**COURSE DESCRIPTION CARD – SPECIMEN**

<table>
<tr><td colspan="9" align="center"><strong>Faculty of Civil Engineering and Environmental Sciences</strong></td></tr>
<tr>
<td><strong>Field of study</strong></td>
<td colspan="6" align="center"><strong>Environmental Engineering</strong></td>
<td align="center"><strong>Degree level and programme type</strong></td>
<td align="center"><strong>Master's degree</strong></td>
</tr>
<tr>
<td><strong>Specialization/ diploma path</strong></td>
<td colspan="6" align="center">mutual subjects for whole course</td>
<td align="center"><strong>Study profile</strong></td>
<td align="center"><strong>academic</strong></td>
</tr>
<tr>
<td rowspan="2"><strong>Course name</strong></td>
<td colspan="6" rowspan="2" align="center"><strong>Computational and statistical methods</strong></td>
<td align="center"><strong>Course code</strong></td>
<td align="center"><strong>EEM11001</strong></td>
</tr>
<tr>
<td align="center"><strong>Course type</strong></td>
<td align="center"><strong>Obligatory</strong></td>
</tr>
<tr>
<td rowspan="2"><strong>Forms and number of hours of tuition</strong></td>
<td align="center"><strong>L</strong></td>
<td align="center"><strong>C</strong></td>
<td align="center"><strong>LC</strong></td>
<td align="center"><strong>P</strong></td>
<td align="center"><strong>SW</strong></td>
<td align="center"><strong>FW</strong></td>
<td align="center"><strong>S</strong></td>
<td align="center"><strong>Semester</strong></td>
<td align="center"><strong>1</strong></td>
</tr>
<tr>
<td align="center">15</td>
<td></td>
<td></td>
<td></td>
<td align="center">30</td>
<td></td>
<td></td>
<td align="center"><strong>No. of ECTS credits</strong></td>
<td align="center"><strong>2</strong></td>
</tr>
<tr>
<td><strong>Entry requirements</strong></td>
<td colspan="8">Basics of mathematics</td>
</tr>
<tr>
<td><strong>Course objectives</strong></td>
<td colspan="8">Familiarizing the student with the basics of mathematical statistics and teaching the ability to apply selected statistical methods to research in environmental engineering.</td>
</tr>
<tr>
<td><strong>Course content</strong></td>
<td colspan="8"><u>Lecture:</u> Basic concepts of statistics. Random variables with jump and continuous distribution. Empirical distribution, features, its description. Point and interval estimation of normal distribution parameters. Testing statistical hypotheses. Parametric significance tests. Statistical modeling and planning of one-, two- and three-factor experiments. One-, two- and three-way analysis of variance. Multiple comparison. Correlation analysis. Regression analysis. Classical linear regression model. Estimation of model parameters. Classical linear regression model with many independent variables. Matrix view of the model. Polynomial simple regression analysis.<br><u>Specialist workshop</u>: Practical implementation of topics discussed during the lecture using MS Excel and Statistica based on real and simulated datasets.</td>
</tr>
<tr>
<td><strong>Teaching methods</strong></td>
<td colspan="8">Information lecture, specialist workshop</td>
</tr>
<tr>
<td><strong>Assessment method</strong></td>
<td colspan="8">lecture - final colloquium; specialist workshop - two tests</td>
</tr>
<tr>
<td><strong>Symbol of learning outcome</strong></td>
<td colspan="6" align="center"><strong>Learning outcomes</strong></td>
<td colspan="2" align="center"><strong>Reference to the learning outcomes for the field of study</strong></td>
</tr>
<tr>
<td align="center"><strong>LO1</strong></td>
<td colspan="6" align="center">The student knows the basic methods of statistical data analysis and IT techniques for the analysis of experimental data</td>
<td colspan="2" align="center">IS2_W08</td>
</tr>
</table>

| | | |
|---|---|---|
| **LO2** | The student is able to develop and interpret the results of model studies | IS2_U01 IS2_U02 |
| **LO3** | The student performs a critical analysis and indicates measurement errors, justifies the purpose of the conducted research and their significance in comparison to similar studies | IS2_U04 IS2_U06 IS2_K03 |
| **LO4** | The student works in a team taking on various roles, verifies and respects the opinion of other team members, is responsible for the safety of his own work and that of others | IS2_K06 |
| **Symbol of learning outcome** | **Methods of assessing the learning outcomes** | **Type of tuition during which the outcome is assessed** |
| **LO1** | colloquium including lecture and specialist workshop | **L, SW** |
| **LO2** | colloquium including lecture and specialist workshop | **L, SW** |
| **LO3** | colloquium including lecture and specialist workshop | **L, SW** |
| **LO4** | discussion on the project with exercise, observation of work in class | **SW** |

| **Student workload (in hours)** | | **No. of hours** |
|---|---|---|
| **Calculation** | participation in lectures | 15 |
| | participation in a specialist workshop | 30 |
| | participation in consultations related to classes | 2 |
| | preparation for passing the lecture | 2 |
| | preparation for passing a specialist workshop | 1 |
| | **TOTAL:** | 50 |

| **Quantitative indicators** | **HOURS** | **No. of ECTS credits** |
|---|---|---|
| **Student workload – activities that require direct teacher participation** | 47 | 2 |
| **Student workload – practical activities** | 33 | 1,5 |
| **Basic references** | 1. Radek Silhavy, Petr Silhavy, Zdenka Prokopowa: Computational and Statistical Methods in Intelligent Systems, (CoMeSySo 2018) 2. Handbook of Computational Statistics: Concepts and Methods: Jamesa E. Gentle, Wolfgang Karl Härdle, Yuichi Mori, (SHCS 2012) 3. Applied Statistics for Engineers and Physical Scientists, Third Edition by Johannes Ledolter, Robert V. Hogg, 2009, International Statistical Review | | |
| **Supplementary references** | 1. Forsyth D. : Probability and Statistics for Computer Science, Springer International Publishing, 2018, 2. Otto S.,P., Day T.: A Biologist's Guide to Mathematical Modeling in Ecology and Evolution, Princeton University Press, 2007, 3. Quinn G., P. Keough M. J.: Experimental Design and Data Analysis for Biologists. Cambridge University Press, 2002. | | |

| Organisational unit conducting the course | Department of Water Supply and Sewage Systems | Date of issuing the programme |
|---|---|---|
| Author of the programme | dr inż. Agnieszka Trębicka | 05.06.2023 |

**L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work,**

**S – seminar**