UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Materials Science for energy conversion and storage

2526-116R-M05

Title

Materials Science for energy conversion and storage

Teacher(s)

Giovanni Di Liberto, Nicolò Pianta

Language

English

Short description

Summary
This PhD course aims at introducing the materials for energy conversion and storage. The course will cover the basics of electrochemistry and electrochemical processes at the interface between an electrode and an electrolyte, from both experimental and modeling viewpoints. The course will span from models systems up to the analysis of real case studies and state-of-the-art applications. In this respect, the target audience of the course involves material scientists working in energy with experimental, computational and theoretical backgrounds.

Module 1: Fundamentals of Electrochemical Energy Conversion and Storage (Nicolò Pianta – 4h)

The first part of the course is devoted to fundamentals, recent achievements and developments of electrochemistry for energy conversion and storage. The course will start by briefly recalling the fundamentals of electrochemistry and the basic models to describe an electrochemical process at the interface with a material. Then, the focus will be dedicated to the implications in energy conversion storage, by also discussing the state-of-the-art materials available nowadays.

Module 2: Modeling materials for Energy Conversion and Storage (Giovanni Di Liberto – 4h)
The main fundamental approaches to describe electrochemical processes will be discussed in close connection with the analysis of real cases studies of electrochemical conversion and storage. This will include the conversion of hydrogen and oxygen on nanocatalysts, and modeling of electrochemical storage systems, such as Li-ion, Na-ion batteries.

CFU / Hours

1 CFU / 8 hours

Teaching period

02/02/2026 - 07/02/2026

Sustainable Development Goals

QUALITY EDUCATION | AFFORDABLE AND CLEAN ENERGY | RESPONSIBLE CONSUMPTION AND PRODUCTION | CLIMATE ACTION