



Fundusze Europejskie  
dla Rozwoju Społecznego



Rzeczpospolita  
Polska

Dofinansowane przez  
Unię Europejską



## COURSE SPECIFICATION

|                            |                            |                      |
|----------------------------|----------------------------|----------------------|
| Course code                | full-time programme:       | <b>M#2-S1-ME-107</b> |
|                            | part-time programme:       |                      |
| Course title in Polish     | <b>Chemia techniczna</b>   |                      |
| Course title in English    | <b>Technical chemistry</b> |                      |
| Valid from (academic year) | <b>2024/2025</b>           |                      |

## GENERAL INFORMATION

|                        |                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------|
| Programme of study     | <b>MECHANICAL ENGINEERING</b>                                                                             |
| Level of qualification | <b>first-cycle</b>                                                                                        |
| Type of education      | <b>academic</b>                                                                                           |
| Mode of study          | <b>full-time programme</b>                                                                                |
| Specialism             | <b>all</b>                                                                                                |
| Department responsible | <b>Department of Maintenance, Laser and Nanoscale Technologies</b>                                        |
| Course leader          | <b>dr hab. inż. Monika Madej, prof. PŚk</b>                                                               |
| Approved by            | <b>dr hab. Jakub Takosoglu, prof. PŚk, Dean of the Faculty of Mechatronics and Mechanical Engineering</b> |

## COURSE OVERVIEW

|                               |                     |                   |
|-------------------------------|---------------------|-------------------|
| Course type                   |                     | <b>basic</b>      |
| Course status                 |                     | <b>compulsory</b> |
| Language of instruction       |                     | <b>English</b>    |
| Semester of delivery          | full-time programme | <b>Semester I</b> |
|                               | part-time programme |                   |
| Pre-requisites                |                     |                   |
| Examination required (YES/NO) |                     | <b>NO</b>         |
| ECTS value                    |                     | <b>2</b>          |

| Mode of instruction       |                     | lecture   | class | laboratory | project | seminar |
|---------------------------|---------------------|-----------|-------|------------|---------|---------|
| No. of hours per semester | full-time programme | <b>15</b> |       | <b>15</b>  |         |         |
|                           | part-time programme |           |       |            |         |         |

## LEARNING OUTCOMES



Politechnika Świętokrzyska  
Kielce University of Technology

Projekt „Dostosowanie kształcenia w Politechnice  
Świętokrzyskiej do potrzeb współczesnej gospodarki”  
nr FERS.01.05-IP.08-0234/23



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| Category of outcome | Outcome code | Course learning outcomes                                                                                                                                                                                                    | Corresponding programme outcome code |
|---------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Knowledge           | W01          | Has advanced knowledge of physics and chemistry, including: thermodynamics, chemical kinetics and catalysis, chemistry of aqueous solutions, structure and principles of operation of chemical, fuel and lithium-ion cells. | MiBM1_W02<br>MiBM1_W16               |
|                     | W02          | Has knowledge of the structure and structure of modern engineering materials, including polymers and organic composites, as well as their research methods.                                                                 | MiBM1_W08                            |
| Skills              | U01          | Is able to use Polish and foreign literature and obtain knowledge from other sources.                                                                                                                                       | MiBM1_U03                            |
|                     | U02          | Is able to use analytical methods to solve engineering tasks, properly interpret experiment results and formulate conclusions.                                                                                              | MiBM1_U12                            |
| Competence          | K01          | Is aware of the need to obtain new information both from literature and experts.                                                                                                                                            | MiBM1_K01                            |
|                     | K02          | Is aware of the need for personal development and understands the need to constantly supplement knowledge in order to improve professional qualifications                                                                   | MiBM1_K03                            |

## COURSE CONTENT

| Type of instruction lecture | Topics covered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| lecture                     | Atomic structure, electronic structure, electronegativity, periodic table of chemical elements, radioactivity of elements and the use of isotopes. Interatomic bonds: atomic, covalent, coordination, ionic, metallic, intermolecular bonds. Classification and properties of inorganic compounds (oxides, hydrides, bases, acids, salts and complexes). Types of chemical reactions: synthesis reactions, analyses, oxidation and reduction reactions, electrochemical reactions, corrosion, corrosion protection. States of matter (properties of gases, liquids and solids, liquid crystals and plasma). Phenomena at the phase boundary - surface tension, surface-active substances. Thermodynamics, kinetics and catalysis of chemical reactions. Electrochemical basis of operation of galvanic cells, photovoltaic cells, fuel cells, lithium-ion cells. Basic organic compounds and functional groups, macromolecular compounds (polymers, composites), fuels, lubricants. |
| class                       | Establishing names and chemical formulas. Stoichiometric calculations. Solutions: percentage and molar concentration, mixing, diluting solutions. Ionic balances in aqueous electrolyte solutions: electrolytic dissociation, degree of dissociation, water ionic product, hydrogen ion exponent - pH, hydrolysis and water hardness. Galvanic cells: electrode potential (half-cells), voltage series of metals, calculation of electromotive force of galvanic cells (SEM).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## ASSESSMENT METHODS

| Outcome | Methods of assessment (Mark with an X where applicable) |
|---------|---------------------------------------------------------|
|---------|---------------------------------------------------------|





| code | Oral examination | Written examination | Test | Project | Report | Other |
|------|------------------|---------------------|------|---------|--------|-------|
| W01  |                  |                     | x    |         |        |       |
| W02  |                  |                     | x    |         |        |       |
| U01  |                  |                     | x    |         |        |       |
| U02  |                  |                     | x    |         |        |       |
| K01  |                  |                     | x    |         |        |       |
| K02  |                  |                     | x    |         |        |       |

**ASSESSMENT TYPE AND CRITERIA**

| Mode of instruction | Assessment type            | Assessment criteria                                              |
|---------------------|----------------------------|------------------------------------------------------------------|
| lecture             | non-examination assessment | The pass mark is a minimum of 50% for the final in-class test.   |
| class               | non-examination assessment | The pass mark is a minimum of 50% f for the final in-class test. |

**OVERALL STUDENT WORKLOAD**

| ECTS weighting |                                                                                 |                     |   |    |   |   |                     |   |    |   |   |      |
|----------------|---------------------------------------------------------------------------------|---------------------|---|----|---|---|---------------------|---|----|---|---|------|
| No.            | Activity type                                                                   | Student workload    |   |    |   |   |                     |   |    |   |   | Unit |
|                |                                                                                 | full-time programme |   |    |   |   | part-time programme |   |    |   |   |      |
| 1.             | Scheduled contact hours                                                         | L                   | C | Lb | P | S | L                   | C | Lb | P | S | h    |
|                |                                                                                 | 15                  |   | 15 |   |   |                     |   |    |   |   |      |
| 2.             | Other contact hours (office hours, examination)                                 | 2                   |   | 2  |   |   |                     |   |    |   |   | h    |
| 3.             | Total number of contact hours                                                   | 34                  |   |    |   |   |                     |   |    |   |   | h    |
| 4.             | Number of ECTS credits for contact hours                                        | 1,4                 |   |    |   |   |                     |   |    |   |   | ECTS |
| 5.             | Number of independent study hours                                               | 16                  |   |    |   |   |                     |   |    |   |   | h    |
| 6.             | Number of ECTS credits for independent study hours                              | 0,6                 |   |    |   |   |                     |   |    |   |   | ECTS |
| 7.             | Number of practical hours                                                       | 25                  |   |    |   |   |                     |   |    |   |   | h    |
| 8.             | Number of ECTS credits for practical hours                                      | 1                   |   |    |   |   |                     |   |    |   |   | ECTS |
| 9.             | Total study time                                                                | 50                  |   |    |   |   |                     |   |    |   |   | h    |
| 10.            | ECTS credits for the course<br><i>1 ECTS credit = 25-30 hours of study time</i> | 2                   |   |    |   |   |                     |   |    |   |   | ECTS |

**READING LIST**

1. Bielański A.: Podstawy Chemii Nieorganicznej. PWN Warszawa, Wyd. IV 2015
2. Cotton F. A., Wilkinson G., Gaus P. L.: Chemia Nieorganiczna, Podstawy. WNT, 1995





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3. Ozimina E., Ozimina D., Materiały do ćwiczeń tablicowych z chemii technicznej, Wyd. PŚk nr 156/2005
4. Drapała T., Chemia ogólna i nieorganiczna, PWN, Warszawa, 2009
5. Pazdro Krzysztof M., Rola-Noworyta Anna, Akademicki zbiór zadań z chemii ogólnej, Wyd. K. Pazdro, 2013,
6. Bodzek M., Cebula J., Materiały pomocnicze do ćwiczeń tablicowych z chemii dla kierunku studiów inżynieria środowiska, Wyd. Politechniki Śląskiej, 2000
7. Whittaker A.G., Mount A.R., Heal M.R. Chemia fizyczna. PWN Warszawa 2003
8. Chemia dla inżynierów, podręcznik pod red. J. Banasia, W. Solarzkiego, AGH Uczelniane Wyd.Nauk.-Dydakt., Kraków 2008 (wyd. uzupeł. i popr.)
9. Peter William Atkins, Loretta Jones Chemia ogólna, Wydawnictwo: Wydawnictwo Naukowe PWN, 2020



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