# DESCRIPTION OF THE COURSE OF STUDY

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|---|---|---|
| **Course code** | **0719-2ID-C36-ADE** | |
| **Name of the course in** | Polish | ***Analiza danych eksperymentalnych*** |
| | English | ***Analysis of Experimental Data*** |

## 1. LOCATION OF THE COURSE OF STUDY within the system of studies

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|---|---|
| **1.1. Field of study** | **Data engineering** |
| **1.2. Mode of study** | **FULL-TIME** |
| **1.3. Level of study** | **FIRST-CYCLE DEGREE, ENGINEERING** |
| **1.4. Profile of study*** | **GENERAL ACADEMIC** |
| **1.5. Person/s preparing the course description** | **Dr hab. Grzegorz Stefanek** |
| **1.6. Contact** | **Grzegorz.stefanek@ujk.edu.pl** |

## 2. GENERAL CHARACTERISTICS OF THE course of study

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|---|---|
| **2.1. Language of instruction** | **english** |
| **2.2. Prerequisites*** | **Statistics, Mathematics, Object-oriented programming, Introduction to algorithms, Databases** |

## 3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

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| 3.1. **Form of classes** | | e.g. lectures, classes, (including e-learning) |
| 3.2. **Place of classes** | | **Didactic rooms UJK** |
| 3.3. **Form of assessment** | | **Lecture – exam, Classes – pass with grade.** |
| 3.4. **Teaching methods** | | **Lecture, Classes-laboratory** |
| 3.5. **Bibliography** | **Required reading** | S.Brandt, Data analysis, Springer Nature, 2012<br>Daniel T. Larose, Discovering knowledge in data, Willey & Sons, 2014 |
| | **Further reading** | R. Brun et al., ROOT User's Guide 5.34 (CERN, 2013)<br>Origin User Guide, Origin Lab, 2022 |

## 4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

### 4.1. Course objectives *(including form of classes)*

***Lecture:***

***C1.*** Familiarization with techniques for recording, formatting, and selecting data from large detection systems.

***C2.*** Familiarization with techniques and methods for analyzing large, diverse data sets.

***C3***. Learning about selected programming tools used in data analysis.

***Classes:.***

***C1.*** Practical application of techniques and methods for analyzing experimental data and describing data.

### 4.2. Detailed syllabus *(including form of classes)*

**Lectures.**

Data from large detection systems: methods of data collection, recording, formatting, online selection, quality control, and data visualization.

Data management, descriptive statistics, estimation, and hypothesis testing.

Formats and structures of large physical data sets.

Data analysis: methods of reading, offline selection, graphical preparation, and substantive interpretation of results.

Correction of results for detector effects, acceptance, and unwanted physical effects.

Use of simulation data from models based on the Monte Carlo method.

**Classes:**

Analysis of sample data sets obtained from research experiments and model data.

### 4.3 Intended learning outcomes

| Code | A student, who passed the course | Relation to learning outcomes |
|---|---|---|
| within the scope of **KNOWLEDGE:** | | |
| W01 | Knows the structures and formats of data from large detection systems. | ID1A_W01<br>ID1A_W04 |

| | | |
|---|---|---|
| | | ID1A_W09<br>ID1A_W10 |
| W02 | Knows examples of techniques and methods for analyzing large data sets as well as descriptive statistics and selected statistical distributions. | ID1A_W01<br>ID1A_W02<br>ID1A_W08<br>ID1A_W10 |
| W03 | Knows the basics of sample software used in the analysis of measurement data. | ID1A_W06<br>ID1A_W07<br>ID1A_W10 |
| within the scope of **ABILITIES:** | | |
| U01 | correctly interprets the obtained data and selects an appropriate method for their analysis. | ID1A_U01<br>ID1A_U02<br>ID1A_U09<br>ID1A_U11 |
| U02 | is able to apply basic methods and techniques for analyzing data sets from detection systems. | ID1A_U01<br>ID1A_U05<br>ID1A_U06<br>ID1A_U07<br>ID1A_U08<br>ID1A_U11 |
| U03 | is able to practically use software applied in data analysis and to prepare his/her own scripts. | ID1A_U05<br>ID1A_U06<br>ID1A_U07<br>ID1A_U10<br>ID1A_U11 |
| within the scope of **SOCIAL COMPETENCE:** | | |
| K01 | is aware of the engineer's role in providing society with competent information regarding methods and techniques of data set analysis. | ID1A_K01<br>ID1A_K04 |

4.4. **Methods of assessment of the intended learning outcomes**

| **Teaching outcomes** *(code)* | **Method of assessment (+/-)** | | | | | | | | | | | | | | | | | | | | |
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| | **Exam oral/written*** | | | **Test*** | | | **Project*** | | | **Effort in class*** | | | **Self-study*** | | | **Group work*** | | | **Others* e.g. standardized test used in e-learning** | | |
| | ***Form of classes*** | | | ***Form of classes*** | | | ***Form of classes*** | | | ***Form of classes*** | | | ***Form of classes*** | | | ***Form of classes*** | | | ***Form of classes*** | | |
| | *L* | *C* | *P* | *L* | *C* | *P* | *L* | *C* | *P* | *L* | *C* | *P* | *L* | *C* | *P* | *L* | *C* | *P* | *L* | *C* | *P* |
| W01 | + | | | | + | | | | | | | | | | | | | | | | |
| W02 | + | | | | + | | | | | | | | | | | | | | | | |
| W03 | + | | | | + | | | | | | | | | | | | | | | | |
| U01 | | | | | + | | | | + | | + | | | + | | | | | | | |
| U02 | | | | | + | | | | + | | + | | | + | | | | | | | |
| | | | | | | | | | + | | + | | | + | | | | | | | |
| K01 | | | | | | | | | | | + | | | + | | | | | | | |
| K02 | | | | | | | | | | | + | | | + | | | | | | | |

****delete as appropriate***

4.5. **Criteria of assessment of the intended learning outcomes**

| **Form of classes** | **Grade** | **Criterion of assessment** |
|---|---|---|
| **lecture (L) (including e-learning)** | **3** | Achievement <50 - 60) % of the requirements used in the assessment methods |
| | **3,5** | Achievement <60 - 70) % of the requirements used in the assessment methods |
| | **4** | Achievement <70 - 80) % of the requirements used in the assessment methods |
| | **4,5** | Achievement <80 - 90) % of the requirements used in the assessment methods |
| | **5** | Achievement <90 - 100) % of the requirements used in the assessment methods |
| | **3** | Achievement <50 - 60) % of the requirements used in the assessment methods |
| | **3,5** | Achievement <60 - 70) % of the requirements used in the assessment methods |

| | | |
|---|---|---|
| classes (C)* (including | **4** | Achievement <70 - 80) % of the requirements used in the assessment methods |
| | **4,5** | Achievement <80 - 90) % of the requirements used in the assessment methods |
| | **5** | Achievement <90 - 100) % of the requirements used in the assessment methods |
| Project (P)* (including e-learning) | **3** | Achievement <50 - 60) % of the requirements used in the assessment methods |
| | **3,5** | Achievement <60 - 70) % of the requirements used in the assessment methods |
| | **4** | Achievement <70 - 80) % of the requirements used in the assessment methods |
| | **4,5** | Achievement <80 - 90) % of the requirements used in the assessment methods |
| | **5** | Achievement <90 - 100) % of the requirements used in the assessment methods |

## 5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

| Category | Student's workload | |
|---|---|---|
| | Full-time studies | Extramural studies |
| *NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/* | ***60*** | |
| *Participation in lectures** | 15 | |
| *Participation in classes, seminars, laboratories** | 30 | |
| *Project* | ***15*** | |
| *INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/* | **40** | |
| *Preparation for the lecture** | 10 | |
| *Preparation for the classes, seminars, laboratories** | *20* | |
| *Preparation for the exam/test** | 10 | |
| *TOTAL NUMBER OF HOURS* | ***100*** | |
| ECTS credits for the course of study | **4** | |

***delete as appropriate***

***Accepted for execution*** *(date and legible signatures of the teachers running the course in the given academic year)*

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