematics and Statistics, Faculty of Science, Masaryk University (since 2017 till now), and a research and development worker at the same department (2015-2017).

The research of Peter Šepitka is devoted mainly to the qualitative theory of linear Hamiltonian differential systems, in particular to asymptotic theory for solutions of the associated Riccati matrix differential equations and for Sturmian theory on compact and noncompact intervals. This research is motivated by mathematical formulations of problems in optimal control theory, calculus of variations, mathematical physics, spectral theory of differential operators, and other disciplines. His main achievements are related with construction of the principal and antiprincipal solutions at infinity for possibly uncontrollable linear Hamiltonian systems, introducing and applying the theory of genera of conjoined bases (both for nonoscillatory and possibly oscillatory systems), development of the theory of Riccati matrix differential equations for uncontrollable systems, and studying regular and singular Sturmian separation and comparison theorems (including the notion of the multiplicity of focal point at infinity). For these investigations he also developed several new results in matrix analysis related to properties of the Moore-Penrose pseudoinverse, orthogonal projectors, and the so-called comparative index of two Lagrangian planes. Peter Šepitka also published related results in the oscillation theory of symplectic difference systems (on discrete-time domains) or symplectic dynamic systems on time scales (on hybrid-time domains).

Peter Šepitka is the author or co-author of 19 original research articles, from which 18 articles are in impacted journals in the WoS database (as of November 15, 2021). Among these publications, there are 2 single-authored extensive papers (45 and 16 pages) about the theory of Riccati matrix differential equations and genera of conjoined bases for linear Hamiltonian systems, and 17 papers in co-authorship with Roman Šimon Hilscher about various aspects of qualitative theory of linear Hamiltonian systems. Among the latter 17 papers, there are 6 voluminous papers (ranging from 30 to 45 pages) representing a unique contribution of Peter Šepitka to the general Sturmian theory of linear Hamiltonian systems. The publication list of Peter Šepitka shows 8 papers with ranking D1 (according to Web of Science IF), 5 papers with ranking Q1, and 3 papers with ranking Q2, among which are publications in Journal of Differential Equations (Elsevier, 7x), Journal of Dynamics and Differential Equations (Springer, 3x), Discrete and Continuous Dynamical Systems (AIMS), Journal of Mathematical Analysis and Applications (Elsevier, 2x), and Linear Algebra and Its Applications (Elsevier, 3x). The papers of Peter Šepitka have 48 citations in WoS (without self-citations, as of November 15, 2021) from 25 articles. Their impact is documented by citations of 26 different authors from Europe (Italy, Spain, Russia, Czech Republic, Austria), USA, and China. His h-index is 7 in WoS.

Peter Šepitka has an active research collaboration with Prof. Julia Elyseeva from Moscow State Technological University. They conduct research in oscillation theory of continuous Lagrangian paths and Maslov index and work on joint publication on this topic. He lectured on his results at several international conferences and workshops in Europe.

Peter Šepitka was a team member in 3 successful grant projects of the Czech Science Foundation during the years 2010–2021.

The Habilitation Committee states that Peter Šepitka is a mature scientific personality with high-quality scientific results, an outstanding publication record, and a very good international response.

Conclusion: The applicant's scholarly/artistic capabilities **meet** the requirements expected of applicants participating in a habilitation appointment procedure in the field of Mathematics - Mathematical Analysis.

Evaluation of the applicant's pedagogical experience

The pedagogical qualification of Peter Šepitka includes full-semester courses and exercises on various parts of mathematical analysis in the study programs Mathematics and Applied Mathematics during the period 2008–2021 and tutoring bachelor and master students. Main courses include basic and advanced mathematical analysis (1 and 8 semesters), Fourier analysis (5 semesters), basic and advanced functional analysis (5 and 2 semesters), calculus of variations (1 semester), and ordinary differential equations (1 semester). Exercises were taught along with all these courses and in addition in measure theory and integration (3 semesters). Teaching was performed mainly at the Faculty of Science, but also at the Faculty of Informatics.

Peter Šepitka has supervised successfully 8 bachelor students, currently, he is an advisor of 1 bachelor student and 2 master students. He is an excellent teacher with a positive response from students' evaluations. He demonstrated his pedagogical skills also during his habilitation lecture.

Conclusion: The applicant's pedagogical capabilities **meet** the requirements expected of applicants participating in a habilitation appointment procedure in the field of Mathematics - Mathematical Analysis.

Habilitation thesis evaluation

The habilitation thesis of Peter Šepitka entitled "*Riccati Matrix Differential Equations and Sturmian Theory for Linear Hamiltonian Systems*" consists of extended commentary (40 pages) of scientific results of the applicant, which are based on 5 original research papers published in the period 2017–2020. The Habilitation Committee addressed three internationally recognized experts in the field of mathematical analysis as the opponents. They are Hermann Schulz-Baldes (Professor, Friedrich-Alexander University Erlangen-Nurnberg, Germany), Roberta Fabbri (Associate Professor, University of Florence, Italy), and Petr Stehlík (Associate Professor, University of West Bohemia, Pilsen, Czech Republic). The opponents appreciate the scientific level of the applicant's work, the high generality of the achieved results, and originality in proposing new mathematical problems and finding methods for their solution. The opponents commend that the obtained results can be used independently in other fields of mathematics, such as linear algebra (especially in matrix analysis) and in mathematical analysis.

Conclusion: The applicant's habilitation thesis **meet** the requirements expected of habilitation theses in the field of Mathematics - Mathematical Analysis.

Secret vote results

Voting took place: electronically

Number of board members		5
Number of votes cast		5
of which	in favour	5
	against	0

Board decision

Based on the outcome of the secret vote and following an evaluation of the applicant's scholarly or artistic qualifications, pedagogical experience and habilitation thesis, the board hereby submits a proposal to the Scientific Board of the Faculty of Science of Masaryk University to **appoint the applicant associate professor** of Mathematics - Mathematical Analysis.

In Brno on 15.11.2021

prof. RNDr. Zuzana Došlá, DSc.