Study Programme: Ph.D. in Computer Science
Course Unit Title: Parallel Programming
Course Unit Code: ID019
Name of Lecturer(s): Srđan Škrbić
Type and Level of Studies: Doctoral Academic Degree
Course Status (compulsory/elective): Elective
Semester (winter/summer): Winter
Language of instruction: Serbian (primary), English (secondary)
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 7
Prerequisites: None

Course Aims:
Parallel processing is being seen as the only cost-effective method for the fast solution of computationally large and data-intensive problems. That is why the objective of this course is to study the principles, tools at the advanced level for programming of wide variety of parallel platforms currently available and to study the basics of parallel programming usage in science.

Learning outcomes
Minimal: At the end of the course, it is expected that students understand and show ability to discuss advantages and disadvantages of different parallel architectures and paradigms and their science applications. The knowledge of parallel programming using the message passing paradigm is a must for every student.
Desirable: At the end of the course, it is expected that a successful student understand solutions to key problems in parallel programming and shows ability to identify the optimal way of solving particular given problem using parallel programming. From a successful student is also expected to have active knowledge of advanced concepts of parallel programming using the message passing paradigm, as well as their usage in solutions to different science problems that cannot be solved using serial computation.

Syllabus
At the beginning of the course, parallel architectures and platforms are examined. In the next part of the course, advanced principles of design of parallel algorithms, decomposition techniques and models of parallel algorithms are studied. Next part of the course is devoted to matrix algorithms and basics of numerical linear algebra as basic tools for science applications. The final part of the course is dedicated to details related to parallel programming using the message passing paradigm.

Required Reading:

1. Grama, A., Gupta, A., Karypis, G., Kumar, V.: Introduction to Parallel Computing, 2nd Edition, Addison-Wesley, 2003.
2. Pacheco, P.: An Inproduction to Parallel Programming, Morgan Kaufmann, 2011.
3. Karniadakis G, Kirby, R.: Parallel Scientific Computing in C++ and MPI, Cambridge University Press, 2002.
4. Pacheco, P.: A User's guide to MPI, University of San Francisco, 1998.
5. Trefethen, L., Bau, D.: Numerical Linear Algebra, SIAM: Society for Industrial and Applied Mathematics, 1997.

Weekly Contact Hours: 2	**Lectures:** 2	**Practical work:** 0

Teaching Methods:
Lectures are organized using classic teaching methods with use of a projector. Students independently explore various research topics, present and discuss results with other students and the lecturer.

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	**Final exam**	points
Seminar paper	60	oral exam	40