



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Low Environmental Impact Materials and Processes

2021-1-F5302Q014

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#### Aims

The course focuses on the design manufacture and use of chemicals processes that have little or no pollution potential or environmental risk and are both economically and technologically feasible

#### Contents

Environmental sustainable chemical processes definitions and applications. Biorefinery concept Green Chemistry approach. Carbon economy approach. Green Chemistry approach: alternative feedstocks and starting materials, alternative synthesis and reagents, alternative reaction conditions. Biorefinery: biomass utilisation, white biotechnology, biofuel. Carbon economy: application of the concept. Important Case History

#### Detailed program

Evolution of low environmental synthesis from 50 to 90 with examples

Twelve green chemistry rules Evolution of green chemistry paradigm Carbon economy concept

The renewable resources description with particular emphasis about lignocellulosic materials

Evolution of pulp and paper industry evaluated under the environmental point of view

Recycle and reuse (advantages and problems)

Synthesis of new materials (biodegradable and not biodegradable )starting from renewable resources with low environmental impact processes

Bulk and surface modifications

Evaluation method for environmental friendly process by LCA ( Life Cycle Assessment )

Chemicals synthesis starting from renewable resources with low environmental impact processes

Biorefinery concept with examples and applications in Italy and Europe

Integration of biorefinery idea in the circular economy concept

## **Prerequisites**

Basic knowledge of Chemistry and Biology

## **Teaching form**

- Lessons, 6 credits

During the Covid-19 emergency period, lessons will take place in mixed mode: partial presence and asynchronous / synchronous videotaped lessons

## **Textbook and teaching resource**

Chapters book from Green Chemistry Theory and Practice PT Anastas 1998 Oxford University Press, Introduzione alla Chimica Ambientale Bruno Rindone Città Studi Edizioni, 1996.

Scientific Articles

## **Semester**

2 semester

## **Assessment method**

Oral examination mark range 18-30/30. The questions during oral examination verify the knowledge about the development of green-chemistry concept, also using case-study, with particular attention about the biorefinery concept.

During the Covid-19 emergency period, oral exams will only be online. They will be carried out using the WebEx platform and on the e-learning page of the course will be published a public link in order to access to the

examination

## **Office hours**

Every day. It is necessary to fix the meeting by E-mail

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