

| <b>STUDY MODULE DESCRIPTION FORM</b>  |  |  |
|---|--|--|
| Name of the module/subject<br><b>Probability and Statistics</b>   |  | Code<br><b>1010115111010340008</b>   |
| Field of study<br><b>Civil Engineering Extramural Second-cycle</b>  | Profile of study<br>(general academic, practical)<br><b>general academic</b> | Year /Semester<br><b>1 / 1</b>   |
| Elective path/specialty<br><b>Construction Engineering and Management</b>   | Subject offered in:<br><b>Polish</b>   | Course (compulsory, elective)<br><b>obligatory</b>   |
| Cycle of study:<br><b>Second-cycle studies</b>  | Form of study (full-time, part-time)<br><b>part-time</b>                     |  |
| No. of hours<br>Lecture: <b>20</b> Classes: <b>-</b> Laboratory: <b>10</b> Project/seminars: <b>-</b>   |  | No. of credits<br><b>3</b>   |
| Status of the course in the study program (Basic, major, other)<br><b>other</b>   |  | (university-wide, from another field)<br><b>university-wide</b>  |
| Education areas and fields of science and art<br><b>technical sciences</b><br><b>Technical sciences</b>   |  | ECTS distribution (number and %)<br><b>3 100%</b><br><b>3 100%</b>   |
| <b>Responsible for subject / lecturer:</b><br>PhD in Math. Sc. Karol Andrzejczak<br>email: karol.andrzejczak@put.poznan.pl<br>tel. +48 61 6652815<br>Faculty of Electrical Engineering<br>Piotrowo 3A, 60-965 Poznań  |  | <b>Responsible for subject / lecturer:</b><br>PhD in Math. Sc. Agnieszka Ziemkowska<br>email: agnieszka.ziemkowska@put.poznan.pl<br>tel. +48 61 6652815<br>Faculty of Electrical Engineering<br>Piotrowo 3A, 60-965 Poznań |
| <b>Prerequisites in terms of knowledge, skills and social competencies:</b>   |  |  |
| 1   | <b>Knowledge</b>   | Methods and applications of the mathematical logic, set theory, analysis and algebras on the basic course of the higher mathematics.   |
| 2   | <b>Skills</b>  | The student can apply the formalism in the acquired mathematical knowledge.  |
| 3   | <b>Social competencies</b>   | The student is conscious of the need to expand own competence. He is able to talk about possibilities of the formalization of simple technical issues.   |
| <b>Assumptions and objectives of the course:</b><br>Modelling of the random experience with using probabilistic adequate spaces and calculating probabilities of the random events.<br>Types of random variables and their functional and numerical characterizations.<br>Limit theorem and their role in the mathematical statistics and in engineering practice.<br>Statistical inference concerning parameters and the random variable distributions being models of studied features in statistical populations.<br>Applying statistical packages in the problem solving. |  |  |
| <b>Study outcomes and reference to the educational results for a field of study</b>   |  |  |
| <b>Knowledge:</b>   |  |  |
| 1. The student perceives random phenomena, understands the need of applying probabilistic methods and statistics. He can apply these methods and interpret results in mechanical and social problems. - [-K_W01, K_W08]   |  |  |
| <b>Skills:</b>  |  |  |
| 1. He is able to apply models of random experiments. - [-K_U05, K_U13]  |  |  |
| 2. He is knowing how to use statistical characteristics of the population and their empirical counterpart - [-K_U05, K_U17]   |  |  |
| 3. He is able to conduct statistical inference with using computer tools. - [-K_U11, K_U13]   |  |  |
| <b>Social competencies:</b>   |  |  |
| 1. He is able to convince other about the need of applying probabilistic methods and mathematical statistics in the problem solving with the incomplete knowledge. - [-K_K01, K_K06]  |  |  |
| 2. He is able to talk about random phenomena associated with the reliability and the maintaining of technical objects. - [-K_K02, K_K06]  |  |  |

| <b>Assessment methods of study outcomes</b>  |                      |      |
|--|----------------------|------|
| <p>Lecture:<br/>           Assessing activities for solving problems intend for independent improving own abilities.<br/>           The written final work concerning the practical application of methods get to know at lectures.</p> <p>Laboratory:<br/>           Evaluation of drawing up the cross-sectional problem with computer assisting.<br/>           Constant assessing the knowledge for the effectiveness of applying acquired during the problem solving and for discussing additional aspects of the issue.</p>  |                      |      |
| <b>Course description</b>  |                      |      |
| <p>The probabilistic space as the model of random experience. The conditional probability and the independence of events. Random variables, their probability distribution, parameters and numerical characteristics. Review of more important distributions and their applications. The Central limit theorem and its practical application.</p> <p>Introduction to simulation methods. Sampling, distributions of sample characteristics.</p> <p>Point and interval parameter estimation. Testing parametric and nonparametric hypotheses.</p> <p>The review of statistical packages and their practical use in the engineering problems solving.</p>  |                      |      |
| <b>Basic bibliography:</b>   |                      |      |
| <ol style="list-style-type: none"> <li>1. Plucińska Agnieszka, Edmund Pluciński: Probabilistyka. WNT, Warszawa 2000.</li> <li>2. Kordecki Wojciech: Rachunek prawdopodobieństwa i statystyka matematyczna. Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS, Wrocław 2003.</li> <li>3. Krysicki Włodzimierz i inni: Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, cz. I i cz. II. PWN Warszawa.</li> <li>4. Sheldon M. Ross, A first course in probability, Prentice-Hall, 2002.</li> </ol>  |                      |      |
| <b>Additional bibliography:</b>  |                      |      |
| <ol style="list-style-type: none"> <li>1. Bobrowski Dobiesław: Probabilistyka w zastosowaniach technicznych. WNT, Warszawa.</li> <li>2. Bobrowski Dobiesław, Krystyna Maćkowiak-Łybacka: Wybrane metody wnioskowania statystycznego. Wyd. PP, Poznań.</li> <li>3. Andrzejczak Karol: Statystyka elementarna z wykorzystaniem systemu Statgraphics. Wyd. PP, Poznań, 1997.</li> <li>4. Grabski Franciszek, Jaźwiński Jerzy: Funkcje o losowych argumentach w zagadnieniach niezawodności, bezpieczeństwa i logistyki. WKŁ, Warszawa 2009.</li> <li>5. Biegus Antoni. Probabilistyczna analiza konstrukcji stalowych. Wydawnictwo naukowe PWN, Warszawa-Wrocław 1999.</li> <li>6. Everitt B.S., The Cambridge Dictionary of Statistics.</li> </ol> |                      |      |
| <b>Result of average student's workload</b>  |                      |      |
| Activity   | Time (working hours) |      |
| 1. Participation in lectures   | 20                   |      |
| 2. Participation in laboratory classes   | 10                   |      |
| 3. Preparing for the credit the lecture  | 10                   |      |
| 4. Preparation for laboratory exercises  | 10                   |      |
| 5. completing (at home) the studies from laboratory exercises  | 10                   |      |
| 6. consultation  | 3                    |      |
| 7. preparing for the credit laboratory classes   | 15                   |      |
| <b>Student's workload</b>  |                      |      |
| Source of workload   | hours                | ECTS |
| Total workload   | 75                   | 3    |
| Contact hours  | 33                   | 1    |
| Practical activities   | 45                   | 2    |