**COURSE SYLLABUS**

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| **Subject: Electrochemistry** | **Academic field: Materials Science and Nanotechnology** |
| **Lecturer: NGUYEN Van - Quynh** |  |
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| **Academic year: 2015-2016** |  |

**COURSE DESCRIPTION**

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| **Credit points** | 4 | |
| **Level** | Bachelor | |
| **Teaching time**  **Location** | DD/MM/YYYY  University of Science and Technology of Hanoi | |
| **Time Commitment** | Lecture | 24 hrs |
| Exercise | 6 hrs |
| Practice | 10 hrs |
| Lab-work | 0 hrs |
| Total | 40 hrs |
| **Prerequisites** | Students should have knowledge on fundamental physical chemistry | |
| **Recommended background knowledge** | Fundamental knowledge on electrochemistry is needed. | |
| **Subject description:** | The course provides basic knowledge on electrochemical batteries, including fuel cells and their potential applications. | |
| **Objectives & Out-come** | Understanding the chemistry of some electrochemical objects, including batteries and fuel cells. | |
| **Assessment/ Evaluation** | Attendance/Attitude | 10 % |
| Class exercise(s) | 10 % |
| Practical | 20% |
| Final exam | 60 % |
| **Prescribed Textbook(s)** | [1] Allen J. Bard Larry R. Faulkner, Electrochemical Methods: Fundamentals and Applications, John Wiley & Sons, Inc., 2001 | |

**COURSE CONTENTS & SCHEDULE**

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| **Class** | **Contents** | **Hours** | | | **Ref./Resources** | **Assignment(s)** |
| **Lect.** | **Exr.** | **Prc.** |
| 1 | 1. **Potentials and Thermodynamics of cells**    1. Basic electrochemical thermodynamics    2. A more detailed view of interfacial potential differences    3. Liquid junction potentials | 3 | 0 | 0 |  |  |
| 2 | 1. **Kinetics of electrode reactions**    1. Butler – Volmermodel of electrode kinetics    2. Implications of the Butler – Volmer model for the one-step, one-electron process | 3 | 3 | 0 |  |  |
| 3 | 1. **Mass transfer by migration and diffusion**   3.1.Derivation of general mass transfer equation   * 1. Migration   2. Mixed migration and diffusion near an active electrode   3. Diffusion | 3 | 3 | 0 |  |  |
| 4 | 1. **Essential electrochemical technique**    1. Potentiometry    2. Voltammetry    3. Electrochemical Methods of Analysis    4. Digital Simulation, Equivalent Circuit, Impedance | 3 | 0 | 5 |  |  |
| 5 | 1. **General introduction of applications**  * Industrial Electrolytic Processes * Electrochemical Reactors * Corrosion of Metals * Electroplating * Fuel Cells * Batteries (Electrochemical Power Sources) | 3 | 0 | 2 |  |  |
| 6 | 1. **Electrochemical Energy Conversion**  * Electrical characteristics * Chemical current - producing reactions in batteries * Performance of batteries * OCV and Discharge Voltage * Electrical Characteristics of Storage Batteries * Comparative Characteristics | 3 | 0 | 0 |  |  |
| 7 | 1. **Fuel cells**  * Design principle * Relationships between parameters in fuel cells * Types of Fuel cells (Direct Methanol; Methanol Permeation Through the Membrane; Development Prospects) | 3 | 0 | 0 |  |  |
| 8 | 1. **Photoelectrochemistry and photogalvanic cells**  * Semiconductor Electrodes * Current-Potential Curves at Semiconductor Electrodes * Photo effects at Semiconductor Electrodes * Surface Photocatalytic Processes at Semiconductor Particles * Electrochemistry of Photolytic Products * Photogalvanic Cells | 3 | 0 | 3 |  |  |

*Notes:*

* *Abbreviation: Lect. (lecture), Exr. (Exercise), Prc. (Practise).*
* *Assignments may include assignments, practical work, reports, exercises ...for each class sessions*

**Reference Literature:**

[1]. Christopher M.A. Brett and Ana Maria Olivia Brett, Electrochemistry: Principles, Methods and Applications, Oxford University Press, 1993.

[2]. V. S. Bagotsky, Fundamentals of Electrochemistry, Second Edition, John Wiley & Sons, Inc., Publication, 2005

[3]. R.G.Compton, C.E. Banks, Understanding Voltammetry, Second Edition, Imperial College Press, 201