

**AGH**AGH UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Code: UBPJO-126 Module name: Modern computer architectures

Academic year: 2013/2014 Semester: Spring, Fall ECTS credits: 4

Programme: University Base of Courses in English

Course homepage: <https://intcourses.agh.edu.pl/> Lecture language: English

Responsible teacher: prof. dr hab. inż. Kitowski Jacek (kito@agh.edu.pl)

Academic teachers: prof. dr hab. inż. Kitowski Jacek (kito@agh.edu.pl)

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Method of learning outcomes verification (form of completion)
Social competence		
M_K001	Students are prepared for discussions	Activity during classes
Skills		
M_U001	Students are prepared for individual and group work to acquiring knowledge and facts from open publications.	Report
Knowledge		
M_W001	Students have knowledge on multiprocessor computer architectures	Examination
M_W002	Students have general knowledge on programming paradigms depending on the hardware construction and on fields of usage of high performance systems	Examination

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes
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		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Others	Fieldwork classes	Workshops	E-learning
Social competence												
M_K001	Students are prepared for discussions	+	-	-	-	-	-	-	-	-	-	-
Skills												
M_U001	Students are prepared for individual and group work to acquiring knowledge and facts from open publications.	+	-	-	-	-	-	-	-	-	-	-
Knowledge												
M_W001	Students have knowledge on multiprocessor computer architectures	+	-	-	-	-	-	-	-	-	-	-
M_W002	Students have general knowledge on programming paradigms depending on the hardware construction and on fields of usage of high performance systems	+	-	-	-	-	-	-	-	-	-	-

Module content

Lectures

To acquaint students with problems of hardware construction and usage of modern systems

- 1.Origins for high performance computations, typical scientific and engineering problems - 4h
- 2.Performance metrics (SPEC, Linpack, HPCG) - 2h
- 3.Basics of computer calculations, speedup and efficiency of parallel computations - Amdahl's Law - 2h
- 4.Overview of current types of microprocessors (RISC, CISC, GPGPU), pipelining,, superscalar, threads, multicores), examples - 4h
- 5.Overview of models of parallel computations, mapping to architecture - 4h
- 6.Computer organization, taxonomies (models) of multiprocessor computers - 2h
- 7.Control mechanism (SIMD, MIMD), organization of operational memory (distributed, SM, DSM) - 2h
- 8.Computation granularity, organization of communications layer (static, dynamic) - 2h
- 9.Cluster and distributed architecture - 2h
- 10.Commercial examples - 2h
- 11.Overview of models of parallel computations, mapping to architecture - 4h
- 12.SOA and Grid paradigms - 2h
- 13.Current trends in high performance computations - 2h

Method of calculating the final grade

Based on exam marks:

if mark > 4.75, then final mark = 5.0, else

if mark > 4.25, then final mark = 4.5, else

if mark > 3.75, then final mark = 4.0, else

if mark > 3.25, then final mark = 3.5, else

final mark = 3

Prerequisites and additional requirements

Basic knowledge of C/C++ programming languages, microprocessors and concurrency

Recommended literature and teaching resources

1.D. E. Culler, J. Pal Singh „Parallel Computer Architecture”, Morgan Kaufmann, 1999

2.S. Kozielski, Z. Szczerbiński „Komputery równoległe, architektura i elementy oprogramowania”, WNT 1993

3.D.A. Patterson, J.L. Hennessy, “Computer Organization and Design - The hardware/software interface”, Morgan Kaufmann, Elsevier, 2009

4.W. Stallings, “Organizacja i architektura systemu komputerowego. Projektowanie systemu a jego wydajność”, WNT, 2004

5.R. Wyrzykowski, „Klasy komputerskich PC i architektury wielordzeniowe: Budowa i wykorzystanie”, EXIT 2009

6.A. Karbowski (Ed.), „Obliczenia Równoległe i Rozproszone”, Oficyna Wydawnicza Politechniki Warszawskiej, 2001.

7.Z. Czech „Wprowadzenie do obliczeń równoległych”, PWN, 2010

8.L. Null, J. Lobur, “Struktura organizacyjna i architektura systemów komputerowych”, Helion, 2004

9.L. Ridgway Scott, T. Clark, and B. Bagheri, „Scientific Parallel Computing”, Princeton University Press, 2005

10.D. B. Kirk, Wen-mei W. Hwu, „Programming Massively Parallel Processors”, Morgan Kaufmann, Elsevier, 2010.

Scientific publications of module course instructors related to the topic of the module

Additional scientific publications not specified

Additional information

Individuals with any disability, either permanent or temporary, which might affect performance in this class are encouraged to inform the instructor at the start of the quarter. Adaptation of methods, materials, or testing may be made as required to provide for equitable participation.

Student workload (ECTS credits balance)

Student activity form	Student workload
Preparation for classes	15 h
Realization of independently performed tasks	30 h
Participation in lectures	28 h
Preparation of a report, presentation, written work, etc.	15 h
Contact hours	15 h
Summary student workload	103 h
Module ECTS credits	4 ECTS