UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Laboratory of Sustainability and One Health

2526-1-F7603Q025

Aims

This laboratory course takes an interdisciplinary approach to sustainability and health, integrating microbiology, food systems, urban planning and public policies within the One Health framework. It examines the role of microorganisms in food production and waste reduction, also addressing regulatory and safety aspects of microbial-based products, including probiotics and nutraceuticals. In parallel, it explores sustainable urban planning strategies, with a focus on mobility, transport and territorial policies aimed at making cities more inclusive, safe and resilient. By connecting these two perspectives, the course highlights the interconnection between food, microorganisms and urban environments, underlining their collective impact on public health, sustainability and policy development. Through theoretical lectures and practical applications, students will develop critical analysis skills, interdisciplinary problem-solving and understanding of the tools needed for sustainable food production and urban planning.

The laboratory course aims to provide students with an integrated understanding of sustainability in food and urban systems, promoting the ability to evaluate and develop sustainable strategies that improve public health through the application of microbiology to food and land management. Students will acquire knowledge on the regulatory and economic aspects of sustainability and develop interdisciplinary approaches to address contemporary global challenges related to food safety, mobility and environmental impact.

The course is structured in two main areas, integrating microbiology and urban planning in a sustainability perspective. The first part focuses on the role of microorganisms in food systems and human health, with a particular focus on their applications in food production, preservation and waste reduction, as well as on the regulatory and safety aspects of microbial-based products, such as probiotics and nutraceuticals. The second part addresses sustainable territorial planning, with a focus on mobility strategies, transport policies and regional development aimed at creating more resilient and sustainable cities. By combining these perspectives, the course provides a comprehensive understanding of the intersection between food systems, microbial applications and urban sustainability in the context of the One Health concept.

This structure of the laboratory course guarantees students the acquisition of both scientific and political-managerial skills, allowing them to critically evaluate and develop solutions at the intersection of microbiology,

production food, public health and urban sustainability.

Knowledge and understanding
Upon completion of the course, students will have acquired:
• A basic understanding of the role of microorganisms in sustainable food systems, including fermentations, probiotics and prevention of foodborne diseases.
• Awareness of policies, regulatory frameworks and economic implications of sustainable food production and microbial applications.
• Understanding of sustainable urban planning principles, with a focus on transport and mobility strategies to reduce environmental and social impacts.
• The ability to evaluate sustainability strategies from both a microbiological and urban planning perspective, integrating concepts of food safety and land management in the One Health approach.

Applying knowledge and understanding
At the end of the course, students will be able to:
• analyze and develop microbial applications for sustainable food production, assessing their safety, regulatory compliance and economic sustainability;
• design and evaluate sustainable territorial strategies, with a focus on policies that improve urban resilience and reduce anthropogenic impacts on the environment;
• integrate microbiological and urban planning approaches to propose innovative solutions to global sustainability challenges;
• effectively communicate the results to policy makers, industry professionals and the scientific community, contributing to the development of more sustainable and public health-conscious societies.

Making judgements
At the end of the course the student will be able to:
• apply the acquired knowledge in various contexts;
• transfer the concepts and approaches introduced in a certain context to connected fields;
• elaborate the concepts discussed in the course.

Communication skills
At the end of the course the student should be able to
• analyse problems in the ares covered by the course in a clear and concise way;
• explain orally with a suitable language the objectives, the procedures and the results of the elaborations carried out.

Learning skills
At the end of the course the student should be able to different from those presented during the course, and to understand the topics covered in the scientific literature concerning the sustainability issue.

Contents

• Microbiology and One Health approach.
• Fundamentals of food fermentations and microbial applications.
• Starter cultures and their industrial applications.
• Microorganisms in food preservation and waste reduction.
• Regulatory aspects and safety of microbial applications in food.
• Microorganisms and health: probiotics, antimicrobial resistance and biome depletion theory.
• Theories and policies for sustainable territorial planning.
• Strategies for mobility and urban development in a sustainable perspective.
• Sustainable Urban Mobility Plans (SUMPs) as a tool to mitigate environmental impact.
• Mobility Management as a connection between technological and organizational sustainability strategies.

Detailed program

Microbiology, Food and One Health
• microbiology in the One Health context;
• food fermentations, inclusing origins of food fermentations, definition of fermented food, types of fermented products (spontaneous and inoculated fermentations);
• starter cultures in the food industry, including evolution, definition and classification of starter cultures;
• starter cultures and public health: regulatory context, QPS status and emerging issues;
• reduction of food waste, including role of microorganisms in food preservation and the reduction and reuse of food waste;
• probiotics, prebiotics and microbial-based nutraceuticals, including scientific and legal definitions of probiotics;
• the probiotic industry: safety and regulations;
• environmental and food microorganisms and human health;
• foodborne diseases: types and socio-economic impact;
• containment of foodborne diseases food;
• diffusion of antimicrobial resistance genes and strategies to reduce their use;
• biome depletion theory and non-communicable diseases.

Sustainable Urban Planning and Mobility
• sustainable development strategies and territorial planning
• the case of the Lombardy region, including the strategic plan of the Metropolitan City of Milan and the Territorial Government Plan (PGT) of the Municipality of Milan;
• mobility planning and sustainable urban development;
• introduction to the macro-concepts of sustainable mobility, determinants and components;
• sustainable Urban Mobility Plans (SUMPs) as tools to mitigate environmental externalities of mobility;
• mobility management as a link between technological and organizational dimensions of sustainable mobility development.

Prerequisites

• Basic knowledge of biology.
• Basic knowledge of chemistry.

Teaching form

6 CFUs of mixed theoretical and interactive lessons in the classroom (60 hours):
• 25 two-hour lectures, in person, Delivered Didactics;
• 5 two-hour lectures, in person, with interviews, exercises and debates, case studies, Interactive Didactics.

Attendance to lectures and interactive exercises is highly recommended.

Textbook and teaching resource

• Lecture slides and additional reading materials made available on the e-learning platform of the course.
• Selected parts of the following texts:

- Colleoni, Matteo (2019), Mobilità e trasformazioni urbane. La morfologia della metropoli contemporanee, Franco Angeli, Milan.
- Pucci P., Colleoni M. (2016), Understanding mobilities for designing contemporary cities. Springer Editor
  • Additional material on selected topics.

Semester

II semester (March - June)

Assessment method

The final exam will consits of a written exam covering the topics of the entire laboratory course and their connections.

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

Please refer to the indications provided in the syllabi of the modules.

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | SUSTAINABLE CITIES AND COMMUNITIES