Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Electrochemical energy storage and conversion
Course code	45534
Scientific sector	ING-IND/23 "Applied Physical Chemistry"
Degree	Master Energy Engineering
Semester	2
Year	2
Academic year	2022/2023
Credits	6
Modular	no

Total lecturing hours	60
Total lab hours	
Total exercise hours	
Attendance	Exercise lessons are mandatory
Prerequisites	General chemistry- Physics: thermodynamics and electromagnetism
Course page	Course Offering / Free University of Bozen-Bolzano (unibz.it)

Specific educational objectives	Knowledge of principles of equilibrium and non-equilibrium electrochemistry and of the main electrochemical energy conversion and storage methods. The course introduces the fundamental notions of electrochemistry and surface thermodynamics necessary for a basic understanding of the physical chemical bases of electrochemical phenomena; how electrochemical and photo-electrochemical devices work. The main industrial electrochemical technologies dedicated to the energy production and storage are presented and analyzed through lectures, laboratory experiments and, if possible, visits to industrial plants.
Lecturer	Dr. Ataollahi Narges
Scientific sector of the lecturer	ING-IND/23
Teaching language	English
Office hours	By appointment
Teaching assistant *(if any)*	-
Office hours	-
List of topics covered	General definitions of electrochemical systems; equilibrium and non-equilibrium phenomena in electrochemistry; electrochemical kinetics; energy devices in electrochemistry: batteries, fuel cells, capacitors and

	supercapacitors; photovoltaic cells and photo-electrochemical cells.
Teaching format	Frontal lectures and exercises

Learning outcomes	**Knowledge and understanding:** profound and detailed scientific knowledge and understanding of the principles of equilibrium and non-equilibrium electrochemistry **Applying Knowledge and understanding:** profound and detailed scientific knowledge of the main electrochemical energy conversion and storage methods **Making judgments:** skills and problem solving capacity to analyze problems of electrochemical energy conversion and storage **Communication skills:** ability to structure and prepare scientific and technical documentation describing project activities **Learning skills:** ability to independently keep up to date with developments in the most important areas of electrochemical energy conversion and storage
Assessment	Evaluation of the written reports on the lab experiments and oral examinations. The examination consists of either an oral test, or the discussion of a report written by the student on a topic which may be either freely chosen or chosen in agreement with the course lecturer. An alternative method for the exam is building an electrochemical device with given specifications (e.g. A zinc-carbon battery which provides a given amount of power for a given time) and discussion of the procedures used and the problems found.
Assessment language	English
Evaluation criteria and criteria for awarding marks	Showing a sufficient knowledge of the topic and the ability to answer related questions
Required readings	One of the following books: Bianchi e Mussini- Elettrochimica - ed. MassonBianchi – Processi elettrochimici - ed. MassonD'Archer e Hill (Eds) Fundamentals of electrochemistry Bagotsky Electrochemistry for material science - Plieth Other files dedicated to specific topics will be indicated or given during the course.
Supplementary readings	Other files dedicated to specific topics will be indicated or given during the course.