University of West Bohemia
Faculty of Applied Sciences

Doctoral Study

List of Courses

Department of Computer Science and Engineering

Computer Science and Engineering

Advanced Methods of Polygonal Mesh Processing
*Pokročilé metody zpracování polygonálních sítí*

**Doc. Ing. Libor Váša, Ph.D.**


Biomedical Information Systems
*Biomedicínské informační systémy*

**Doc. Dr. Ing. Jana Klečková**


Biomedical Visualization
*Biomedicínské vizualizace*

**Doc. Ing. Josef Kohout, Ph.D.**

The course focuses on providing the students with an introduction to methods and techniques specific to visualization of biomedical data sets of various kind and origin (e.g., CT and MRI scans, vector fields, ECG signals) so that they could design...
independently visualization solution to common problems in biomedicine such as coronal stenting, virtual colonoscopy, Alzheimer disease progression monitoring, etc.

**Component Models and Architectures**  
*Komponentové modely a architektury*  
**Doc. Ing. Přemysl Brada, MSc., Ph.D.**  

**Computational Geometry Algorithms and Applications**  
*Algoritmy a aplikace výpočetní geometrie*  
**Prof. Dr. Ing. Ivana Kolingerová**  
Selected algorithms of computational geometry, suitable, first of all, for computer graphics and its applications, but also for other specialisations in which geometric objects need to be handled (specialization is done according to the approximate student’s theme). Analysis and synthesis of algorithms from the given area. Use of these algorithms in applications. Examples of themes: data structures for geometrical objects modelling, geometric search, convex hulls, triangulations, duality, motion planning, robustness and effectivity of geometric algorithms.

**Communication in Computer Systems and Networks**  
*Komunikace v počítačových systémech a sítích*  
**Ing. Jiří Ledvina, CSc.**  

**Computer Graphics and Visualisation**  
*Počítačová grafika, vizualizace dat a informací*  
**Prof. Ing. Václav Skala, CSc.**  
Data structures, object modelling techniques, methods for objects representation and manipulation in E3 geometric transformations, fundamentals of projective geometry and geometry algebra, algorithm design and verification in special computational architectures, scalar ad vector fields, methods for technical, medical and information data processing for visualisation in E3 and in virtual collaborative environment.

**Design of Algorithms for Computer Graphics**  
*Návrh výpočetních algoritmů počítačové grafiky*  
**Prof. Ing. Václav Skala, CSc.**  
Data and information representation in En, Euclidean and affine spaces, stability and robustness of algorithms of computer graphics and visualisation. Algorithm design with respect to special architectures (CPU, GPU, CUDA, etc.). Geometry algebra principles and usage in computer graphics and visualisation algorithm design.
Distributed Computer Systems


Distributed Computing

Distributed computation independent of the underlying computing system. Distributed algorithms for understanding computing systems in different areas, e.g. information systems, scientific computing. Specification of their required behaviour, correctness and performance. Problems of resource allocation, data consistency, deadlock detection, leader election, causality and time, scheduling, routing.

Documentographical Information Systems


Fault-tolerant Computer Systems


Human – Computer Communication in Natural Language

Basic concepts of natural language processing and speech understanding, continuous and spontaneous speech recognition and speech synthesis system architectures; acoustic-phonetic and linguistic analysis of the speech, lexical-functional and generative grammars; natural language parsing methods, generative and interpretation semantics and internal sentence representation, continuous speech understanding, projection principle; natural language generation and synthesis; man-machine dialogue and dialogue system structures,
principles of dialogue control, natural dialogue system design and alternatives of its implementation.

**Knowledge Extraction from Large Data Sources**  
*Extrakce znalostí z rozsáhlých datových zdrojů*  
**Prof. Ing. Karel Ježek, CSc.**  

**Knowledge Engineering and Knowledge-based Systems**  
*Znalostní inženýrství a znalostní systémy*  
**Prof. Ing. Václav Matoušek, CSc.**  
Principles of knowledge acquisition, representation and utilization, searching of problem solving and its control, development of new knowledge; fundamentals of production systems, resolution refutation systems and rule-based deduction systems; inference system and inference control, reasoning under uncertainty, optimized methods of problem solving; structure, function and components of knowledge system, inference nets and influence diagrams; development and implementation of knowledge system structure, creation and implementation of knowledge and data bases, processing of uncertainty in knowledge and data; learning in knowledge based systems, methods of inductive learning, decision trees, net methods, learning algorithms implementation, knowledge based systems in pattern recognition and natural language understanding.

**Modelling of Performance and Reliability of Computing Systems**  
*Modelování výkonnosti a spolehlivosti výpočetních systémů*  
**Doc. Ing. Stanislav Racek, CSc.**  
The goal of the course is to provide survey of state of the art in the given area and to get knowledge of fundamental analytic and experimental methods used in construction and use of reliable and efficiency models of computing systems and programs. Probability based models of computer systems – Markov models, stochastic Petri nets, evaluation nets. Discrete-time simulation models – principles of construction. Computer system performance and reliability prediction using models of various types.

**Modern Programming Styles and Methods**  
*Moderní programovací styly a metody*  
**Doc. Ing. Pavel Herout, Ph.D.**  
Object orientated analysis, design and implementation of large software applications. Theory and practice of markup languages. Scripting languages. Programming of embedded systems. Fail-safe and fault-tolerant software applications.
Nonlinguistic Aspects of Speech
Nonlingvistické aspekty řeči
Doc. Dr. Ing. Jana Klečková
Suprasegmental features of the sound design of language and speech. Specific properties of prosodic phenomena; general principles of their description for computer speech processing; design of databases. Current approaches to the phenomenological description of intonation (metric theory, intonation systems). Application of the universal properties of speech production and perception from the point of view of sound variability; coding of the Czech pronunciation, speech samples. Possible application of nonverbal communication in the continuous speech processing system. Multimodal emotion recognition (facial expressions, linguistic and prosody analysis and expressivity analysis, gesture recognition.

Pattern Analysis and Understanding
Klasifikace a rozpoznávání objektů
Doc. Ing. Václav Matoušek, CSc.
Principal approach to pattern recognition, types of patterns, signal representation and preprocessing, segmentation methods, classification problem, general recognition strategies; data structures and databases for patterns, main control structures and their implementation, knowledge and learning in pattern recognition, learning concepts; neural net based recognition methods and systems.