UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Biomass As Renewable Resource

2526-1-F7603Q005-F7603Q00503

Aims

The module ‘Biomass as renewable resource' aims at providing knowledge and skills regarding the potential of plant biomass as feedstock, with a major focus on challenges and opportunities for its sustainable use in agriculture and industry for the production of bio-energy and bio-products through a circular economy approach. Classes will give basics of plant biology and ecology preliminary to understand which are the determinants of their direct and indirect importance as feedstock for energy supply and other uses. Characteristics of biomass and valorisation pathways will be taught. Students will learn limits and benefits in the use of different types of biomass in the light of social and environmental issues related to global change. In this regard, the role of biomass as a key component in the circular economy will be analyzed. The cascading use as efficient utilisation of residues and waste materials to extend biomass availability will be discussed also through case studies. Case studies will be analysed and discussed during sessions common to the other two modules to provide the necessary interdisciplinary understanding of the topics covered in the course.

Students are invited to consult the syllabus of the entire course for details regarding learning- and skill-related objectives.

Contents

• Renewable resources in the global change era.
• The importance of biomass as renewable resource.
• Main EU and international policies regarding biomass use as renewable resource.
• Basics of plant biology and ecology.
• Classification of biomass based on origin, characteristics and sustainability.
• Pathways and processes of biomass valorisation in the productive and energetic supply chain.
• Biomass in circular economy.
• Challenges and opportunities in the cascading use of biomass as feedstock.
• Real-world examples of sustainable biomass management in the productive and energetic supply chain.

Detailed program

• Overview of renewable resources.
• Evolution of biomass as a feedstock in the bioeconomy and its direct or indirect origin from plants.
• Principles of plant biology and ecology related to the use of plants as biomass in the productive and energetic supply chain.
• Classification of biomass into generations.
• Chemical components of interest for the production of high value-added compounds and bioenergy from biomass.
• Processes and technologies for the production of bioenergy from biomass: thermochemical, biological and physical conversion.
• Essential biomass parameters to be considered when choosing the appropriate conversion technology.
• Cascading principles for the use of biomass.
• Interdisciplinary case studies of the use of biomass in the bioeconomy.

Prerequisites

• Basic notions of environmental sustainability.

Teaching form

4 CFUs of mixed theoretical and interactive lessons (32 hours)
• 8 two-hour lectures, in person, mostly frontal teaching and discussion in class, Delivered Didactics.
• 4 two-hour lectures, online, mostly frontal teaching and discussions, Delivered Didactics.

1 CFU, of mixed didactics in the classroom (16 hours).
• 4 two-hour lectures, in person, including group presentations, group debates, discussion of relevant case studies and reading of relevant material in class, Interactive Teaching.

Textbook and teaching resource

• Slides
• Notes shown during lectures and additional material on selected topics, *i.e.*, scientific articles, made available on the e-learning website of the course.

Semester

I semester (October - January)

Assessment method

The final exam consists of a single written exam at the end of the course, which comprises the discussion of various topics covered in the course within the three modules, with an emphasis also on the connections between concepts and processes, such as to arrive at a critical evaluation of work from the point of view of planetary boundaries and responsible use of renewable and non–renewable resources.

The final score will be between 18/30 and 30/30 *cum laude*, based on the overall assessment considering the following criteria:
(1) knowledge and understanding;
(2) ability to connect different concepts;
(3) autonomy of analysis and judgment;
(4) ability to correctly use scientific language.

Office hours

Always, after scheduling an appointment *via* phone or e-mail.

Sustainable Development Goals

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