

## WROCLAW UNIVERSITY OF TECHNOLOGY – PHD STUDIES

|                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FACULTY OF PURE AND APPLIED MATHEMATICS</b>                                                                                                                                                                                                                                                                                                                                       |
| <b>SUBJECT CARD</b>                                                                                                                                                                                                                                                                                                                                                                  |
| Course name in Polish: Wstęp do Statystyki praktycznej                                                                                                                                                                                                                                                                                                                               |
| Course name in English: Introduction to the Practice of Statistics                                                                                                                                                                                                                                                                                                                   |
| Course language: English                                                                                                                                                                                                                                                                                                                                                             |
| University-wide general course type:<br>1) <u>basic course (mathematics, physics, chemistry, other)</u><br>2) humanity course<br>3) managerial skills<br>4) English language<br>5) other modern language<br>Departmental course developing professional skills:<br>1) specialized course<br>2) interdisciplinary course<br>3) seminar (interdisciplinary, specialized, departmental) |
| Type of course (obligatory, <u>optional</u> )                                                                                                                                                                                                                                                                                                                                        |
| <b>Educational effects according to ZW 26/2017 regulations:<br/> P8S_WG, P8S_UW, P8S_KK, P8S_KR</b>                                                                                                                                                                                                                                                                                  |
| Subject code: MAT1308                                                                                                                                                                                                                                                                                                                                                                |

\*delete as applicable

|                                                                                 | Lecture |
|---------------------------------------------------------------------------------|---------|
| Number of hours of organized classes in University (ZZU)                        | 30      |
| Number of hours of total student workload (CNPS)                                | 90      |
| Form of crediting                                                               | Exam    |
| Number of ECTS points                                                           | 3       |
| including number of ECTS points for practical (P) classes                       |         |
| including number of ECTS points for direct teacher-student contact (BK) classes | 2       |

| <b>PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES</b>                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Knowledge of basic skills in Calculus.<br>2. Knowledge of Probability at the high school level.<br>3. Good English communication skills. |

| SUBJECT OBJECTIVES |                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------|
| C1                 | The student will learn basic skills of descriptive and graphical statistics for empirical data.         |
| C2                 | The student will acquire knowledge of basic notions of probability used in mathematical modelling.      |
| C3                 | The student will acquire the skills of Forming statistical models with specific assumptions.            |
| C4                 | The student will be able to choose and perform statistical procedures to specific statistical problems. |

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**SUBJECT EDUCATIONAL EFFECTS****Relating to knowledge:**

PEK\_W01 – Student knows basic methods of graphical and descriptive presentation of data

PEK\_W02 – Student knows basic probabilistic models

PEK\_W03 – Student knows methods of estimation in basic parametric models

PEK\_W04 – Student knows tests of significance for a selection of parametric models

**Relating to skills:**

PEK\_U01 – Student can apply graphical and descriptive methods to present data

PEK\_U02 – Student can perform calculations related to basic parametric probability models

PEK\_U03 – Student can choose and perform estimation in basic parametric models

PEK\_U04 – Student can choose and perform tests of significance in basic parametric models

**Relating to social competences:**

PEK\_K01 – Student is aware of the role of cooperation, including an international cooperation.

PEK\_K02 – Student is aware of the importance of the original research activity

**PROGRAM CONTENTS**

| <b>Form of classes – lecture</b> |                                                                                        | Number of hours |
|----------------------------------|----------------------------------------------------------------------------------------|-----------------|
| Lec 1                            | Data and distribution. Describing distribution with graphs and numbers.                | 2               |
| Lec 2                            | Normal distribution.                                                                   | 2               |
| Lec 3                            | Relationships in data. Scatterplot and correlation. Least-squares regression.          | 2               |
| Lec 4                            | The question of causation. Design of experiment and sampling design.                   | 2               |
| Lec5                             | Rules of probability. Independence.                                                    | 2               |
| Lec6                             | Sampling distributions of counts and means.                                            | 2               |
| Lec7                             | Introduction to confidence intervals.                                                  | 2               |
| Lec8                             | Midterm 1.                                                                             | 2               |
| Lec9                             | Introduction to tests of significance.                                                 | 2               |
| Lec10                            | T-tests and T-confidence intervals for means.                                          | 2               |
| Lec11                            | Inference for proportions.                                                             | 2               |
| Lec12                            | Two-way tables. Conditional distributions. Testing for independence in two-way tables. | 2               |
| Lec13                            | Inference for simple linear regression.                                                | 2               |
| Lec14                            | One-way analysis of variance.                                                          | 2               |
| Lec15                            | Midterm 2.                                                                             | 2               |
| Total hours                      |                                                                                        | 30              |

**TEACHING TOOLS USED**

|    |               |
|----|---------------|
| N1 | lecture       |
| N2 | consultations |

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|    |          |
|----|----------|
| N3 | homework |
|----|----------|

| EVALUATION OF ACHIEVED SUBJECT EDUCATIONAL EFFECTS                  |                                                                                                                    |                                                      |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| <b>Evaluation:</b><br>F – forming (partial)<br>C – concluding       | Educational effect number                                                                                          | Way of evaluating achievement of educational effects |
| F1                                                                  | PEK_W01,<br>PEK_W02,<br>PEK_W03,<br>PEK_W04<br>PEK_U01,<br>PEK_U02,<br>PEK_U03,<br>PEK_U04                         | midterm 1                                            |
| F2                                                                  | PEK_W01,<br>PEK_W02,<br>PEK_W03,<br>PEK_W04<br>PEK_U01,<br>PEK_U02,<br>PEK_U03,<br>PEK_U04                         | midterm 2                                            |
| F3                                                                  | PEK_W01,<br>PEK_W02,<br>PEK_W03,<br>PEK_W04<br>PEK_U01,<br>PEK_U02,<br>PEK_U03,<br>PEK_U04,<br>PEK_K01,<br>PEK_K02 | homework                                             |
| F4                                                                  | PEK_W01,<br>PEK_W02,<br>PEK_W03,<br>PEK_W04<br>PEK_U01,<br>PEK_U02,<br>PEK_U03,<br>PEK_U04                         | quizzes                                              |
| $C = 0.25 \cdot F1 + 0.25 \cdot F2 + 0.25 \cdot F3 + 0.25 \cdot F4$ |                                                                                                                    |                                                      |

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## PRIMARY AND SECONDARY LITERATURE

**PRIMARY LITERATURE:**

- [1] D. Moore, G. McCabe, Introduction to the Practice of Statistics, ed. IV, Freeman, 2003.

**SECONDARY LITERATURE:**

- [1] L. Gajek, M. Kałuszka, Wnioskowanie statystyczne. Modele i metody. WNT, Warszawa 2004.
- [2] J. Greń, Statystyka matematyczna. Modele i zadania, PWN, Warszawa 1976.
- [3] T. Inglot, T. Ledwina, Z. Ławniczak, Materiały do ćwiczeń z rachunku prawdopodobieństwa i statystyki matematycznej, Wydawnictwo Politechniki Wrocławskiej, Wrocław 1984.
- [4] H. Jasiulewicz, W. Kordecki, Rachunek prawdopodobieństwa i statystyka matematyczna. Przykłady i zadania. GiS, Wrocław 2001.
- [5] W. Klonecki, Statystyka matematyczna, PWN, Warszawa 1999.
- [6] J. Koronacki, J. Mielniczuk, Statystyka dla studentów kierunków technicznych i przyrodniczych, WNT, Warszawa 2004.
- [7] W. Kryszicki, J. Bartos, W. Dyczka, K. Królikowska, M. Wasilewski, Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, Cz. I-II, PWN, Warszawa 2007.
- [8] W. Kordecki, Rachunek prawdopodobieństwa i statystyka matematyczna. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2002.

**SUBJECT SUPERVISOR**

(NAME AND SURNAME, E-MAIL ADDRESS)

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**MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS  
FOR SUBJECT  
INTRODUCTION TO THE PRACTICE OF STATISTICS  
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY  
Doctoral studies at Faculty of Pure and Applied Mathematics**

| 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*** |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------|-------------------------|
| (knowledge) PEK_W01        | P8S_WG                                                                                                                                      | C1                    | Lec1-4               | N1, N2, N3              |
| PEK_W02                    | P8S_WG                                                                                                                                      | C2                    | Lec1-4               | N1, N2, N3              |

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|                                        |               |                   |         |            |
|----------------------------------------|---------------|-------------------|---------|------------|
| <b>PEK_W03</b>                         | <b>P8S_WG</b> | C3, C4            | Lec7-15 | N1, N2, N3 |
| <b>PEK_W04</b>                         | <b>P8S_WG</b> | C3, C4            | Lec7-15 | N1, N2, N3 |
| <b>(skills)</b><br><b>PEK_U01</b>      | <b>P8S_UW</b> | C1                | Lec1-4  | N1, N2, N3 |
| <b>PEK_U02</b>                         | <b>P8S_UW</b> | C2                | Lec5-6  | N1, N2, N3 |
| <b>PEK_U03</b>                         | <b>P8S_UW</b> | C3, C4            | Lec7-15 | N1, N2, N3 |
| <b>PEK_U04</b>                         | <b>P8S_UW</b> | C3, C4            | Lec7-15 | N1, N2, N3 |
| <b>(competences)</b><br><b>PEK_K01</b> | <b>P8S_KK</b> | C1, C2, C3,<br>C4 | Lec1-15 | N1, N2, N3 |
| <b>PEK_K02</b>                         | <b>P8S_KR</b> | C1, C2, C3,<br>C4 | Lec1-15 | N1, N2, N3 |

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

\*\*\* - from table above