

SYLLABUS OF A MODULE

Polish name of a module	Metodologia badań naukowych
English name of a module	Methodology of scientific research
ISCED classification - Code	0612
ISCED classification - Field of study	<i>Database and network design and administration</i>
Languages of instruction	<i>English</i>
Level of qualification:	2
Number of ECTS credit points	4
Examination:	A
Available in semester:	A

Number of hours per semester:

Lecture	Tutorial	Laboratory	Seminar	Project	Others
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. Knowledge of mathematics.
2. Basics of computer skills.
3. Rational and logical thinking.

4. Ability to perform mathematical operations to solve given tasks.
5. Ability to use various sources of information including manuals and technical documentation.
6. Ability to correctly interpret and present their own actions.

LEARNING OUTCOMES

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

LO 2 - able to determine further directions of learning and raising professional qualifications.

LO 3 - understand the need for further education, as well as raising professional, personal and social competences.

LO 4 - has ordered, theoretically founded knowledge including methods of conducting scientific research.

LO 5 - able to plan and conduct research in the field of simple research problems.

MODULE CONTENT

Lectures		Hours
Lect. 1	The difference between science and engineering (Różnica między nauką a inżynierią)	1
Lect. 2	Current challenges facing science (Aktualne wyzwania stojące przed nauką)	1
Lect. 3	Introduction to scientific research methodology (Wprowadzenie do metodologii badań naukowych)	1
Lect. 4	Selected problems and its analysis (in the area of Artificial Intelligence) (Wybrane problemy i ich analiza (w obszarze sztucznej inteligencji))	1

Lect. 5	Selected problems and its analysis (in the area of High Performance Computing) (Wybrane problemy i ich analiza (w obszarze High Performance Computing))	1
Lect. 6	Selected problems and its analysis (in the area of multimedia processing) (Wybrane problemy i ich analiza (w zakresie obróbki multimediów))	1
Lect. 7	Performance metrics of research computation – hardware analysis (Miary wydajności obliczeń badawczych - analiza sprzętu)	1
Lect. 8	Current hardware used in research computation (CPU, GPU, FPGA, ...) (Aktualny sprzęt używany w obliczeniach badawczych (CPU, GPU, FPGA...))	1
Lect. 9	Performance metrics of research computation – software analysis (Miary wydajności obliczeń badawczych - analiza oprogramowania)	1
Lect. 10	Models of algorithm characteristics and design (Roofline, PCAM, ...) (Modele charakterystyk algorytmów i konstrukcji (Roofline, PCAM, ...))	1
Lect. 11	Analysis of performance of scientific problems (Analiza realizacji problemów naukowych)	1
Lect. 12	Analysis of energy consumption of scientific problems (Analiza energochłonności problemów naukowych)	1
Lect. 13	Analysis of accuracy results of scientific problems (Analiza trafności wyników problemów naukowych)	1
Lect. 14	Hypothesis, solutions and conclusions formulation for given problems (Hipotezy, rozwiązania i formułowanie wniosków dla zadanych problemów)	1
Lect. 15	Unsolved problems in computer of science (Nierozwiązane problemy w informatyce)	1
Laboratories		Hours
Lab. 1	Introduction to methodology of scientific research (Wprowadzenie do metodologii badań naukowych)	1

Lab. 2	Tools (software and resources) for computer science researchers (Narzędzia (oprogramowanie i zasoby) dla badaczy informatyki)	1
Lab. 3	Data collection methods in scientific research (Metody zbierania danych w badaniach naukowych)	1
Lab. 4	Analysis, profiling and optimization of Artificial Intelligence problems(Analiza, profilowanie i optymalizacja problemów sztucznej inteligencji)	1
Lab. 5	Analysis, profiling and optimization of High Performance Computing problems (Analiza, profilowanie i optymalizacja problemów wysokowydajnych komputerów)	1
Lab. 6	Analysis, profiling and optimization of problems of multimedia processing (Analiza, profilowanie i optymalizacja problemów przetwarzania multimediiów)	1
Lab. 7	Hardware analysis – strengths and limitations (Analiza sprzętu - mocne strony i ograniczenia)	1
Lab. 8	Comparison of different hardware solutions between CPU and GPU (Porównanie różnych rozwiązań sprzętowych między procesorem a GPU)	1
Lab. 9	Algorithm analysis – requirements, bound conditions, methods of development (Analiza algorytmów - wymagania, warunki brzegowe, metody tworzenia)	1
Lab. 10	Roofline model for selected algorithms and architectures (Model linii dachu dla wybranych algorytmów i architektur)	1
Lab. 11	Performance evaluation of scientific computing (Ocena wydajności obliczeń naukowych)	1
Lab. 12	Energy consumption of scientific computing (Zużycie energii przez obliczenia naukowe)	1
Lab. 13	Analysis of results accuracy in scientific computing (Analiza dokładności wyników w obliczeniach naukowych)	1
Lab. 14	Hypothesis, solutions and conclusions formulation for given problems (Hipotezy, rozwiązania i formułowanie wniosków dla zadanych problemów)	1

Lab. 15	Summary test (Test podsumowujący)	1
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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. – one midterm exam for laboratory
F2. – one in-class quiz
F3. – one take-home quiz
P1. – the final grade is based on the knowledge and skills gained from lectures and laboratories

*) warunkiem uzyskania zaliczenia jest otrzymanie pozytywnych ocen ze wszystkich ćwiczeń laboratoryjnych,

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	0
1.3	Laboratory	15
1.4	Seminar	0
1.5	Project	0
Total number of contact hours with teacher:		30
2.	Student's individual work	
2.1	Preparation for tutorials and tests	0

2.2	Prreparation for laboratory exercises, writing reports on laboratories	29
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	11
2.5	Preparation for examination	0
2.6	Individual study of literaturę	30
Total numer of hours of student's individual work:		70
Overall student's workload:		100
Overall number of ECTS credits for the module		4
Number of ECTS points that student receives in classes requiring teacher's supervision:		1,2
Number of ECTS credits acquired during practical classes including laboratory exercises and projects :		0,6

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, INSTITUTE, E-MAIL ADDRESS)

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