Study program : Informatics

Type and level of studies : Undergraduate academic studies

Course unit : Parallel Programming

Teacher in charge : Miloš Ivanović

Language of instruction: English

ECTS: 6

Prerequisites: basics of programming in C and data structures, basics of computer architecture

Semester : Summer Semester

Course unit objective

The main aim of the subject is to enable acquiring of the relevant theoretical and practical knowledge in the field of distributed computing systems and parallel programming using MPI (Message Passing Interface), and, to some extent, OpenMP. A ny CS student who passes this exam should be able to participate in R&D and commercial projects involving parallel and distributed processing.

Learning outcomes of Course unit

Students will be able to develop and implement following topics in the field of parallel programming:

- Architecture of the parallel computing systems
- Interconnection topologies
- Problem decomposition strategies
- Distributed memory programming using MPI (Message Passing Interface)
- Communication paradigms in MPI
- Examples of parallel strategies using well known algorithms
- Introduction to OpenMP (Open MultiProcessing)

Course unit contents

Theoretical classes

History of paralell computing; Modern parallel computers; Interconnection topologies; Flynn's taxonomy; Foster's methodology of the algorithm design; MPI programming; P2P and collective communications; Sieve of Eratosthenes; Floyd-Warshall algorithm; Document classification; Performance analysis; Amdahl's law, Amdahl's effect, Gustaffson-Barsis Law, Karp-Flatt metrics; Isoeficiency metrics; Parallel Random Numer Generators; Monte-Carlo methods;

Practical classes

Practical classes closely follow topics mentioned in the theoretical part. Most of the examples are implemented in C/MPI, with an addition of C++ coupled with Boost.MPI helper library.

Literature

- M.J. Quinn, Parallel programming in C with MPI and OpenMP, Mc Graw. Hill, 2003.

Number of active teaching hours				**Other classes**
Lectures: 2	Practice: 3	Other forms of classes:	Independent work:	

Teaching methods

Classical, case study, individual research

Examination methods (maximum 100 points)

Exam prerequisites	**No. of points:**	**Final exam**	**No. of points:**
Student’s activity during lectures	**4**	oral examination	**50**
practical classes/tests	**46**	written examination	/
Seminars/homework	/		
Project	/		

Other			
Grading system			
Grade	**No. of points**	**Description**	
10	**91-100**	Excellent	
9	**81-90**	Exceptionally good	
8	**71-80**	Very good	
7	**61-70**	Good	
6	**51-60**	Passing	
5	**0-50**	Failing	