**SYLLABUS**

**Course description**

<table>
<tr><td colspan="2">Course code</td><td rowspan="2">Course</td><td colspan="4">TEORIA EKSPERYMENTU</td></tr>
<tr><td colspan="2">MB/O/I/ST/B1.7</td><td colspan="4">EXPERIMENT THEORY</td></tr>
<tr><td colspan="3">Language of instruction</td><td colspan="4">English</td></tr>
<tr><td colspan="3">Academic year</td><td colspan="4">2023/2024</td></tr>
<tr><td colspan="3">field of study:</td><td colspan="4">Mechanical engineering</td></tr>
<tr><td colspan="3">field of specialisation:</td><td colspan="4">All</td></tr>
<tr><td colspan="3">Educational level</td><td colspan="4">first-cycle studies</td></tr>
<tr><td colspan="3">Education profile</td><td colspan="4">General academic</td></tr>
<tr><td colspan="3">Mode of study</td><td colspan="4">Full-time studies</td></tr>
<tr><td colspan="3">Semester(s)</td><td colspan="4">2</td></tr>
<tr><td colspan="3">Affiliation with a group of classes</td><td colspan="4">Core subjects</td></tr>
<tr><td colspan="3">Course status</td><td colspan="4">Obligatory</td></tr>
<tr><td colspan="3" rowspan="4">Types of classes, instruction hours, ECTS credits</td><td>Types of classes</td><td>Number of instruction hours</td><td colspan="2">Number of ECTS credits</td></tr>
<tr><td>Lecture</td><td>[h]</td><td colspan="2" rowspan="3">2 ECTS</td></tr>
<tr><td>Classes</td><td>[h]</td></tr>
<tr><td>Project</td><td>30 [h]</td></tr>
<tr><td rowspan="3">Linkage of the course</td><td>with the education profile</td><td colspan="3">Related to the conducted scientific activity in the discipline to which the field of study is assigned</td><td>0 ECTS</td></tr>
<tr><td>with qualifications</td><td colspan="3">It is used to acquire engineering competences by the student</td><td>2 ECTS</td></tr>
<tr><td>with science discipline</td><td colspan="3">Mechanical engineering</td><td>2 ECTS</td></tr>
<tr><td colspan="2">Form of teaching</td><td colspan="4">Traditional – classes organized at the University /classes conducted using online learning methods and techniques</td></tr>
<tr><td colspan="2">Prerequisites</td><td colspan="4">Basic knowledge and skills in algebra and mathematical statistics.</td></tr>
<tr><td colspan="3">Department</td><td colspan="4">Faculty of Mechanical Engineering</td></tr>
<tr><td colspan="3">Coordinator</td><td colspan="4">dr hab. inż. Wojciech Żurowski prof. UTH Rad.</td></tr>
<tr><td colspan="3">The website of the basic organizational unit</td><td colspan="4">www.uniwersytetradom.pl</td></tr>
<tr><td colspan="3">E-mail address, phone number of the coordinator</td><td colspan="4">wojciech.zurowski@uthrad.pl</td></tr>
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**LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES**

| | |
|---|---|
| Learning Objective: | The aim of education is to acquire the ability to create experiment plans (in the general sense: production process, quality control) adapted to the conditions in which it is conducted and to the tasks to be carried out, as well as the acquisition of competences necessary for the statistical analysis of the results obtained. The aim of laboratory exercises is to show the mechanism of creating object functions and to prepare students to define them on their own. |
| Curriculum Content: | Definition of terms: experiment plan, object function and object model. Characteristics of the research object: input quantities, output quantities, constant and disturbing quantities. Decomposition of the research object. Classification and general characteristics of experimental designs. Chebyshev polynomials. The standardized form of the experiment design. The basic division of plans: determined, randomized and optimization. The structure of the composition plans: the core of the plan, star points and the center of the plan. Measures of location and dispersion of measurement results. The general population and its sample. Location measures: arithmetic mean, geometric mean, harmonic mean, mode and median. Measures of dispersion of measurement results: sample and population variance, corrected variance, sample standard deviation, corrected standard deviation. Distribution function and probability distribution function. Statistical interpretation of results: confidence interval, significance level and confidence level in a normal distribution. Approximation of the function of the research object and the method of verifying its adequacy. Least squares method. |
| Didactic (educational) methods: | Discussion of basic issues with the use of audiovisual means, verbal problem method. Computational issues implemented in the computer lab. |
| Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade: | The final grade is the average of the grade obtained from the practical project and the test of the ability to determine the basic parameters characterizing experimental data sets. |

| Learning outcomes for the course in relation to the field of study learning outcomes and the type of classes | | | | Methods of verifying learning outcomes | |
|---|---|---|---|---|---|
| Learning outcome number | Description of the learning outcomes for the course (PEU) A student who has passed the course ( **W** ) knows and understands / ( **U** ) can / ( **K** ) is ready to: | Field of study learning outcome (KEU) | Types of classes | Form of verification (credits) | Methods of testing and assessment |
| W1 | The concept and role of the theory of experiment in scientific research, production processes and quality control. | K_WG01 | discussion of the issue | test | result of the test |
| W2 | Classification and general characteristics of experimental designs. Plans: complete, monoselective, polyselective (fractional, orthogonal, rotational, optimal, special), randomized (complete, block, square). | K_WG01 | discussion of the issue | multiple choice | result of the test |
| W3 | Measures of location and dispersion of measurement results: mean values, sample variance, standard deviation, range. | K_WG01 | discussion of the issue | test | result of the test |
| W4 | Approximation of the function of the test object and verification of its adequacy (mean deviation, maximum squared deviation, mean squared deviation, sum of squared deviations and multiple correlation coefficient). | K_WG01 | discussion of the issue | multiple choice | result of the test |

| | | | | | |
|---|---|---|---|---|---|
| U1 | Can calculate the average of a sample (arithmetic, geometric, harmonic, mode and median). | K_UW01 | calculations in the computer lab. | test | test result |
| U2 | He is able to select a function approximating the results of measurements, estimate its parameters and determine the measures of adequacy of this approximation. | K_UW02 | calculations in the computer lab | multiple choice | test result |
| K1 | He can cooperate with a team performing measurements or simulation calculations. | K_KK01 | conversation | | |

| Literature and teaching aids |
|---|
| 1. M. Korzyński, Metodyka eksperymentu. Planowanie, realizacja i statystyczne opracowanie wyników eksperymentów technologicznych. Wydawnictwo Naukowe PWN, 2022<br>2. B. Kacprzyński, Planowanie eksperymentów. Podstawy matematyczne, Wyd.Nauk.- Techn., Warszawa 1974<br>3. Z. Polański, Planowanie doświadczeń w technice, PWN, Warszawa 1996.<br>4. R. Górecka, Teoria i technika eksperymentu, skrypt Politechniki Krakowskiej, Kraków 1995. |

| Student workload required to achieve the assumed learning outcomes – the balance of ECTS credits | | | |
|---|---|---|---|
| Attendance, participation | Student workload [h]. | | |
| | Other contact hours (IGK) | Student's self-study hours Classes without a teacher (ZBN) | Classes |
| Participation in ... lectures | X | X | 30 [h] |
| Participation in .... classes/laboratory classes | X | X | X |
| Meeting with teachers during their duty hours | 2 [h] | X | X |
| Preparation for lectures/classes/.... ,<br>Preparation for ... credit / exam | X | 14 [h]<br>4 [h] | X |
| Total student workload | 2 [h]/0,1 ECTS | 18 [h]/0,7 ECTS | 30 [h]/1,2 ECTS |
| ECTS credits for the course | 2 ECTS | | |

| Additional information, comments |
|---|
| In the case of students with special needs, including disabilities, and chronic illnesses, the methods and forms of verification of learning outcomes specified above (in the syllabus) are adapted to the individual needs of these students, as appropriate.<br>Detailed rules and forms of support for students with special needs, including those with disabilities and chronically ill, during classes, credits, and exams are specified in: University Regulations (Regulamin Studiów Uniwersytetu Technologiczno-Humanistycznego w Radomiu), Study Regulations (Zasady Studiowania), and Procedure for Ensuring Accessibility of the Educational Process to Students with Special Needs, Including Those with Disabilities and Chronically ill (Procedura dotycząca zapewnienia dostępności procesu kształcenia studentom ze szczególnymi potrzebami, w tym: z niepełnosprawnością, przewlekle chorych). |