**Course sheet**

**1. Data about the program**

|  |  |
| --- | --- |
| 1.1 Higher education institution | Babeș-Bolyai University |
| 1.2 Faculty | Faculty of Chemistry and Chemical Engineering |
| 1.3 Doctoral school | Chemistry |
| 1.4 Field of study |  |
| 1.5 Study cycle | Doctorate |
| 1.6 Study program / Qualification | Doctoral training / Doctor of Chemistry |

**2. Course data**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2.1 Name of discipline | | | Electrochemical methods of investigation | | | | | | |
| 2.2 Teacher responsible for lectures | | | | | Prof. Liana Muresan | | | | |
| 2.3 Teacher responsible for seminars | | | | | Prof. Liana Muresan | | | | |
| 2.4 Year of study | 1st | 2.5 Semester | | 2 | | 2.6. Type of evaluation | E | 2.7 Course framework | Opt |

**3. Estimated total time of teaching activities** (hours per semester)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 3.1 Hours per week | 2 | | Out of which: 3.2 Lectures | | 1 | 3.3 Seminars / Laboratory classes | 1 |
| 3.4 Total hours in the curriculum | 24 | | Out of which: 3.5 Lectures | | 12 | 3.6 Seminars / Laboratory classes | 12 |
| Allocation of study time: | | | | | | |  |
| Study supported by textbooks, other course materials, recommended bibliography and personal student notes | | | | | | | 8 |
| Additional learning activities in the library, on specialized online platforms and in the field | | | | | | | 6 |
| Preparation of seminars / laboratory classes, topics, papers, portfolios and essays | | | | | | | 8 |
| Tutoring | | | | | | | - |
| Examinations | | | | | | | 2 |
| Other activities: - | | | | | | |  |
| 3.7 Individual study (total hours) | | 24 | |
| 3.8 Total hours per semester | | 24 | |
| 3.9 Number of credits | | 10 | |

**4. Preconditions** (where applicable)

|  |  |
| --- | --- |
| 4.1 Curriculum | * None |
| 4.2 Competences | * None |

**5. Conditions** (where applicable)

|  |  |
| --- | --- |
| 5.1 Conducting lectures | * Mobile phones should be shut down * No delays are accepted |
| 5.2 Conducting seminars / laboratory classes | * Mobile phones should be shut down * The scientific reports should be ready one week before their oral presentation |

**6. Specific competences acquired**

|  |  |
| --- | --- |
| **Professional competences** | * C1.1 Definition of notions, concepts, theories of Electrochemistry and their use in professional communication * C1.2 Use of basic knowledge of fundamental sciences to interpret and explain the electrochemical phenomena * C1.3 Critical analysis and use of principles, methods and working techniques for quantitative and qualitative evaluation of electrochemical processes * C1.4 Theoretical approach of specific issues by using established principles and methods of electrochemistry |
| **Transversal competences** | * Accomplishment of requested tasks with respect of imposed conditions and deadlines, of professional and moral rules and by following an established working plan * Solving of requested tasks in agreement with the general objectives and through integration in a working group * Information and permanent documentation in the field of interest * Improvement of professional results by involvement in the conducted activities |

**7. Course objectives** (based on the acquired competencies grid)

|  |  |
| --- | --- |
| 7.1 The general objective of the course | * Getting familiar of PhD students with the basic notions, concepts and theories of Electrochemistry |
| 7.2 Specific objectives | * Acquisition of theoretical and practical knowledge related to main aspects of electrochemistry * Understanding of interdisciplinary character of presented notions * Gaining experimental skills in the field of Electrochemistry |

**8. Content**

|  |  |  |
| --- | --- | --- |
| **8.1 Lectures** | **Teaching methods** | **Comments** |
| 8.1.1. Introduction.Basic notions of electrochemical investigation methods | Presentation, discussion, case studies |  |
| 8.1.2. Classification of electrochemical investigation methods |  |
| 8.1.3. Potentiodynamic methods: linear and cyclic voltammetry applied to redox systems in solution |  |
| 8.1.4. Potentiodynamic methods: linear and cyclic voltammetry applied to adsorbed redox systems |  |
| 8.1.5 Square-wave voltammetry and stripping voltammetry |  |
| 8.1.6. Chronoamperometry at low and high overpotentials |  |
| 8.1.7. Hydrodynamic voltammetry (EDR, EDIR) |  |
| 8.1.8. Electrochemical Impedance Spectroscopy |  |
| 8.1.9. Non-conventional polarography |  |
| 8.1.10. Quartz microbalance and other methods |  |
| 8.1.11. Determination of electrochemical parameters, study of reaction mechanisms and of electrocatalytic effects etc. by using electrochemical methods |  |
| 8.1.12. Case studies | Presentation, discussion, case studies, exercises |  |
| **8.2 Seminars / laboratory classes** | **Teaching methods** | **Comments** |
| Case studies prepared with the doctoral students, based on their individual doctoral research topics | Presentation, discussion, exercises |  |
| Bibliography:  1. L. Oniciu şi colab., „Lucrări practice de electrochimie şi tehnologii electrochimice”, Ediţia II-a, Litografia UBB, Cluj-Napoca, 1993.  2. . L. Oniciu, Liana Mureşan, „Electrochimie aplicată”, Presa Universitară Clujeana, 1998.  3. Scientific journals | | |

**9. Aligning the contents of the discipline with the expectations of the epistemic community representatives, professional associations and standard employers operating in the program field**

|  |
| --- |
| * By getting familiar with the theoretical and experimental concepts of electrochemical investigation methods, the doctoral students get important knowledge in agreement with the partial competences required for the possible occupations mentioned in Grille 1-RNCIS |

**10. Examination**

|  |  |  |  |
| --- | --- | --- | --- |
| Activity type | 10.1 Evaluation criteria | 10.2 Evaluation methods | 10.3 Weight in the final grade |
| 10.4 Lectures | Assessment of knowledge | Oral presentations | 90% |
| 10.5 Seminars / laboratory classes | Activity during seminars | Discussions, answers to questions | 10% |
| 10.6 Minimum performance standard | | | |
| * Satisfactory | | | |

|  |  |  |
| --- | --- | --- |
| Date of issue | Signature of the teacher responsible for lectures | Signature of the teacher responsible for seminars |

13.10.2021

 

Date of approval by the doctoral school council Signature of the doctoral school director

………………………………… ………………………………….