AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Module name: Advances in Computer Science

Academic year: 2019/2020 Code: ZSDA-3-0061-s ECTS credits: 5

Faculty of: Szkoła Doktorska AGH

Field of study: Szkoła Doktorska AGH Specialty: —

Study level: Third-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 0

Course homepage: —

Responsible teacher: dr inż. Bubak Marian (bubak@agh.edu.pl)

Module summary

The aim of this subject is to familiarize PhD students with current, valuable trends in computer science on the example of research conducted in the Department of Computer Science. The course includes 10 lectures, 3 hours each, conducted by selected employees of the Department of Computer Science and scientists visiting it (30 hours in total) and a seminar (30 hours). On the basis of these lectures, PhD students study, develop and present selected topics at the seminars..

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence: is able to			
M_K001	Ability to collaborate and to share knowledge and experience during the research process	SDA3A_K01, SDA3A_K03	Activity during classes
Skills: he can			
M_U001	Is able to present results of research in English and in a form used during scientific conferences	SDA3A_U05	Presentation
Knowledge: he knows and understands			
M_W001	Understanding of basic research methods in computers science	SDA3A_W03	Presentation
M_W002	Getting knowledge of recent valuable trends in computer science	SDA3A_W02	Activity during classes

Number of hours for each form of classes

	Form of classes										
Suma	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
60	30	0	0	0	0	30	0	0	0	0	0

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										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
Social competence: is able to												
M_K001	Ability to collaborate and to share knowledge and experience during the research process	+	-	-	-	-	+	-	-	-	-	-
Skills: he can												
M_U001	Is able to present results of research in English and in a form used during scientific conferences	-	-	-	-	-	+	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	Understanding of basic research methods in computers science	+	-	-	-	-	+	-	-	-	-	-
M_W002	Getting knowledge of recent valuable trends in computer science	+	-	-	-	-	+	-	-	-	-	-

Student workload (ECTS credits balance)

Student activity form	Student workload
Udział w zajęciach dydaktycznych/praktyka	60 h
Preparation for classes	30 h
przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania	30 h
Realization of independently performed tasks	10 h
Examination or Final test	2 h
Contact hours	3 h
Summary student workload	135 h
Module ECTS credits	5 ECTS

Additional information

Module content

Lectures

Topics of lectures

1.Advanced algorithms for computer simulations with B-splines and Non-Uniform 1. Rational B-splines (NURBS) in the frame of isogeometric analysis.
Maciej Paszyński
2.Methods and algorithms of high-dimensional data and complex networks embedding – the role of interactive data visualisation in data science.
Witold Dzwinel
3.Challenges of high performance software construction for the 5G systems and next generation cloud applications
Krzysztof Zieliński
4.Nature-inspired computing: state-of-the-art solutions and current trends.
Aleksander Byrski, Marek Kisiel-Dorohinicki
5.Solving large scale applications scheduling problems with mathematical programming methods.
Maciej Malawski
6.High Performance Computing, environments and software tools for computational science and Big Data problems.
Jacek Kitowski
7.Selected problems of computational network science: graph models, social network analysis, community detection, identification of roles, graph matching, identification of frequent patterns and anomalies in dynamic graphs, prediction of graph evolution.
Jarosław Kożlak
8.Introduction to computer-aided decision making: how to enhance with computer science
methods an efficient elaboration of the final decision of a team of decision makers.
Grzegorz Dobrowolski
9.Stochastic algorithms of huge data inversion.
Robert Schaefer
10.Cognitive computing – systems that learn, reason and interact with humans

naturally.
Bogdan Kwolek
11.Integrating cognitive science in developing emerging technologies: some case studies.
Bipin Indurkhya, Bartlomiej Sniezynski
12.Overview of recent developments in quantum computing and quantum informatics
Marian Bubak, Katarzyna Rycerz

Seminar classes

Topics of seminars
1. Short PhD students presentations of their research topics as the first step of exchange of ideas and knowledge.
2-9. Eight seminars devoted to presentations of a selected topics based on lectures, students experience, and overview of computer science journals.
10. Final seminar: presentations of students achievements in their PhD researches and assessment of knowledge exchange

Teaching methods and techniques:
Lectures: lecture, discussion
Seminar classes: Presentations, discussions, overviews

Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:
Student should be present at least at 5 seminars and give 2 presentations on her/his PhD, 3 on lecture topics, and 2 overviews of selected computer science journals.

Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:
Lectures:
– Attendance is mandatory: No
– Participation rules in classes: PhD student should be present at least at 5 lectures
Seminar classes:
– Attendance is mandatory: Yes
– Participation rules in classes: PhD student should be present at least at 5 seminars

Method of calculating the final grade
The final grade is the average grade of presentations and student’s activity.

Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:
By participation in the next seminar meeting.

Prerequisites and additional requirements
None

Recommended literature and teaching resources
Will be presented during each of lectures.

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

K. Rycerz, M. Bubak, E. Ciepiela, D. Harezlak, T. Gubala, J. Meizner, M. Pawlik, B. Wilk: Composing, Execution and Sharing of Multiscale Applications, Future Generation Computer Systems, 53, 77-87, 2015
M. Kasztelnik, E. Coto, M. Bubak, M. Malawski, P. Nowakowski, J. Arenas, A. Saglimbeni, D. Testi, A. F. Frangi: Support for Taverna Workflows in the VPH-Share Cloud Platform, Computer Methods and Programs in Biomedicine, 146, 37-46, 2017
P. Nowakowski, M. Bubak, T. Bartyński, T. Gubała, D. Harężlak, M. Kasztelnik, M. Malawski, J. Meizner: Cloud computing infrastructure for the VPH community, Journal of Computational Science, 24, 169-179, 2018
as well as publications of the above listed professors – authors of 10 lectures.

Additional information

PhD students will be asked to participate in conferences at the Department of Computer Science as well as in selected PhD defenses; their observations will be discussed at seminars.