

# SYLLABUS

## Course description

|   |   |  |                        |        |
|---|---|--|------------------------|--------|
| Course code                                       | Course  | <b>CHEMIA</b>  |                        |        |
| MB/O/I/NST/A.3                                    |   | <b>CHEMISTRY</b>   |                        |        |
| Language of instruction                           | English   |  |                        |        |
| Academic year                                     | 2023/2024   |  |                        |        |
| <b>field of study:</b>                            | Mechanical Engineering  |  |                        |        |
| <b>field of specialisation:</b>                   | All   |  |                        |        |
| Educational level                                 | first-cycle studies   |  |                        |        |
| Education profile                                 | General academic  |  |                        |        |
| Mode of study                                     | Part-time study   |  |                        |        |
| Semester(s)                                       | 1   |  |                        |        |
| Affiliation with a group of classes               | Basic classes   |  |                        |        |
| Course status                                     | Obligatory  |  |                        |        |
| Types of classes, instruction hours, ECTS credits | Types of classes  | Number of instruction hours  | Number of ECTS credits |        |
|   | Lecture   | 8[h]   | 4 ECTS                 |        |
|   | Laboratory classes  | 12[h]  |                        |        |
| Linkage of the course                             | with the education profile  | Related to the conducted scientific activity in the discipline to which the field of study is assigned |                        | 4 ECTS |
|   | with qualifications   | It is used to acquire engineering competences by the student   |                        | 4 ECTS |
|   | with science discipline   | Mechanical engineering   |                        | 4 ECTS |
| Form of teaching                                  | Traditional – classes organized at the University /classes conducted using online learning methods and techniques |  |                        |        |
| Prerequisites                                     | basic knowledge of chemistry, physics, and mathematics acquired in the secondary school                           |  |                        |        |
| Department  | Faculty of Mechanical Engineering   |  |                        |        |
| Coordinator                                       | Dr Małgorzata Wojtyniak   |  |                        |        |
| The website of the basic organizational unit      | www.uniwersytetradom.pl   |  |                        |        |
| E-mail address, phone number of the coordinator   | <a href="mailto:m.wojtyniak@uthrad.pl">m.wojtyniak@uthrad.pl</a> , tel. 48 361-76-55                              |  |                        |        |

**LEARNING OUTCOMES, CURRICULUM CONTENT, TEACHING CLASSES, VERIFICATION OF LEARNING OUTCOMES**

|   |  |
|---|--|
| Learning Objective:   | <p>C1 - to familiarize students with basic chemical terminology</p> <p>C2 - gaining by students the knowledge regarding basic principles and concepts that are fundamental in chemistry, properties of chemical elements and compounds, the structure of atom, and basic states of matter.</p> <p>C3 - to acquaint students with the basic principles of work in a chemical laboratory, practical ability of conducting chemical experiments and preparation of research reports</p>   |
| Curriculum Content:   | <p><u>Lecture:</u><br/>                     Fundamental principles and laws of chemistry. Structure of atom. Classification of elements and periodicity in properties. Chemical bonding. Chemical compounds. Mixtures (heterogeneous and homogeneous). States of matter. Electrolyte solutions. Reactions in aqueous solutions.<br/>                     Galvanic and electrolytic cells. Reactivity of metals. Corrosion and corrosion protection. Principles of organic chemistry.</p> <p><u>Laboratory classes:</u><br/>                     Basic principles of work in a chemical laboratory including principles of occupational health and safety; presentation of laboratory test stands; guidelines for report preparation. Determination of the current efficiency of electrolysis, electroplated coatings. Concentration of a solution; solubility of selected salts in water. Refractive index measurement; determination of the percentage composition of solutions. Emulsions; determination of the emulsion type. Measurement of the electromotive force (SEM) of galvanic cells; pH of water solutions; salt hydrolysis. Reserve classes and credit.</p> |
| Didactic (educational) methods:   | <p>Lecture with a multimedia presentation and discussion of examples.</p> <p>Execution of laboratory classes.</p>  |
| Course assessment type, the criteria for assessing the achieved learning outcomes, and the method of calculating the final grade: | <p>To credit the course a student has to obtain the required learning outcomes. Student is obliged to execute all experiments included in the curriculum.</p> <p>Lecture: written test (open tasks)</p> <p>Laboratory: interviews, execution of laboratory experiments and submitting reports. The grade is calculated as an arithmetic average of the partial grades (interviews and reports).<br/>                     The way of the final grade calculation is defined in the Rules of the Study.</p>  |

| 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)<br>A student who has passed the course ( <b>W</b> ) knows and understands / ( <b>U</b> ) can / ( <b>K</b> ) is ready to:                             | Field of study learning outcome (KEU) | Types of classes | Form of verification (credits)         | Methods of testing and assessment |
| W1   | Knows and understands fundamental principles and laws of chemistry   | K_WG03                                | Lecture          | Pass with a grade                      | Written test                      |
| W2   | Knows and understands modern theories of atom and molecule structures, in particular - electron configuration of atoms. Knows how to relate properties of an element to its positioning on the periodic table. | K_WG03                                | Lecture          | Pass with a grade                      | Written test                      |
| W3   | Knows and understands issues related to the solution chemistry. Knows basics of chemical calculations and properties of the main organic compounds.  | K_WG03<br>K_WG12                      | Lecture          | Pass with a grade                      | Written test                      |
| U1   | Is able to use laboratory equipment and  | K_UW06                                | Laboratory       | Pass with                              | Interviews,                       |

|    |   |        |                    |                         |                         |
|----|---|--------|--------------------|-------------------------|-------------------------|
|    | conduct simple chemical experiments. Is able to prepare calibration curves of the measuring systems.  | K_UO13 | classes            | a grade                 | lab reports             |
| U2 | Is able to perform basic chemical calculations related to the fundamental laws of chemistry, solution concentrations, stoichiometry, and equilibrium states in electrolyte solutions. | K_UW06 | Laboratory classes | Pass with a grade       | Interviews, lab reports |
| U3 | Works well in a team.   | K_UO20 | Laboratory classes | Activity during classes | Observation             |
| K2 | Is aware of the impact of chemical compounds on the environment.  | K_KO03 | Laboratory classes |                         |                         |

| Literature and teaching aids |  |
|------------------------------|--|
| 1.                           | Vining W.J., Young S.M., Day R., Botch B.: General Chemistry. Brooks/Cole Pub Co., 2014.                         |
| 2.                           | Weller M., Overton T., Rourke J., Armstrong F.: Inorganic Chemistry. Oxford University Press; 7th edition, 2018. |
| 3.                           | Morrison R.T., Boyd R.N.: Organic chemistry. Pearson, 7th ed., 1999.   |
| 4.                           | Housecroft C. E., Sharpe A. G.: Inorganic chemistry. Harlow : Pearson Education, 2008.                           |
| 5.                           | Timm J. A.: General chemistry. New York : McGraw-Hill Book Company, 1966.  |
| 6.                           | Streitwieser A., Heathcock C. H.: Introduction to organic chemistry. New York : MacMillan Publishers, 1976.      |
| 7.                           | Brown W. H.: Organic chemistry. Belmont : Brooks/Cole Cengage Learning, 2009.                                    |
| 8.                           | Inorganic Chemistry. Berlin : Akademie Verlag, 1981.   |

| 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<br>Classes without a teacher (ZBN) | Classes          |
| Participation in lectures  | X                         | X   | 8 [h]            |
| Participation in laboratory classes  | X                         | X   | 12 [h]           |
| Meeting with teachers during their duty hours  | 5 [h]                     | X   | X                |
| Preparation for lectures/laboratory classes,<br>Preparation for credit                           | X                         | 25[h]/30[ h]<br>20[h]   | X                |
| Total student workload   | 5 [h]/ 0,2 ECTS           | 75 [h]/ 3 ECTS  | 20 [h]/ 0,8 ECTS |
| ECTS credits for the course  | 4 ECTS                    |   |                  |

| Additional information, comments  |
|---|
| <p>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.</p> <p>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, przewlekłe chorych).</p> |