SYLLABUS OF A MODULE

Polish name of a module	**Metodyka i metodologia badań naukowych**
English name of a module	**Methodology of scientific research**
ISCED classification - Code	0613
ISCED classification - Field of study	*Software and applications development and analysis*
Languages of instruction	*English*
Level of qualification: ***1 – BSc (EQF 6)*** ***2 – MSc (EQF 7)*** ***3 – PhD (EQF 8)***	*2*
Number of ECTS credit points	*3*
Examination: ***EO – exam oral*** ***EW – exam written*** ***A - assignment***	*A*
Available in semester: ***S – Spring only*** ***A – autumn only*** ***Y - booth***	*A*

Number of hours per semester:

Lecture	Exercises	Laboratory	Seminar	E-learning	Project
15	0	15	0	0	0

MODULE DESCRIPTION

MODULE OBJECTIVES

O1. Obtaining knowledge in the area of scientific research.

O2. Familiar with methods of obtaining scientific material, providing its deeply analysis and formulate conclusions.

O3. Acquisition by students skills to work independently and in a team, develop reports, analyze the results, etc.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of computer architecture and operating systems.
2. Basic knowledge of the theory of algorithms and data structures.
3. Ability of C++ and Java programming.
4. Ability to use different sources of information and technical documentation.
5. Ability to work independently and in a group.
6. Ability to correctly interpret and present their own activities.

LEARNING OUTCOMES

LO 1 – has competences to work individually and in a team, has the ability to estimate the time required to perform ordered tasks.

LO 2 – has ordered, theoretically founded knowledge including methods of conducting scientific research.

LO 3 – able to plan and conduct research in the field of simple research problems.

MODULE CONTENT

Type of classes – lecture	**Number of hours**
Lec 1 - The difference between science and engineering	**1**
Lec 2 - Current challenges facing science	**1**
Lec 3 - Introduction to scientific research methodology	**1**
Lec 4 - Selected problems and its analysis (in the area of Artificial Intelligence)	**1**
Lec 5 - Selected problems and its analysis (in the area of High Performance Computing)	**1**
Lec 6 - Selected problems and its analysis (in the area of multimedia processing)	**1**
Lec 7 - Performance metrics of research computation – hardware analysis	**1**
Lec 8 - Current hardware used in research computation (CPU, GPU, FPGA, …)	**1**
Lec 9 - Performance metrics of research computation – software analysis	**1**
Lec 10 - Models of algorithm characteristics and design (Roofline, PCAM, ...)	**1**
Lec 11 - Analysis of performance of scientific problems	**1**
Lec 12 - Analysis of energy consumption of scientific problems	**1**
Lec 13 - Analysis of accuracy results of scientific problems	**1**
Lec 14 - Hypothesis, solutions and conclusions formulation for given problems	**1**
Lec 15 - Unsolved problems in computer of science	**1**
Sum	**15**
Type of classes – laboratory	**Number of hours**
Lab 1 - Introduction to methodology of scientific research	**1**
Lab 2 - Tools (software and resources) for computer science researchers	**1**
Lab 3 - Data collection methods in scientific research	**1**
Lab 4 - Analysis, profiling and optimization of Artificial Intelligence problems	**1**
Lab 5 - Analysis, profiling and optimization of High Performance Computing problems	**1**
Lab 6 - Analysis, profiling and optimization of problems of multimedia processing	**1**
Lab 7 - Hardware analysis – strengths and limitations	**1**
Lab 8 - Comparison of different hardware solutions between CPU and GPU	**1**
Lab 9 - Algorithm analysis – requirements, bound conditions, methods of development	**1**
Lab 10 - Roofline model for selected algorithms and architectures	**1**
Lab 11 - Performance evaluation of scientific computing	**1**
Lab 12 - Energy consumption of scientific computing	**1**
Lab 13 - Analysis of results accuracy in scientific computing	**1**
Lab 14 - Hypothesis, solutions and conclusions formulation for given problems	**1**
Lab 15 - Summary test	**1**
Sum	**15**

TEACHING TOOLS

1. – multimedial presentations for lectures
2. – instructions for laboratories
3. – wide range of algorithm and programming tools
4. – workplaces for students equipped with workstations

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE)

F1. - evaluation of reports on the implementation of exercises covered by the curriculum
S1. - assessment of the ability to solve the problems posed and the manner of presentation obtained results - pass mark *
S2. - assessment of mastery of the teaching material being the subject of the lecture

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
1.	**Contact hours with teacher**	
1.1	Lectures	15
1.2	Tutorials	
1.3	Laboratory	15
1.4	Seminar	
1.5	Project	
1.6	Examination	
	Total number of contact hours with teacher:	30
2.	**Student's individual work**	
2.1	Preparation for tutorials and tests	10
2.2	Preparation for laboratory exercises, writing reports on laboratories	10
2.3	Preparation of project	
2.4	Preparation for final lecture assessment	10
2.5	Preparation for examination	
2.6	Individual study of literature	15
	Total number of hours of student's individual work:	45
	Overall student's workload:	75
Overall number of ECTS credits for the module		3 ECTS
Number of ECTS points that student receives in classes requiring teacher's supervision:		1.24 ECTS
Number of **ECTS** credits acquired during practical classes including laboratory exercises and projects:		1.1 ECTS

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. - C. Wohlin et al., Experimentation in Software Engineering, Springer, 2012
2. - E.R Khan et al., Research Methods of Computer Science, Laxmi Publications, 2015

MODULE COORDINATOR (NAME, SURNAME, E-MAIL ADDRESS)

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