**Course SYLLABUS form**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Basic data of the subject** | | | | |
| **Academic Unit:** | | **Faculty of Mathematics & Natural Sciences** | | |
| **Course title:** | | **Industrial Electrochemistry** | | |
| **Level:** | | **Master** | | |
| **Course status:** | | **Mandatory** | | |
| **Study year:** | | **I** | | |
| **Number of hours per week:** | | **2+2** | | |
| **Credit value – ECTS:** | | **6** | | |
| **Time / location:** | | **Thursday 10:30, class no: 1** | | |
| **Lecturer:** | | **Prof. Dr. Fetah PODVORICA** | | |
| **Contact details:** | | [**fetah.podvorica@uni-pr.edu**](mailto:fetah.podvorica@uni-pr.edu) | | |
|  | | | | |
| **Course description** | | This course will help students to gain basic knowledge of the use of electrochemistry for industrial processes | | |
| **Course objectives:** | | This modul is prepared in order to introduce to the students of chemistry, chemical engineering, material sciences and metalurgy with theoritical and practical fundamental knowledge of use of electrochemistry in industry. Students will learn about parts of industry that depends on electrochemical technology. All applications of electrochemistry are based on basic principles of electrochemistry. | | |
| **Learning outcomes:** | | *At the end of the courses the student will be able:*  *1. to introduce basic principles of electrochemistry*  *2. to learn industrials fields when electrochemistry is applied*  *3. to know to interpret basic principles in main processes during the synthesis of compounds with industrial great importance*  *4. to learn for engineering that is used in industrial electrochemistry* | | |
|  | | | | |
| **Contribution on student load (must correspond with learning outcomes)** | | | | |
| **Activity** | | **Hours** | **week** | **Total /hours** |
| Lectures | | 2 | 15 | 30 |
| Exercise theoretical/laboratory | | 2 | 15 | 30 |
| Practice work | |  |  |  |
| Contact with lecturer/consultations | | 1 | 10 | 10 |
| Field exercises | |  |  |  |
| Mid-terms, seminars | | 2 | 2 | 4 |
| Homework | | 1 | 10 | 10 |
| Individual time spent studying (at the library or home) | | 2 | 10 | 20 |
| Final preparation for the exam | | 2 | 15 | 30 |
| Time spent in evaluation (tests, quiz, final exam) | | 2 | 5 | 10 |
| Projects, presentations, etc. | | 2 | 3 | 6 |
| **Total** | |  |  | **150** |
|  | | | | |
| **Teaching methods** | | Lectures, discussions, exercises, consultations, homework, colloquies and exams. | | |
|  | |  | | |
| **Evaluation methods** | | The first test is 15%,  second test is 15%,  attendance 5%,  engagements in practical exercises 15% and  final exam 50%. | | |
| **Literature** | | | | |
| **Basic Literature:** | 1. D. Pletcher, F. Walsh, “Industrial electrochemistry”, 2nd Edition, Chapman & Hall, New York, 1993.  2. V.S. Bagotsky, “*Fundamentals of Electrochemistry”*, 2nd Edition, Wiley, New Jersey, 2006.  A. C. West. Electrochemistry and Electrochemical Engineering, USA 2012. | | | |
| **Additional Literature** | 1. H. Lund, O. Hammerich, “*Organic Electrochemistry*”, Marcel Dekker Inc. New York, 2001. | | | |

|  |  |
| --- | --- |
| **Designed study plan:** | |
| **Week** | **Lectures which will be held** |
| ***First week:*** | Introduction, fundamental concepts, electrochemical instruments, electrodes |
| ***Second week:*** | Different types of cells, membranes. |
| ***Third week:*** | Electrochemicalreactions,criteria for the selection of electrode materials |
| ***Fourth week:*** | Electrochemical engineering |
| ***Fifth week:*** | Industrial production of chlorine and potassium hydroxide |
| ***Sixth week:*** | Extraction, refining and production of metals |
| ***Seventh week:*** | Production of organic substances with electrochemical processes  1st mid-term evaluation |
| ***Eighth week:*** | Electro-organic synthesis. |
| ***Ninth week:*** | Hydrodimerization of acrylonitrile, other electrosynthetic processes. Indirect electrosynthesis. |
| ***Tenth week:*** | Water cleaning by electrochemical methods. |
| ***Eleventh week:*** | Metals finishing |
| ***Twelfth week:*** | Corrosion and its monitoring, |
| ***Thirteenth week:*** | Bateries and fuel cells |
| ***Fourteenth week:*** | Electrochemical sensors and monitoring techniques |
| ***Fifteenth week:*** | 2nd mid-term evaluation |
|  |  |
| **Designed study plan:** |  |
|  | **Exercises which will be held** |

|  |
| --- |
| Electrochemical cell |
| Overpotential. Water electrolysis |
| Electrochemical production of Chlorinein small scale |
| Trace elimination of metals from water by electrochemistry |
| Organic electrochemistry |
| Electro-organic synthesis. |
| Hydrodimerization of acrylonitrile |
| Electrochemical sensors |
| Metals passivation |
| Batteries |
|  |
| **Academic policies and rules of conduct:** |
| Attendance at lectures and exercises should be regular and scheduled time. Students must be in commensurate to the general rules of the university. For specific rules and specifics of organizing lectures and exercises, students are notified by the professor of the course. |