



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Laboratory of Sustainability and One Health

2627-1-F7603Q025

Aims

The laboratory course provides students with an interdisciplinary understanding of sustainability and One Health by integrating two complementary perspectives: the role of microorganisms in food systems and human health, and the role of urban and territorial planning in promoting sustainable, inclusive and healthy communities. The course connects food microbiology, public health, sustainable food systems, urban planning, mobility and territorial policies, with the aim of showing how environmental, biological, social and spatial dimensions contribute to sustainability and quality of life.

The course is structured into two modules. The Food, Microbes and Human Health module focuses on the relationships between microorganisms, food systems and human health, addressing food fermentations, microbial starters, food preservation, food waste reduction, safety and regulatory aspects of microbial applications, probiotics, antimicrobial resistance, foodborne diseases and biome depletion theory. The Urban Planning I module focuses on sustainable territorial planning, urban development and mobility strategies, with particular attention to Sustainable Urban Mobility Plans (SUMPs), mobility management and the territorial implementation of sustainability policies.

Knowledge and understanding

Students will acquire knowledge concerning:

- the role of microorganisms in food systems and their relevance for human health, food safety and sustainability;
- the contribution of microbial applications to food production, preservation and food waste reduction;
- the main safety and regulatory aspects related to microbial applications in food systems;
- the relevance of foodborne diseases, antimicrobial resistance and biome depletion theory within a One Health perspective;
- the main theories and policies for sustainable territorial planning;
- the role of mobility and transport systems in sustainable urban and territorial development;
- the function of Sustainable Urban Mobility Plans (SUMPs) and mobility management in reducing environmental impacts and improving quality of life.

Applying knowledge and understanding

Students will develop the ability to apply concepts from food microbiology, public health, sustainability and urban planning to the analysis of real-world problems. They will be able to interpret examples and case studies concerning microbial applications in food systems, food safety, food waste reduction, urban mobility and territorial planning. Students will also learn to evaluate sustainability strategies by considering both biological and spatial dimensions, and by connecting food-related, environmental and urban issues within a One Health framework.

Making judgements

Students will acquire the ability to critically assess opportunities and limitations of different sustainability strategies in food and urban systems. They will be able to evaluate, at a basic but scientifically grounded level, the potential benefits and risks associated with microbial applications in food systems, as well as the environmental, social and health implications of urban planning and mobility policies. Students will develop the capacity to frame complex sustainability challenges by integrating scientific evidence, regulatory aspects, territorial policies and public health considerations.

Communication skills

Students will be able to communicate concepts related to food microbiology, One Health, sustainable food systems, urban planning and mobility using appropriate scientific and technical language. They will develop the ability to explain interdisciplinary problems to audiences with different disciplinary backgrounds, highlighting the connections between food systems, microorganisms, public health, urban environments, mobility and sustainability.

Learning skills

Students will acquire the conceptual and methodological tools needed to further explore topics related to sustainability and One Health in food and urban systems. They will be able to consult teaching materials, scientific literature, institutional reports, regulatory documents and planning documents in order to update and integrate their knowledge in an interdisciplinary context.

Contents

- Food microbiology in the One Health framework.
- Fundamentals of food fermentation and microbial applications in food systems.
- Microbial starters and their applications in food production.
- Role of microorganisms in food preservation and food waste reduction strategies.
- Safety and regulatory aspects of microbial applications in food.
- Microorganisms, food and public health: probiotics, antimicrobial resistance, foodborne diseases 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 tools to mitigate environmental impact.
- Mobility Management as a connection between technological and organizational sustainability strategies.

Detailed program

Food, Microbes and Human Health

Food microbiology in the One Health framework

- Role of microorganisms at the interface between food systems, human health, animal health and the environment.
- Food-associated microorganisms as beneficial, technological, spoilage or pathogenic agents.
- Microbial contributions to sustainable food systems, food safety and public health.

- The One Health approach applied to food microbiology and microbial risks.

Fundamentals of food fermentation and microbial applications in food systems

- Origins and significance of food fermentation.
- Definition of fermented foods.
- Spontaneous and inoculated fermentations.
- Main categories of fermented foods and their relevance for preservation, nutritional quality and sustainability.

Microbial starters and their applications in food production

- Evolution, definition and classification of starter cultures.
- Technological functions of microbial starters in food production.
- Starter cultures as tools to standardize food processes, improve safety and reduce food losses.
- Microbial starters and public health: regulatory context, QPS status and emerging safety concerns.

Role of microorganisms in food preservation and food waste reduction strategies

- Role of microorganisms in food preservation.
- Microbial strategies to control spoilage and improve food shelf-life.
- Contribution of microbial processes to the prevention, reduction and valorization of food waste.
- Examples of microbial applications for the reuse or transformation of food by-products.

Safety and regulatory aspects of microbial applications in food

- Main safety issues related to the intentional use of microorganisms in foods.
- Regulatory concepts relevant to microbial applications in food systems.
- Safety assessment of microbial cultures and microbial-based products.
- Scientific rationale and critical evaluation of claims related to microbial products for human health.

Microorganisms, food and public health: probiotics, antimicrobial resistance, foodborne diseases and biome depletion theory

- Scientific and legal definitions of probiotics.
- Prebiotics and other microbial-related products.
- Foodborne diseases: main types, routes of transmission and socio-economic impact.
- Strategies for the prevention and containment of foodborne diseases.
- Spread of antimicrobial resistance genes through food, animals, humans and the environment.
- Strategies to reduce antibiotic use and antimicrobial resistance from a One Health perspective.
- Biome depletion theory and its possible relationship with non-communicable diseases in industrialized societies.

Urban Planning I

Theories and policies for sustainable territorial planning

- Role and structure of sustainability strategies and their territorial implementation.
- The regional dimension of sustainability policies, with reference to the case of Lombardy Region.
- Analysis of the Milan Metropolitan City Strategic Plan.
- Milan Municipality PGT (Territorial Government Plan).

Strategies for mobility and urban development in a sustainable perspective

- Mobility as a key dimension of territorial planning and urban sustainability.
- Main concepts, determinants and components of sustainable mobility.
- Relationship between mobility systems, environmental externalities, quality of life and public health.
- Mobility planning as a tool to support sustainable and resilient urban development.

Sustainable Urban Mobility Plans (SUMPs) as tools to mitigate environmental impact

- Sustainable Urban Mobility Plans as planning tools for reducing mobility-related environmental impacts.
- Role of SUMPs in addressing mobility-driven negative externalities in urban and metropolitan areas.
- Integration of mobility planning with broader sustainability and territorial development strategies.

Mobility Management as a connection between technological and organizational sustainability strategies

- Mobility Management as a bridging activity between technological and organizational dimensions of sustainable mobility.
- Policies and tools for improving mobility behaviours and reducing anthropogenic impacts.
- Contribution of mobility strategies to more sustainable, inclusive and health-oriented urban environments.

Integration between the two modules

- Food systems and urban systems as interconnected dimensions of sustainability and public health.
- One Health as a framework to interpret links between microorganisms, food, environment, mobility, cities and quality of life.
- Case-based discussion of sustainability challenges involving biological, environmental, social and territorial dimensions.

Prerequisites

No specific formal prerequisites are required for the integrated laboratory course.

Basic knowledge of biology and chemistry is useful for the Food, Microbes and Human Health module. Basic understanding of ecology and sustainability concepts may also support the learning process, but is not mandatory. No specific prerequisites are required for the Urban Planning I module.

Teaching form

The laboratory course includes 6 CFUs, corresponding to 60 hours of in-person teaching activities.

Teaching activities include 50 hours of expository teaching (DE), delivered in person (LEL), dedicated to the presentation of the scientific, conceptual and methodological foundations of the two modules. These activities will address the relationships between microorganisms, food systems, public health and sustainability, as well as the main principles of sustainable territorial planning, urban development and mobility strategies.

The course also includes 10 hours of interactive teaching (DI), delivered in person (LEL), mainly within the Food, Microbes and Human Health module. Interactive activities may include guided discussion of case studies, analysis of examples from the scientific literature and institutional or regulatory documents, problem-solving activities, short debates and group-based exercises.

Virtual laboratories may be used as optional supporting activities, depending on the availability of suitable tools and their coherence with the learning objectives of the course. They are not planned as compulsory teaching activities.

Attendance to lectures and interactive activities is highly recommended.

Textbook and teaching resource

Lecture slides and additional teaching materials will be made available on the e-learning platform of the course. Additional materials may include scientific articles, institutional reports, regulatory documents, planning documents and other resources related to the topics covered in the two modules.

For the Urban Planning I module, selected parts of the following texts may be used:

- Colleoni, M. (2019). Mobilità e trasformazioni urbane. La morfologia della metropoli contemporanea. Franco Angeli, Milan.
- Pucci, P., & Colleoni, M. (2016). Understanding Mobilities for Designing Contemporary Cities. Springer.

No compulsory textbook is required for the Food, Microbes and Human Health module.

Semester

Second semester.

Assessment method

The assessment consists of a single final evaluation covering the topics of the entire integrated laboratory course and the connections between the two modules.

The assessment is primarily based on an individual written examination, which may include open-ended questions and/or a brief written essay. The examination will assess the student's ability to describe key concepts, connect topics from the two modules, interpret case studies or examples, and critically discuss sustainability and One Health issues related to food systems, microorganisms, public health, urban planning, mobility and territorial strategies.

An optional oral examination may be held at the request of the student or the lecturers. The oral examination may be used to integrate the written assessment, to discuss its outcomes, or, where appropriate, to replace the written assessment. In all cases, the oral examination will assess the same learning outcomes as the written assessment, with particular attention to the student's ability to argue critically, connect different topics and use appropriate scientific and technical terminology.

The final grade will be expressed on a 30-point scale, from 18/30 to 30/30 cum laude. The assessment will take into account the following criteria:

- knowledge and understanding of the topics covered in the course;
- ability to apply concepts from food microbiology, public health, sustainability and urban planning to relevant examples or case studies;
- ability to connect the two modules within a One Health and sustainability perspective;
- autonomy of analysis and judgement in the interpretation of complex interdisciplinary issues;
- clarity, coherence and accuracy of the answers;
- appropriate use of scientific and technical terminology.

Office hours

Please refer to the office hour arrangements indicated in the syllabi of the individual modules.

Sustainable Development Goals

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