INDUSTRIAL ELECTROCHEMICAL ENGINEERING (Vito Di Noto)

Organizzazione della didattica

Anno accademico	2025/2026
Corso di studio	XXX
Curriculum	XXX

Syllabus

Prerequisiti:	In order to follow this course it is necessary that the student has passed the following exams: (i) General and Inorganic Chemistry or Elements of Chemistry; (ii) General Physics II.
Conoscenze, abilità e competenze da acquisire:	The aim of this course is to bridge the gap between fundamental electrochemistry, electrochemical engineering, and industrial electrochemistry by demonstrating how a solid understanding of the fundamentals is crucial for the efficient design and operation of processes. The course is essential for understanding the principles that drive many modern technologies, from energy storage systems like batteries and fuel cells to processes such as synthesis, electroplating, corrosion prevention, and water treatment. It equips participants with the knowledge to design and optimize electrochemical systems, ensuring efficiency, sustainability, and cost-effectiveness. By bridging fundamental electrochemical theories with practical industrial processes, this course fosters innovation and problem-solving skills, enabling professionals to address complex challenges in fields like energy, manufacturing, and environmental engineering. This expertise is crucial for industries aiming to adopt greener technologies and enhance operational performance.
Modalità di esame:	Oral examination.
Criteri di valutazione:	The grade is gauged on the basis of the evaluation of the knowledge both of the fundamental aspects that characterize the subject and of the technological-industrial characteristics and applicability of the systems described during the course
Contenuti:	Part I. Fundamental concepts a. Electron transfer b. Mass transport c. Phase formation in electrode reactions d. Chemical reaction e. Assessment of cell voltage f. Electrochemistry of cell Part II. Electrochemical Engineering a. General considerations b. Costing an electrolytic process

	c. Performance and figures of merit d. Electrolysis parameters e. Principles of cell design f. Laboratory data and scale-up Part III. Industrial processes a. The chlor-alkaline industry b. Inorganic electrolytic process (Fluorine, water electrolysis, peracids and their salts, hydrogen peroxide, ...) c. Organic electrosynthesis (indirect electrosynthesis, and future of electrochemistry) d. Water purification Part IV. Metal industry a. Electroforming b. Electrodeposition of metal powder c. Electroplating and electroless plating d. Electrochemical etching Part V. Corrosion and its control a. Fundamental, thermodynamic and kinetics od corrosion reactions b. Prevention of corrosion and control c. Corrosion problem in electrolytic processing d. Corrosion measurement and monitoring
Attività di apprendimento previste e metodi di insegnamento:	1) classroom lectures with examples on Industrial applications. 2) laboratory teaching and activities
Eventuali indicazioni sui materiali di studio:	lecture notes, ppt of the lesson
Testi di riferimento:	• Dereck Pletcher and Frank C. Walsh, “Industrial Electrochemistry”, Chapman and Hall, second Edition, 1993 •

Didattica innovativa: Strategie di insegnamento e apprendimento previste, Obiettivi Agenda 2030 per lo sviluppo sostenibile

Didattica innovativa: Strategie di insegnamento e apprendimento previste:

- Case study
- Project work
- Problem based learning
- Utilizzo delle tecnologie per la didattica (moodle e/o altri strumenti per la didattica, software, video, quiz, wooclap)
- Feedback

Obiettivi Agenda 2030 per lo sviluppo sostenibile:

- Istruzione di qualita'
- Uguaglianza di genere
- Energia pulita e accessibile
- Industria, innovazione e infrastrutture
- Citta' e comunita' sostenibili
- Agire per il clima