Specification for the book of courses

Study program	Electronics and Microsystems		
Module	Electronics and Microsystems		
Type and level of studies	Master studies		
The name of the course	Advanced Microprocessor Architectures		
Lecturer (for lectures)	Nikolić R. Tatjana		
Lecturer/associate (for exercises)	Nikolić R. Tatjana		
Lecturer/associate (for OFE)	Nikolić R. Tatjana		
Number of ECTS	5	**Course status (obligatory/elective)**	Elective
Prerequisites			
Course objectives	Introducing students with current trends and future directions for the development of microprocessor architectures. The study material refers to a high-performance processor and various techniques of parallelism that are implemented at the thread-level and process-level.		
Course outcomes	a) Acquiring knowledge of modern multicore on-chip microprocessor, b) Ability to design and program homogeneous and heterogeneous multiprocessor systems-on-chip, c) Creating multithread programs, performance evaluation using code profiler and debugging code, d) Architecture and software design of application-specific processor.		
Course outline			
Theoretical teaching	Trends in scaling technology. Techniques to improve performance. Reducing energy consumption. Operating modes for saving energy in a microprocessor. Throughput increasement. Multiprocessor systems. Physical and logical connection of computer resources. Basic concepts of parallel programming. Parallelism at different levels. Concurrent and distributed systems. Process. Thread. Data communication and synchronization. Forms of parallel programming. Structure of the program. Multicore processor architectures. Multicore system programming. Manycore processors. Characteristics of symmetric and asymmetric multiprocessor architectures. Application specific processors. Data level parallelism with SIMD and GPU architecture. Programming manycore systems using OpenCL, OpenMP and MPI.		
Practical teaching (exercises, OFE, study and research	During implementation of the plan and program the students need independently to do the following exercises: 1) performance evaluation of the system with parallel execution of program sections, 2) creating a thread, 3) creating parallel-sequential programs, 4) usage of parallel library program for multicore machines, 5) creating a code with threads by modification of the serial code, 6) creating complex multithread parallel programs.		
Textbooks/references			
1	Advanced microprocessor architectures, PowerPoint presentations for all lectures, available on the website of the course		
2	Mile Stojčev, Emina Milovanović, Tatjana Nikolić, Multi- and many-core system on chip, Faculty of Electronic Engineering Niš, in Serbian, 2012.		
3	J. L. Hennessy, D. A. Patterson, Computer Architecture: A Quantitative Approach (5th Edition), Morgan Kaufmann, 2012.		
4	Barbara Chapman, Gabriele Jost, Ruud van der Pas, Using OpenMP, Portable Shared Memory Parallel Programming, The MIT Press, Cambridge, MA, 2008.		
5	Michel Dubois, Murali Annavaram, Per Stenstrom, Parallel Computer Organization and Design, Cambridge University Press, 2012.		

Number of classes of active education per week during semester/trimester/year

Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	2	1		
Teaching methods	Lectures, exercises, labs, homeworks, colloquia, projects, consultations			

Grade (maximum number of points 100)

Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures		**Written exam**	20
Exercises	20	**Oral exam**	20
Colloquia	20		
Projects	20		