FACULTY W-8 / DEPARTMENT………………

## SUBJECT CARD

**Name in Polish Rachunek prawdopodobieństwa i statystyka matematyczna**
**Name in English Theory of probabilistic and statistics**
**Main field of study (if applicable): Information and 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 INZ0257W, INZ0257C**
**Group of courses YES / NO\***

|  | Lecture | Classes | Laboratory | Project | Seminar |
|---|---|---|---|---|---|
| Number of hours of organized classes in University (ZZU) | 30 | 30 | | | |
| Number of hours of total student workload (CNPS) | 90 | 60 | | | |
| Form of crediting | Examination | crediting with grade | | | |
| For group of courses mark (X) final course | | | | | |
| Number of ECTS points | 4 | 2 | | | |
| including number of ECTS points for practical (P) classes | | | | | |
| including number of ECTS points for direct teacher-student contact (BK) classes | 2,4 | 1,2 | | | |

\*delete as applicable

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

1. Passed the subject: Algebra and Analytic Geometry. Knowledge of the subject.
2. Passed the subject: Mathematical analysis. Knowledge of the subject.
3. Passed the subject: Discrete Mathematics. Knowledge of the subject.

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### SUBJECT OBJECTIVES

C1 Acquisition of basic knowledge of probability and increased knowledge of selected aspects of the theory of probability.
C2 Acquisition of basic knowledge of the reliability of systems.
C3 Acquisition of basic knowledge of mathematical statistics.

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### SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEK_W01 - has knowledge of the nature and properties of probability and probability space, and has knowledge of calculating probability and conditional probability events.
PEK_W02 - know the total probability theorem events and Bayesian model and also has knowledge of the reliability of circuits.
PEK_W03 - has knowledge of random variables, the distribution of the probability distribution function of a random variable, has a knowledge of the basic parameters of random variable and their interpretations.
PEK_W04 - knows limit theorems and their interpretation, and knows the probability inequalities, and knows how to pre-analyze the data for the analysis of probabilistic.

PEK_W05 - knows the point estimate and the maximum likelihood estimators.
PEK_W06 - has knowledge of confidence intervals for the mean and variance of the normal distribution and the ratio, it also has the knowledge of statistical hypothesis testing, tests for the mean and variance for a normal distribution and proportion.
PEK_W07 - known compatibility tests and independence tests, chi-square test, gained knowledgeof analysis of variance and one-dimensional linear regression.

relating to skills:
PEK_U01 - can calculate the overlap of events, conditional probability and the probability of overlap completely overlapping events.
PEK_U02 - can calculate the reliability of connections.
PEK_U03 - is able to calculate the distribution and the cumulative distribution of a random variable, and the basic parameters of random variables.
PEK_U04 - can use estimation and processes greatest reliability estimates, test hypotheses about the mean and variance of the normal distribution, as well as be a one-dimensional linear regression.

relating to social competences:
PEK_K01 - understands the importance of the theory of probability and statistics in the processes of social, economic, and technology.

| PROGRAMME CONTENT | |
|---|---|
| **Form of classes - lecture** | **Number of hours** |
| Lec 1 The essence of a random experience. The definition and the properties of probability. Calculation of the probability of the event. The definition of the probability space. | 2 |
| Lec 2 Conditional probability. Definition and examples. | 2 |
| Lec 3 Bayesian formula. Total probability theorem events. | 2 |
| Lec 4 Independence of events. Reliability of connections. | 2 |
| Lec 5 Random variable. Probability distribution. The distribution of the random variable. Formal definitions and examples. | 2 |
| Lec 6 Basic parameters of random variable. Interpretation of parameters. | 2 |
| Lec 7 Limit theorems and their interpretation. Important inequalities of probability. | 2 |
| Lec 8 Preliminary analysis of the data. | 2 |
| Lec 9 The point estimate. | 2 |
| Lec 10 Maximum likelihood estimators. | 2 |
| Lec 11 Confidence intervals for the mean and variance of the normal distribution and the aspect ratio. | 2 |
| Lec 12 Testing statistical hypotheses. Tests for the mean and variance for a normal distribution and proportion. | 2 |
| Lec 13 Compliance tests and independence tests. Chi-square test. | 2 |
| Lec 14 Analysis of variance. Simple linear regression. | 2 |
| Lec 15 Repertory. | 2 |
| Total hours | **30** |

| Form of classes - class | | Number of hours |
|---|---|---|
| Cl 1 | Determination and calculation of the probability of events - accounting exercises. | 2 |
| Cl 2 | Conditional probability - examples and tutorials. | 2 |
| Cl 3 | Independence of events - examples, tutorials. Reliability of connections - accounting exercises. | 2 |
| Cl 4 | Random variable. Probability distribution. The distribution of the random variable. Analysis of the properties of the distributions of random variables. Examples of phenomena of the distribution. | 2 |
| Cl 5 | Basic parameters of the random variable and their interpretation - tutorials. | 2 |
| Cl 6 | Important inequalities in probability theory, limit theorems and their interpretation - tutorials. | 2 |
| Cl 7 | Preliminary analysis of the data. Examples of data analysis problems. Types of analytical variables. Examples and tutorials. | 2 |
| Cl 8 | Point estimation - tutorials. | 2 |
| Cl 9 | Maximum likelihood estimators - tutorials. | 2 |
| Cl 10 | Confidence intervals for the mean and variance of the normal distribution and the aspect ratio. Classes. | 2 |
| Cl 11 | Statistical hypothesis testing - examples. Tests for the mean and variance of the normal distribution and the ratio - examples and tutorials. | 2 |
| Cl 12 | Compliance tests and chi-square independence - tutorials. | 2 |
| Cl 13 | Analysis of variance. Simple linear regression. Examples and tutorials. | 2 |
| Cl 14 | Simple linear regression. | 2 |
| Cl 15 | Final test. | 2 |
| | Total hours | **30** |
| Form of classes - laboratory | | Number of hours |
| Lab 1 | | |
| Lab 2 | | |
| … | | |
| | Total hours | |
| Form of classes - project | | Number of hours |
| Proj 1 | | |
| Proj 2 | | |
| … | | |
| | Total hours | |
| Form of classes - seminar | | Number of hours |
| Sem 1 | | |
| Sem 2 | | |
| … | | |
| | Total hours | |
| **TEACHING TOOLS USED** | | |

N1. Traditional lecture. Slideshows.
N2. Tutorials and discussion of solutions of the foundations of probability theory and the reliability of systems. Discussing and presenting solutions lists. Final test of the exercise.
N3. Counseling for students.
N4. Self-study students - solving task lists.
N5. Own work - self-study problems of lecture and exam preparation.

## EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

| Evaluation (F – forming (during semester), C – concluding (at semester end) | Educational effect number | Way of evaluating educational effect achievement |
|---|---|---|
| F1 | PEK_U01-PEK_U04 | Examples and tutorials. Solving lists. Analysis of system reliability problems. |
| C | PEK_W01-PEKW_07, PEK_K01 | Examination. |

## PRIMARY AND SECONDARY LITERATURE

### PRIMARY LITERATURE:

[1]     J. Bartos, W. Dyczka, W. Krysicki,  Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, PWN, Warszawa 2008.
[2]     J. Jakubowski, R. Sztencel, Rachunek prawdopodobieństwa dla prawie każdego, Script, Warszawa, 2009.
[3]     A. Plucińska, E. Pluciński, Rachunek prawdopodobieństwa, WNT, Warszawa 1999.
[4]     R. Zieliński, Tablice statystyczne, WNT, Warszawa 2006.
[5]     J. Koronacki, J. Mielniczuk, Statystyka dla studentów kierunk. technicznych i przyrodniczych, WNT, Warszawa 2001.
[6]     L. Gajek, M. Kaluszka, Wnioskowanie statystyczne. Modele i metody, Wydawnictwa Naukowo-Techniczne, Warszawa 1984.
[7]     D. Bobrowski, Probabilistyka w zastosowaniach technicznych, WNT, Warszawa 1986.
[8]     D. Bobrowski, Modele i metody matematyczne teorii niezawodności w przykładach i zad., WNT, Warszawa 1985.
[9]     M. Fisz, Probability Theory and Mathematical Statistics, 3 Edition, Krieger Pub Co, June 1980.
[10]   D.C.Montgomery, G.C.Runger, Applied Statistics and Probability for Engineers. Third Ed., John Wiley & Sons, New York 2003.

### SECONDARY LITERATURE:

[1]     W. Feller, Wstęp do rachunku prawdopodobieństwa, tom I.II, PWN, Warszawa 2009.
[2]     G. Grimmet, D. Stirzaker, One thousand exercises In probability, Oxford University Press, 2004.
[3]     H. Jasiulewicz, W. Kordecki, Rachunek prawdopodobieństwa i statystyka matematyczna. Definicje, twierdzenia, wzory, GiS, Wrocław 2001.
[4]     H. Jasiulewicz, W. Kordecki, Rachunek prawdopodobieństwa i statystyka matemat. Przykł. i zad., GiS, Wrocław 2001.
[5]     M. Maliński, Weryfikacja hipotez statystycznych wspomagana komputerowo, Wyd. Politechn. Śląskiej, Gliwice 2004.
[6]     H.Kobayashi, B.L.Mark, W.Turin, Probability, Random Processes, and Statistical Analysis, Cambridge University Press 2012.
[7]     D.R.Cox, C.A.Donnelly, Principles of Applied Statistics, Cambridge University Press 2011.
[8]     L.Chaumont, M.Yor, Exercises In Probability, Cambridge University Press 2011.

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR
SUBJECT
**Probability theory and mathematical statistics**
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
**Information and Computer Science**
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*** | Program content*** | Teaching tool number*** |
|---|---|---|---|---|
| PEK_W01 (knowledge) | K1INF_W02 | C1 | Wy1-Wy2 | N1, N3, N5 |
| PEK_W02 | K1INF_W02 | C2 | Wy3-Wy4 | N1, N3, N5 |
| PEK_W03 | K1INF_W02 | C3 | Wy5-Wy6 | N1, N3, N5 |
| PEK_W04 | K1INF_W02 | C3 | Wy7-Wy8 | N1, N3, N5 |
| PEK_W05 | K1INF_W02 | C3 | Wy9-Wy10 | N1, N3, N5 |
| PEK_W06 | K1INF_W02 | C3 | Wy11-Wy12 | N1, N3, N5 |
| PEK_W07 | K1INF_W02 | C3 | Wy13-Wy15 | N1, N3, N5 |
| PEK_U01 (skills) | K1INF_W02 | C1 | Ćw1-Ćw3 | N2, N3, N4 |
| PEK_U02 | K1INF_W02 | C2 | Ćw3 | N2, N3, N4 |
| PEK_U03 | K1INF_W02 | C3 | Ćw4-Ćw7 | N2, N3, N4 |
| PEK_U04 | K1INF_W02 | C3 | Ćw8-Ćw15 | N2, N3, N4 |
| PEK_K01 (competences) | K1INF_W02 | C1-C3 | Wy1-Wy15 | N1, N3, N5 |

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

*** - from table above