FACULTY OF COMPUTER SCIENCE AND MANAGEMENT / DEPARTMENT…

**SUBJECT CARD**

**Name in Polish Fizyczne podstawy współczesnej informatyki**

**Name in English Introduction to Physics of Computer Science**

**Main field of study (if applicable): Computer Science**

**Specialization (if applicable):**

**Level and form of studies~~: 1st~~/ 2nd* level, full-time /~~ part-time*~~**

**Kind of subject: obligatory ~~/ optional / university-wide*~~**

**Subject code INZ0156WsW EN**

**Group of courses YES / ~~NO~~***

| | Lecture | Classes | Laboratory | Project | Seminar |
|---|---|---|---|---|---|
| Number of hours of organized classes in University (ZZU) | 15 | | | | 15 |
| Number of hours of total student workload (CNPS) | 60 | | | | 60 |
| Form of crediting | ~~Examination /~~ crediting with grade* | Examination / crediting with grade* | Examination / crediting with grade* | Examination / crediting with grade* | ~~Examination~~ / crediting with grade* |
| For group of courses mark (X) final course | X | | | | |
| Number of ECTS points | 2 | | | | 2 |
| including number of ECTS points for practical (P) classes | | | | | |
| including number of ECTS points for direct teacher-student contact (BK) classes | 1,2 | | | | 1,2 |

*delete as applicable

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES**

1. None

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**SUBJECT OBJECTIVES**

C1 Educating the abilities of understanding the principles of physics of Computer Science.

C2 Educating the competences in the scope of understanding physical nature of information and thermodynamics of information media.

C3 Acquiring the knowledge of physics of the telecommunication media, principles of physics of storages, and physical nature of computing machines.

C4 Providing knowledge of contemporary trends in the scope of new data security solutions, algebraic and quantum cryptography and security with use group, field and character theory.

C5 Providing the knowledge of the nature of quantum information.

C6 Acquiring the knowledge of physical nature of bioinformatics.

**SUBJECT EDUCATIONAL EFFECTS**

relating to knowledge:

PEK_W01 Student has a knowledge about of physical principles of contemporary computer science.

PEK_W02 Student has a knowledge about the physical nature of information and thermodynamics of informational media.

PEK_W03 Student knows physical phenomena used for creating storage devices.

PEK_W04 Student has knowledge of quantum information and quantum information processing.

PEK_W05 Student has a knowledge of classical and quantum gates, quantum computers, and physical principles of bioinformatics.

relating to skills:

PEK_U01 Student has an ability to understand contemporary solutions in computer science based on physics of computer science.

relating to social competences:

PEK_K01 Student has competence for solving ethical and society problems related to physical nature of computer science.

**PROGRAMME CONTENT**

| Form of classes - lecture | | Number of hours |
|---|---|---|
| Lec 1 | Introduction. Great discoveries in physics and mathematics leading to originate of computer science. | 2 |
| Lec 2 | Physical nature of information. Thermodynamics of informational media. Physics and computer software. | 2 |
| Lec 3 | Physics of telecommunication media. | 2 |
| Lec 4 | Physical nature of data storages. Materials for creating data storages. Ferromagnetics, ferroelectrics and ferroelstics. Physics of computing machines, bases. | 2 |
| Lec 5 | Quantum physics and quantum information. | 2 |
| Lec 6 | Classical and quantum gates. Quantum computers. | 2 |
| Lec 7 | Final test. | 1 |
| Lec 8 | Biophysics and bioinformatics. | 2 |
| | Total hours | 15 |

| Form of classes - class | | Number of hours |
|---|---|---|
| Cl 1 | | |
| Cl 2 | | |
| Cl 3 | | |
| Cl 4 | | |
| .. | | |
| | Total hours | |

| Form of classes - laboratory | | Number of hours |
|---|---|---|
| Lab 1 | | |
| Lab 2 | | |
| Lab 3 | | |

| | | |
|---|---|---|
| Lab 4 | | |
| Lab 5 | | |
| … | | |
| | Total hours | |

| **Form of classes - project** | | **Number of hours** |
|---|---|---|
| Proj 1 | | |
| Proj 2 | | |
| Proj 3 | | |
| Proj 4 | | |
| … | | |
| | Total hours | |

| **Form of classes - seminar** | | **Number of hours** |
|---|---|---|
| S1-S6 | Presentation of additional and extended subject matter of lectures content | 12 |
| S7 | Final test | 1 |
| S8 | Presentation of the foreseeable future of the cyber physics | 2 |
| | | |
| | | |
| | | |
| | | |
| | | |

**TEACHING TOOLS USED**

N1. Multimedia presentations
N2. The course Web page
N3. Electronics and paper books and library references

**EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT**

| **Evaluation** (F – forming (during semester), P – concluding (at semester end) | Educational effect number | Way of evaluating educational effect achievement |
|---|---|---|
| F1<br>F2 | PEK_W01-PEK_W05 | Short tests, final test<br>Oral presentations, reports prepared by student, personal and science activity |
| C=(F1+F2)/2 | | |

**PRIMARY AND SECONDARY LITERATURE**

## PRIMARY LITERATURE:

[1] Aaronson S.: Quantum computing since Democritus.Cambridge University Press 2013.
[2]. Feynmann R.: The Feynman Lectures on Physics. Basic Books; Slp edition. 2011.
[3] Pardalos P.M., Principe J.C.: Biocomputing. Springer 2002.

## SECONDARY LITERATURE:

[1] Rohrkemper R.: Effective Topologies for Computation in Cortex-like Networks: Tools for evaluating computational richness and robustness/ LAP LAMBERT Academic Publishing 2012.
[2] Yanofsky N.S.: Quantum Computing for Computer Scientists. Cambridge University Press 2008.
[3] Stakhov A.: Mathematics of Harmony: From Euclid to Contemporary Mathematics and Computer Science. World Scientific Publishing 2009.
[4] Selected science papers.

## SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

**Arkadiusz Liber, PhD**
**Arkadiusz . Liber / at / pwr . wroc . pl**

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT

**……**

AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY

……..

AND SPECIALIZATION ……..

| Subject educational effect | Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)** | Subject objectives*** | Programme content*** | Teaching tool number*** |
|---|---|---|---|---|
| **PEK_W01** | K2INF_W01 | C1-C6, | Lec1-Lec8,S1-S8 | N1, N2, N3 |
| **PEK_W02** | K2INF_W01 | C1-C6 | Lec1-Lec8,S1-S8 | N1, N2, N3 |
| **PEK_W03** | K2INF_W01 | C1-C6 | Lec1-Lec8,S1-S8 | N1, N2, N3 |
| **PEK_W04** | K2INF_W01 | C1-C6 | Lec1-Lec8,S1-S8 | N1, N2, N3 |
| **PEK_W05** | K2INF_W01 | C1-C6 | Lec1-Lec8,S1-S8 | N1, N2, N3 |
| **PEK_W06** | K2INF_W01 | C1-C6 | Lec1-Lec8,S1-S8 | N1, N2, N3 |
| **PEK_U01** | K2INF_U10 | C1-C6 | Lec1-Lec8,S1-S8 | N1, N2, N3 |
| **PEK_K01** | K2INF_W01, K2INF_U10 | C1-C6 | Lec1-Lec8,S1-S8 | N1, N2, N3 |

** - enter symbols for main-field-of-study/specialization educational effects

*** - from table above