UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

LCA e Indicatori di Sostenibilità

2223-1-F7501Q104-F7501Q114M

Aims

The main objective is to provide the student with the theoretical and practical knowledge useful for evaluating the interaction between production activities and the environment from a sustainability perspective and the tools to operate in the field of innovation.

Knowledge and understanding
At the end of the course the student knows:

- The fundamentals of environmental reactivity of chemical compounds;
- The main indicators of environmental sustainability;
- The fundamentals of life cycle analysis.

Applying knowledge and understanding
At the end of the course the student is able to:

- Calculate some of the main environmental sustainability indicators;
- Calculate mass and energy flows in the life cycle analysis of a product or process.

Making judgements
At the end of the course the student is able to:

- Analyze the phases of the life of a product or a process;
- Critically evaluate the results obtained from the application of the models;
- Identify possible interventions to reduce the impacts.

Learning skills
Being able to apply the acquired knowledge to contexts different from those presented during the course, and to understand the topics covered in the scientific literature concerning the sustainability issue.

Contents

The reactivity of chemical compounds in the environment. The indicators of sustainability and environmental sustainability. Life cycle analysis.

Detailed program

REACH general aspects.
Life time and half life of the compounds in the environment.
Reactivity of compounds in the atmosphere. Oxides of nitrogen and sulfur and their reactivity. Acid rain. The radical reactions of volatile organic compounds, tropospheric ozone. Chloro-fluoro-carbides (CFCs) and stratospheric ozone depletion. Primary and secondary atmospheric particles, PMx sources, PMx chemical composition, PMx aging. Effects on the environment, health and cultural heritage.
Reactivity of compounds in water. Water as a system open to the atmosphere and sediments, CO2, acidification and alkalinity of surface waters. Reactions of hydrolysis, substitution and elimination.
Outline of Red-Ox reactions in surface waters, electronic activity.

Sustainability indicators: Human development index, Index of Sustainable Economic Welfare. Environmental sustainability indicators: emergetic analysis, ecological footprint, life cycle analysis. Life cycle analysis: history, objectives, phases of an analysis, inventory (primary, secondary and tertiary data, allocation), impact assessment (midpoint and endpoint impact categories, classification, characterization, normalization, weighing). Case studies.
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Prerequisites

Fundamentals of Chemistry and Physics.

Teaching form

The course includes 2 CFU of lecture classes (16 hours) to provide the student with basic knowledge of the fundamental principles enriched by 4 CFU of exercise sessions (40 hours) to learn how to use the most used software in this area.

Textbook and teaching resource

Teaching material will be available on the e-learning platform.

Semester

First semester

Assessment method

Oral examination
The oral examination exam aim is to verify the knowledge of the topics covered in the lectures and exercises. In the oral exam, as far as possible, the student will be assessed on the basis of the following criteria: (1) knowledge and understanding; (2) ability to connect different concepts; (3) autonomy of analysis and judgment; (4) ability to use the scientific language correctly.
Exam grade in the range 18-30/30.

Office hours

By appointment to be made by e-mail (ezio.bolzacchini@unimib.it, elena.collina@unimib.it).

Sustainable Development Goals

QUALITY EDUCATION | SUSTAINABLE CITIES AND COMMUNITIES | RESPONSIBLE CONSUMPTION AND PRODUCTION