# DESCRIPTION OF THE COURSE OF STUDY

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| **Course code**  |  | **0912-7LEK-B2.6-BEl** |
| **Name of the course in**  | Polish  | **Biostatystyka z elementami informatyki**  |
| English  | **Biostatistics with elements of informatics**  |

## 1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

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| **1.1. Field of study**  | Medicine  |
| **1.2. Mode of study**  | Full-time  |
| **1.3. Level of study**  | Uniform Master’s study  |
| **1.4. Profile of study\***  | General academic  |
| **1.5. Person preparing the course description**  | dr Artur Michalik |
| **1.6. Contact**  | artur.michalik@ujk.edu.pl |

## 2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

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| **2.1. Language of instruction**  | English  |
| **2.2. Prerequisites\***  | ~~--------------~~  |

## 3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

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| **3.1. Form of classes**  | semester 1: lectures (20 h including 5 h e-learning), classes (20 h) semester 2: lectures(20 h including 5 h e-learning), classes (15 h) |
| **3.2. Place of classes**  | Courses in the teaching rooms of UJK faculty of Mathematics and Natural Science, e-learning |
| **3.3. Form of assessment**  | Exam (lectures), credit with grade (classes)  |
| **3.4. Teaching methods**  | lectures– informative lectures classes – problem methods, laboratory method (practical classes using Statistica and/or R package as well as MS Excel).  |
| **3.5. Bibliography**  | **Required reading**  | [1] Aviva Petrie, Caroline Sabin “Medical Statistics at a Glance”, Blackwell Science, 2009 [2] Betty R. Kirkwood, Jonathan A.C. Sterne “Essential Medical Statistics”, Blackwell Science, 2003 – or newer |
|  **Further reading**  | 1. Introduction to Biostatistical Applications in Health Research with

Microsoft Office Excel, Robert P. Hirsch, ISBN: 978-1-119-08965-0 1. Workbook to accompany introduction to biostatistical applications in health research with Microsoft® Office Excel® , Wiley, 2016, Robert P. Hirsch
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**4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED TEACHING OUTCOMES**

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| **4.1. Course objectives (including form of classes)** **Lectures**  **C1** – Presentation of planning principles and research in medicine as well as basic methods of description and statistical inference in medical research.**Classes** **C2** – Developing skills to find information in medical databases. **C3** – Developing skills to use selected statistical methods with the usage of program supporting statisticalcalculations.**C4** – Developing skills to cooperate in a group on the project.  |
| **4.2. Detailed syllabus (including form of classes)** **Lectures:** Introduction to biostatistics. Population and sample. Statistical variables. Types of statistical data. The distribution of statistical data. Descriptive statistics and data visualization. Elementary concepts of probability. Types of statistical inference. Point and interval estimation of population parameters. Statistical hypotheses. Process of statistical hypothesis testing. Type I and type II errors. The statistical power of a test. Hypothesis testing: one- and two-sample inference. Nonparametric methods. Test of independence. Study designs in medical research. Experimental and observational studies. Randomized controlled trials. Case reports. Cohort studies. Case-control studies. Cross-sectional studies. The hierarchy of research designs. Statistical methods in population studies. Statistical evaluation of diagnostic tests. Receiver operating characteristic curve. Survival analysis. **e-learning:**Winter semester (5 godz.):1. Regression and correlation methods.
2. Analysis of variance.

Summer semester (5 godz.):1. Logistic regression.
2. Meta-analyses.
3. Analytical and graphic presentation and interpretation of meta-analysis results.

**Classes:** Searching for information in medical bibliographic databases.Using Excel for statistical data analysis. Statistics graphs with Excel. Pivot tables in Excel. Creating a simple medical database in Excel. Excel data management (merging, sorting, filtering of data). Statistical description – choosing, stating and interpreting statistical measures, graphic presentation of data adeqate to its type and the measuring scale used. Elementary concepts of probability. Point and interval estimation – computing and interpretation. Hypothesis testing: one- and two-sample inference. Nonparametric methods. Goodnes-of-fit tests. Test of independence. Regression and correlation methods. Analysis of variance. Complex analysis of medical data. Statistical methods in population and diagnostic studies. Receiver operating characteristic curve – obtaining and interpretation (ROC). Application of logistic regression model. Estimation and interpretaion of logistic regression equation’s parameters. Estimation and interpretation of odds ratio. Creation of survival curve. Survival analysis in Cox proportional hazard model. Note: for implementation of the above content, to support calculation and visualization of data, the program Statistica is used (licensed commercial program, license is provided for every student), as well as MS Excel program (Office 365 license is provided for every student). |

### 4.3 Education outcomes in the discipline

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| **Code** | **A student, who passed the course**  | **Relation to teaching outcomes**  |
|  | within the scope of **KNOWLEDGE**, the graduate knows and understands**:**  |  |
| W01  | the basic computer and biostatistical methods used in medicine, including medical databases, spreadsheets and basics of computer graphics; | B.W26.  |
| W02  | the basic methods of statistical analysis used in population and diagnostic studies; | B.W27.  |
| W03  | the possibilities of modern telemedicine as a tool to support the work of a physician; | B. W28.  |
|  | within the scope of **ABILITIES**, the graduate knows how to**:**  |  |
| U01  | use databases, including online ones, and searches for necessary information using available tools; | B.U10.  |
| U02  | select appropriate statistical tests, performs basic statistical analyzes and uses suitable methods of presentation of results; interprets the results of the meta-analysis and carries out analysis of the likelihood of survival; | B.U11.  |
| U03  | explain the differences between prospective and retrospective studies, randomized and case/control studies and experimental research, and ranks them according to the reliability and quality of scientific evidence; | B U12.  |
| U04  | plan and perform basic scientific research, interprets the results and draw conclusions; | B.U13.  |

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| within the scope of **SOCIAL COMPETENCE**, the graduate is able to: |
| K01 | recognize his/her own limitations and self-evaluate educational deficiencies and needs; | H.S5. |
| K02 | use reliable information sources; | H.S7. |
| K03 | conclude on the basis of own surveys and observations; | H.S8. |
| K04 | introduce rules of social conduct and teamwork to the group of specialists, including specialists form other medical professions also in the multicultural and multinational environment; | H.S9. |
| K05 | give opinions concerning various aspects of professional activity; | H.S10. |
| K06 | take responsibility for own decisions made during professional activities including own safety and safety of other people; | H.S11. |

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| **4.4. Methods of assessment of the intended teaching outcomes**  |
| **Teaching outcomes** ***(code)***  | **Method of assessment (+/-)** |
| **Exam** **~~oral~~/written\***  | **Test\***  | **Project\***  | **Effort in class\***  | **Self-study\***  | **Group** **work\***  | **Participation in Lectures\***  | **Observations** |
| ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes***  | ***Form of classes*** |
| *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *...*  | *L*  | *C*  | *.*  | *L*  | *C*  | *…* | *L/ C* |
| W01 | + |  |  |  | ***+*** |  |  | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| W02 | ***+*** |  |  |  | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| W03 |  |  |  |  |  |  |  | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| U01 |  |  |  |  | ***+*** |  |  | ***+*** |  |  |  |  |  |  |  |  | ***+*** |  |  |  |  |  |
| U02 | ***+*** |  |  |  | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| U03 | ***+*** |  |  |  | ***+*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| U04 |  |  |  |  |  |  |  | + |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| K01-K06 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | ***+*** | ***+*** |  | ***+*** |

***\*delete as appropriate***

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| **4.5. Criteria of assessment of the intended teaching outcomes**  |
| **Form of classes**  | **Grade**  | **Criterion of assessment**  |
| **lecture (L)** | **3**  | at least 61% and not more than 68% of the total number of available points  |
| **3,5**  | more than 69% and not more than 76% of the total number of available points  |
| **4**  | more than 77% and not more than 84% of the total number of available points  |
| **4,5**  | more than 85% and not more than 92% of the total number of available points  |
| **5**  | more than 93% of the total number of available points  |
| **classes (C)\*** | **3**  | at least 61% and not more than 68% of the total number of available points  |
| **3,5**  | more than 69% and not more than 76% of the total number of available points  |
| **4**  | more than 77% and not more than 84% of the total number of available points  |
| **4,5**  | more than 85% and not more than 92% of the total number of available points  |
| **5**  | more than 93% of the total number of available points  |

* Thresholds are valid from 2018/ 2019 academic year

**5. BALANCE OF ECTS CREDITS – STUDENT’S WORK INPUT**

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| **Category**  | **Student's workload**  |
| **Full-time studies**  |
| *NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/*  | **75** |
| *Participation in lectures\**  | **30** |
| *Participation in classes, seminars, laboratories\**  | **35** |
| *Preparation in the exam/ final test\**  |  |
| *Others\**  | **101**  |
| *INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/* | **75** |
| *Preparation for the lecture\** | **15** |
| *Preparation for the classes, seminars, laboratories\**  | **25** |
| *Preparation for the exam/test\**  |  |
| *Gathering materials for the project/Internet query\**  |  |
| *Preparation of multimedia presentation*  |  |
| *Others\**  |  **35** |
| *TOTAL NUMBER OF HOURS*  | **150** |
| ECTS credits for the course of study  | **6** |

 ***\*delete as appropriate***

1 e-learning (without participation of the lecturer)

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

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