Computational and Applied Mathematics

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Faculty	Faculty of Electrical Engineering and Computer Science
Type of study	Doctoral
Language of instruction	English
Code of the programme	P0541D170006
Regular period of the study	4 years
Coordinating department	Department of Applied Mathematics
Coordinator	doc. Ing. Dalibor Lukáš, Ph.D.
Keywords	Mathematical Modelling and HPC, Mathematical and Functional Analysis, Variation Methods and FEM, Optimization Methods, Statistics

About study programme

The study program combines studies with active work in the field of mathematics and with solving of problems. The problems students solve come from real life. The methods used for solving the problems benefit from new possibilities of computing and reflect current progress in the field of applied mathematics. Graduates find their employment in research departments of software companies and industry companies, in science institutions, or possibly at universities.

Doctoral study program is a part of Doctoral school that integrates Faculty of Mathematics and Physics of Charles University, Institute of Mathematics of the Czech Academy of Sciences, Faculty of Electrical Engineering and Computer Science of VSB – Technical University of Ostrava, and IT4Innovations National Supercomputing Center.

Graduate's employment

The graduates will apply especially in the research departments of software and industrial companies, in scientific institutions, or at universities. In the neighbourhood of Ostrava, there are mainly the following: Tieto, the National Supercomputing Center, the Institute of Geonics of the Academy of Sciences of the Czech Republic, etc.

Study aims

The aim of the graduate program is to provide education of highly qualified experts who are aware of the main results in their field of study, understand their role in the solution of real world problems, and are able to use their knowledge and experience to get new results. The students are assumed to exploit specific opportunities provided by the department, in particular contact with engineering research, cooperation with National Supercomputer Centre, local industry, and locally based software companies. They are also assumed to participate in international research projects using contacts with cooperating universities. Department of Applied Mathematics currently participates in the Graduate School Project with top Czech universities and research institutions and participates in organizations of winter schools.

The graduate program Computational and Applied Mathematics combines study with active research in the field of mathematics, concentrating on the topics motivated by the engineering practice, progress in computational technology, and new results in applied and numerical mathematics. The theses are assumed to contain new theoretical results or new algorithms, the effectivity of which will be tested by numerical experiments and/or by the solution of interesting real world problems.

Graduate's knowledge

The graduates from the study program should have deep and systematic knowledge and insight into the applied mathematics and

information technology in the extend corresponding current state of the art in the field. The should have practical knowledge of applied mathematics and some fields of applications. The knowledge of applied mathematics acquired during the graduate study is a suitable qualification also for various positions that require deep knowledge of mathematics, in particular in mechanical engineering, medicine, or electrical engineering.

Graduate's skills

The graduates from the study program should be able to find complex and innovative solutions to new challenging problems, assess new results and ideas, taking into account their long term effect, and identify their innovative potential. They should be able to develop and assess theoretical results, concepts, and methods, with understanding of their global effect.

Graduate's general competence

The graduates from the study program should be able to take decisions in new or varying circumstances, coordinate the teamwork, and take responsibility for the results. They should have communication skills, should be able to identify the core of problem, summarize the opinions of the members of the team, identify effective methods for the solution of given problems, and systematically approach complex problems.

Professions

- Academic staff member
- Mathematician
- Analyst – specialist
- Researcher
- Teacher/Instructor
- Statistician
- HPC specialist
- Research and development specialist
- Consultant
- Programmer - specialist
- Data scientist
- Data analyst

Hard skills

- Shape optimization
- Optimization methods
- Matlab
- Parallel programming
- OpenFOAM
- MPI
- OpenMP
- Regression analysis
- Dynamic systems
- R programming language
- PETSc
- Fortran
- Mathematical methods and analyses
- Quadratic programming
- Reliability theory
- Numerical methods

- Statistical methods
- Finite element method
- Statistical data analysis
- Linear programming
- HPC programming
- Numerical modelling
- Knowledge of mathematical models
- Work with data (big data)
- FETI methods
- Parallel data processing
- CUDA

Study curriculum

- form Full-time (en)
- form Part-time (en)