

Syllabus

Course description

Course title	Electrochemical energy storage and conversion
Course code	45534
Scientific sector	ING-IND/23
Degree	Master Energy Engineering
Semester	2
Year	1
Academic year	2017/2018
Credits	6
Modular	no

Total lecturing hours	48
Total lab hours	
Total exercise hours	12
Attendance	Exercise lessons are mandatory
Prerequisites	General chemistry- Physics: thermodynamics and electromagnetism
Course page	-

Specific educational objectives	<p>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.</p>
Lecturer	Prof. Claudio Della Volpe
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	<p>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.</p>

Teaching format	Frontal lectures and exercises
Learning outcomes	<p>Knowledge and understanding: profound and detailed scientific knowledge and understanding of the principles of equilibrium and non-equilibrium electrochemistry</p> <p>Applying Knowledge and understanding: profound and detailed scientific knowledge of the main electrochemical energy conversion and storage methods</p> <p>Making judgments: skills and problem solving capacity to analyze problems of electrochemical energy conversion and storage</p> <p>Communication skills: ability to structure and prepare scientific and technical documentation describing project activities</p> <p>Learning skills: ability to independently keep up to date with developments in the most important areas of electrochemical energy conversion and storage</p>
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	<p>One of the following books: Bianchi e Mussini-Elettrochimica - ed. MassonBianchi – Processi elettrochimici - ed. MassonD'Archer e Hill (Eds)</p> <p>Fundamentals of electrochemistry Bagotsky</p> <p>Electrochemistry for material science - Plieth</p> <p>Other files dedicated to specific topics will be indicated or given during the course.</p>
Supplementary readings	Other files dedicated to specific topics will be indicated or given during the course.