Climate smart technologies and IoT for the agrifood sector [SGSC177]

Academic Activity a.y. 2028/2029

Lecturer(s):

Time period: Secondo Ciclo Semestrale

Learning objectives:
The course Climate smart technologies and IoT for the agrifood sector will prepare students for understanding the structure of IoT systems and how to select today available technologies for implementing smart solutions that are climate aware.
After finishing the course, students will have a good overview of actual smart technologies that are climate aware and how to apply them for conceiving systems, as IoT, applied to the food chain of value.

Prerequisites:
Basic knowledge of electronic systems and programming.

Course contents:
  Program
What and which are the Climate-Smart Technologies?
Importance of Data and their use for smart systems
Introduction to IoT systems and their architecture
IoT and data analytics in precision agriculture: benefits and challenges
Crop management system using IoT: optimization in resource usage and crop security
Data communication and processing basics for their use in AgriFood
Examples of application of IoT to AgriFood.

 Teaching method
Teaching language: English.
The teaching method consists in theoretical lectures with some exercises and laboratories where the students can apply the concepts learnt during the theoretical part.

 Criteria, rules and procedures for the exam
For full-time students
The exam consists of a group project aimed at ascertaining the acquisition of knowledge about the use of IoT and Climate-Smart technologies in AgriFood. The student group will have to present their work related to the top level design of and IoT system for AgriFood, following concepts of climate aware methodologies.

Exam procedures are partially differentiated according to whether students have had more or less than 30% absences (in compliance with the University regulations). In particular, for students who have exceeded this threshold an additional written test is envisaged, consisting of additional questions. For students who have not exceeded the 30% absences threshold, the final grade may be supplemented by the marks obtained in interim assessment tests (in accordance with the rules approved by the Academic Council).

The assessment criteria will be as follows: 100% relating to the project and its presentation.

For part-time students
Same as full-time students.

Recommended readings:
For full-time students
Special teaching material has been developed for this course, which does not completely coincide with texts available on the market. Slides will be given available for the students.

For part-time students
Special teaching material has been developed for this course, which does not completely coincide with texts available on the market. Slides will be given available for the students.

Further readings:

 Learning objective
The professional figure of the “graduate in Food Tech for Ecological Transition“ who works in the context of Climate Smart Technologies and IoT for the AgriFood sector is typically entrusted with the task of:
- Learning which can be defined Climate-Smart Technologies and how they can be applied to AgriFood applications
- Learning the basics of IoT systems
- Learning the possible architectures of IoT solutions
- Learning the application of IoT to the AgriFood chain of value
At the threshold level, this figure must be able to implement a simple IoT system most useful for the specific AgriFood application.
This course module proposes providing at the basic level:
- Competences aimed at design an IoT solution that can be climate aware
- Competences in conceiving possible IoT solutions for AgriFood applications

 Response to the learning objective
With the aim of demonstrating the effective preparation for the threshold competencies the student will be asked to demonstrate, before the end of this course module, that they have attained knowledge about the following points of particular importance:
- Understand the architecture of an IoT system and its usefulness for an AgriFood application
- Capability to conceive a simple IoT system for AgriFood
and capacity to apply knowledge:
- To be able to design and implement a simple IoT solution for an AgriFood application
- Prepare a technical report for presenting the design of an IoT system

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	9	AGRI-02/A, GIUR-11/A, IINF-01/A

Printed on: 19/02/2026

Energy resources and management [SG434]

Academic Activity a.y. 2028/2029

Lecturer(s):

Time period: Secondo Ciclo Semestrale

Learning objectives:
The course “Energy resources and management” offers preparation for Geothermal energy in gastronomic sciences exploits the Earth's heat on the one hand, and the constant temperature of underground water on the other, to improve food production. Applications include drying and pasteurizing foods, sterilizing tools, and even producing cheese, cured meats, and beer. Geothermal energy can also be used for climatization of indoor environment and/or greenhouses, increasing indoor environmental quality in agri-food production.
The course prepares students to face the world of work, both academically in continuation of the activities undertaken during the academic path, and professionally in highly qualified Companies in the agri-food sector. After, at the end of the course the student will be able to fully address the energy and environmental aspects in the agri-food sector.

Prerequisites:
It is recommended that students attending this course should already know basic knowledge of Office.

Course contents:
Program
The course is subdivided into four main sections:

Section A HIGH ENTHALPY GEOTHERMAL SYSTEMS (8h)
Module A1: introduction to geothermal energy.
Module A2: principal solutions geothermal plants.

Section B LOW ENTHALPY GEOTHERMAL SYSTEMS (12h)
Module B1: general concept of hydrogeology.
Module B2: Open and closed loop geothermal systems. Module 3 (3h): Regional, National and International regulatory frameworks
Module B3: Design of Geothermal Systems: Simplified Approaches, Tools, Software & Technologies
Module B4: Case studies and best practices: examples of implementation in various geological and hydrogeological contexts. The exercises will be carried out in groups of four/five students who will analyze the case studies in order to prepare a specific geological and energetics-technical report for each case.

Section C ENERGY AND ENVIRONMENTAL IMPACTS IN AGRI-FOOD FIELD (22h)
Some building physics issues will be proposed to the students, which appear with frequency during design process of building related to agri-food sector. For each issue, professors provide a building physics interpretation of the topic and a methodology for an in-depth examination of the problem, in order to identify the best technological solutions according to regulations and indoor environmental quality requirements in indoor spaces intended for agri-food production and processes. In particular, the following topics are covered:
Module C1: Principles for post-carbon building design;
Module C2: Design requirements related to indoor air quality and thermal comfort;
Module C3: Building envelope thermal design;
Module C4: Techniques for natural ventilation and air-conditioning for indoor environment; Ventilation and air-conditioning systems;
Module C5: Building energy systems design;
Module C6: Renewable energy sources technologies;
Module C7: Building energy and emissions assessment.

Section D AGRI-FOOD PRODUCTION FIELD TRIP (6h)
The course includes one or more educational excursions, which cover all the aspects studied during the classroom lessons.

Teaching method
Lectures, exercises, group work both in the classroom and in the field.
Teaching language:

The teaching method consists in lessons in English

Criteria, rules and procedures for the exam
The purpose of the examination is to verify the understanding of the main characteristics of the geological systems, and of energy and environmental aspects examined during the course, and the ability to present concisely and comprehensively in short written texts the main elements learned.
The exam consists of two parts: a written part and an oral one.
The individual written exam lasts 1 hour and consists of 25 questions with multiple choice and 2 questions with open answers.

The oral exam consists of the evaluation of a report produced by each group, which will form the basis of the evaluation. A written report (produced in group) accompanied by the cartographic documents is evaluated for the purposes of the exam and must be delivered in advance (10 days) with respect to the date set for the oral appeal for the intent of its analysis by the teachers. During the oral exam, each group illustrates in a short seminar of a maximum duration of 10 minutes the content of the report highlighting the examined area and motivating the design choices adopted. The oral presentation is followed by theoretical questions that the teachers will ask each individual student.

Recommended readings:
For full-time and part-time students
All slides projected by the teacher will be made available on the teaching portal of the course.
Main reference texts:
- David Banks, An Introduction to Thermogeology: Ground Source Heating and Cooling, 2nd Edition. Wiley. ISBN: 978-0-470-67034-7
- Ronald DiPippo, Geothermal Power Plants (3rd Edition) Principles, Applications, Case Studies and Environmental Impact. Elsevier. ISBN: 978-0-08-098206-9
- ASHRAE Fundamentals developed by ASHARE (American Society of Air Conditioning)

In addition, other specific references and other bibliography related to technical literature, to regulations and to industrial production of technological components and systems, will be provided during the course.

Further readings:
Learning objective
The professional figure of the “graduate in Food Tech for Ecological Transition“ who works in the context of agri-food production and processes is typically entrusted with the task of: address issues related to sustainability and sustainable renewable energy.
This course module aims to provide basic skills focused on the interaction between food production and workplace comfort through energy sustainability.
Students will acquire expertise in environmental issues regarding the potential use of underground water resources and energy skills applied to sustainable environmental comfort.

Response to the learning objective
With the aim of demonstrating the effective preparation for the threshold competencies the student will be asked to demonstrate, before the end of this course module, that they have attained knowledge about the following points of particular importance:
- Hydrogeological concepts
- Energy concepts
and capacity to apply knowledge:
- in the agri-food context

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	6	IIND-07/B, GEOS-03/B

Printed on: 19/02/2026

Field visits - 3rd year [SG429]

Academic Activity a.y. 2028/2029

Lecturer(s):

Time period: Ciclo Annuale Unico

Learning objectives:
The learning activity “Field visits” offers preparation for professional contexts requiring the ability to observe, analyse, and critically interpret food systems and production processes within real operational environments, with particular reference to sustainability, technological innovation, and ecological transition.
The learning activity “Field visits” is present every academic year. It is characterized by a strong experiential part envisaging two didactic visits per year, each predominantly linked to one or more specific learning goals. In particular, in the third year aims are strongly focused on the resources management:
- to understand and analysing the main principles of managing the energy resources (water, energy, etc.) and resource efficiency management in the visited food processing realities;(III year).
- to apply quantitative analysis of geospatial phenomena related to food and agriculture activities to visited realities.
The course will prepare students to:
- understand food systems and production processes through direct experiential learning;
- analyse technological, environmental, and organisational aspects of agri-food realities;
- connect theoretical knowledge acquired in core courses with real-world case studies;
- critically reflect on sustainability challenges and innovation strategies in food systems;
- interact with professionals operating in different areas of the agri-food sector.

Prerequisites:
No specific prerequisites are required.

Course contents:
  Program
Every academic year envisages two didactic visits, each characterized by specific learning goal. In particular:
developing the ability to lead sustainability research and projects (I year);
conducting a holistic analysis of a productive process (I year);
analysing and implement the by-products optimization and reuse (II year);
developing innovative product and process design (II year);
managing the energy and resource efficiency (III year).

Every didactic visit will be structured into three phases:
Phase 1: Preparation (lectures and group work)
Phase 2: Experiential learning on site (company visits)
Phase 3: Reflection and synthesis (collective reflections)

The teaching language for all three phases is English.

Note: The programme is to be considered as a forecast and may be subject to minor changes according to specific class needs.

 Teaching method
Teaching activities include class discussions, visits to company and different production realities operating in the food sector and group work.
Teaching language: English

 Criteria, rules and procedures for the exam
For full-time students
The exam consists of a group presentation to the class, or a 15-minute video, or a collection of 20 photographs with narrative, or a 15-minute podcast, freely chosen by students, focusing on one field trip or on a meta-theme emerging across multiple field trips.
Assessment criteria will be:
Phase 2: Students are assessed based on behaviour, attention, and level of participation.
Phases 1 and 3: Proactive participation during in-class activities, accuracy of the self-produced contents, completeness of the work, research skills, ability to analyse, elaborate, and critically reflect.

The weighting of assessments toward the final grade: 100% of the self-produced material.

For part-time students
Examination procedures are partially differentiated depending on whether students have exceeded or not 30% of absences (in compliance with university regulations).
In particular, students exceeding this threshold are required to complete an additional academic workload, given by teachers and to produce an audiovisual project (video) lasting 20 minutes.

Recommended readings:

For full-time students
A dedicated set of teaching materials will be developed for this course, which does not fully coincide with published textbooks. Materials will be made available to students before each lecture via the designated online platform and organised by topic.
For efficient consultation, students are encouraged to refer to the course syllabus available on the same platform.

For part-time students
A dedicated set of teaching materials will be developed for this course, which does not fully coincide with published textbooks. Materials will be made available to students before each lecture via the designated online platform and organised by topic.
For efficient consultation, students are encouraged to refer to the course syllabus available on the same platform.

Further readings:

 Learning objective
Graduates in “Food Tech for Ecological Transition” are expected to support sustainable analysis and optimisation of food systems and processes. Within this framework, the activity “Field Visits” aims to develop threshold competencies enabling students to:
- understand food production systems through direct observation;
- identify social, technological and environmental criticalities in real contexts;
- recognise opportunities for sustainable innovation in products and processes.

At a basic level, the course provides:
- skills supporting holistic process analysis;
- competencies related to sustainability assessment and innovation;
- the ability to connect technical, ecological, and socio-organisational dimensions of food systems.

 Response to the learning objective
With the aim of demonstrating the effective preparation for the threshold competencies the student will be asked to demonstrate, before the end of this course module, that they have attained knowledge about the following points of particular importance:
- understanding of real-world food production processes;
- developing awareness of social, technological, environmental, and sustainability factors affecting food systems;
- familiarizing with organisational and managerial aspects of food-related activities.

and capacity to apply knowledge:
- analysing production processes and sustainability practices observed during field visits;
- contributing to the identification of improvement strategies for implementing the sustainability of food systems;
- critically reflecting on innovation pathways in relation to ecological transition.

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	3	NN

Printed on: 19/02/2026

Food tech law [SG430]

Academic Activity a.y. 2028/2029

Lecturer(s):

Time period: Primo Ciclo Semestrale

Learning objectives:
The course "Food Tech Law" will prepare students to work as a strategic consultant for food companies, particularly those involved in designing food policies to promote sustainable technological innovation, and for private and public bodies that quantify the impact of agri-food production. To this end, particular attention will be paid to legal issues relating to food technology from a transnational and comparative perspective.
At the end of the course, students will be able to address the most relevant aspects of global and comparative food law and independently carry out legal research relating to the intervention of public and private regulators affecting food systems. In particular, the expected learning outcomes concern the knowledge, understanding, and analysis of the main legal issues relating to food safety, sovereignty, sustainability, and quality.

Prerequisites:
It is recommended that students enrolling in this course have an advanced knowledge of English, given that various types of English-language documents will be used for teaching purposes, including legal texts, doctrinal articles, and national and European court rulings.

Course contents:
Program
1) Risk regulation and precautionary principle. A comparison of the EU and US legal systems.
2) Genetic engineering in agriculture. GMOs and new genomic techniques.
3) Law and technology in the alternative protein sector. The hamburger and its substitutes.
4) Information technology and consumer law.
5) Artificial intelligence and food sustainability.

Teaching method
Teaching language: English
The teaching method used consists of lectures, in which students will be required to actively participate by discussing legal texts, doctrinal articles, and other documents provided in advance.

Criteria, rules and procedures for the exam
Exam language: English
Exam format: oral exam
Individual or group exam: individual
Exam structure: 15-minute test (without the aid of notes or books) aimed at assessing the acquisition of knowledge of global and comparative food law from both a theoretical perspective (1 question) and through the analysis and resolution of practical cases - or the development of reflections by the student on topics covered in class - (1 question).
Exam duration: 15-20 minutes
Assessment criteria: Independence in answering and completeness of the topics presented; clarity of presentation and consistency in reasoning; appropriateness of the technical terminology used.
Weighting of the various assessments on the final grade in points or percentage: during the course, students may carry out individual research, for which they may be awarded a bonus of 1-2 points to be added to their final grade.
Additional workload if student absences exceed 30%: Workload and exam procedures to be agreed upon between teachers and students.
Additional information:
Exam criteria, rules, and procedures are subject to change.

For full-time students
Examination procedures are partially differentiated depending on whether students have more or less than 30% absences. In particular, students who have exceeded this threshold will be required to complete additional coursework, consisting of the study of a reading (doctrinal article or judgment) not directly addressed during the course and agreed upon in advance with the instructor. Only for students who have not exceeded the 30% absence threshold, the final grade may be supplemented by the grades obtained in mid-term assessments.

For part-time students
The exam consists of an oral test on the course syllabus. The assessment criteria will be similar to those indicated for full-time students.

Recommended readings:

For full-time students
Special teaching material has been developed for this course, which does not fully correspond to the texts available on the market.

Handouts (consisting mainly of legal essays and judgments in English) will be made available via the Moodle platform before the start of the lessons.

For part-time students
Special teaching material has been developed for this course, which does not fully correspond to the texts available on the market.

Handouts (consisting mainly of legal essays and judgments in English) will be made available via the Moodle platform before the start of the lessons.

Further readings:

Learning objective
At the threshold level, graduates working in the field of Food Tech Law must be able to conduct research in order to resolve basic legal issues relating to food.
This teaching module aims to provide the following basic skills:
- Competencies aimed at analyzing production processes and their reorganization in a sustainable manner with a view to continuous improvement, exploiting the latest technological innovations;
- Competencies aimed at developing projects and products in the food sector that improve the sustainability of supply chains through technological innovation;
- Competencies aimed at analyzing the legal, social, cultural, and ethical aspects of technological innovation in the food sector.

Response to the learning objective
With the aim of demonstrating the effective preparation for threshold competencies the student will be asked to demonstrate, before the end of this course module, that they have attained knowledge about the following points of particular importance:
· Food sovereignty.
· Food safety.
· Food sustainability.
· Agri-food quality.
· Food consumer protection. In particular, the consumer's right to be informed.
and capacity to apply knowledge:
· Research in specialist databases
· Correct identification of legal issues relating to food systems

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	6	GIUR-11/A

Printed on: 19/02/2026

Internship / Applied laboratory or experiential learning [SG435]

Academic Activity a.y. 2028/2029

Lecturer(s):

Time period: Secondo Ciclo Semestrale

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	6	NN

Printed on: 19/02/2026

Open geospatial data for food technologies [SG432]

Academic Activity a.y. 2028/2029

Lecturer(s): PIERO BOCCARDO

Time period: Primo Ciclo Semestrale

Learning objectives:
This course aims to introduce and critically analyze open-source geospatial data relevant to various applications in the fields of food systems, agricultural monitoring, environmental sustainability and territorial development. Students will gain an understanding of different classes of geospatial data, their characteristics and their potential applications in food security, precision agriculture, land use planning and climate-resilient food production. The course will also cover tools for accessing, managing and analyzing geospatial data, with a focus on open-source geographic information systems (GIS) and Earth observation platforms.

At the end of the course, students will have acquired the skills to assess data integrity, perform spatial analysis using open-source tools, and generate analyses that can be easily incorporated into reports and presentations, with the aim of extracting added-value information from data.

Prerequisites:
There are no prerequisites necessary to access the proposed course.

Course contents:
  Program
The course will be divided into 5 well-defined and sequential parts, with a time duration as indicated in brackets as follows:
1. Introduction to Geospatial Data for Food and Agriculture (3 hours)
2. Data Quality and Integrity in Food and Agricultural Geospatial Analysis (3 hours)
3. Open Source Geographic Information Systems (GIS) for Food and Agricultural Applications (6 hours)
4. Earth Observation for Food and Agriculture: Satellite Remote Sensing (6 hours)
5. Satellite Data for Food Security and Sustainable Agriculture (6 hours)

 Teaching method
Course language: italiano
The teaching method consists of teacher presentations and laboratory activities using software and computers carried out in synchronous mode in the classroom. The course is based on a learning-by-doing approach so that students can apply the theoretical concepts described during the lessons.

 Criteria, rules and procedures for the exam
For full-time and part-time students
The exam consists of an oral interview lasting approximately 30 minutes on the course's teaching material, which can be taken in Italian or English at the student's choice. It aims to ascertain the acquisition of the knowledge transmitted.
Each student must submit a group report (max 4 students per group) on the laboratory activities carried out during the course. This report will be evaluated with a score between 0 and 30 and will be part of the overall evaluation, as described below. The evaluation will take into account the student's ability to solve the task required by the laboratory activities, the completeness of the work carried out, the quality of the report itself (organization of the content, quality of the figures, the correctness of the solution, etc.) and the methodology used.

The evaluation criteria will be as follows:
70% of the grade related to the oral exam taken
30% of the grade regarding the individual and/or collective work related to the report to be prepared for the exam.

Recommended readings:
For full-time and part-time students
For this course, specific teaching material has been developed that does not entirely coincide with texts available on the market. For this reason, no texts are suggested in advance. Still, the teaching material will be integrated with readings that will be made available to students before the respective lessons through the University e-learning platform.
Exercises: Before each lesson, the teacher indicates to students the material to be studied so that they can carry out

exercises and/or discussions related to it in class.

Further readings:

 Learning objective
The professional figure who works in the context of food systems, agricultural monitoring and environmental sustainability is typically entrusted with the task of:
- Collecting and monitoring data;
- Analyzing them with application in the field of food security, precision agriculture, land use planning and climate-resilient food production.
At the threshold level, this figure must be able to access, manage and analyze quantitative and qualitative data. This course aims to provide basic skills for accessing, managing, and analyzing quantitative geospatial data, with a focus on open-source geographic information systems (GIS) and Earth observation platforms.

 Response to the learning objective
To demonstrate the preparation for the threshold skills, the student has to demonstrate, by the end of this course, the achievement of knowledge on the following main points:
• Geographic Information Systems (GIS);
• Satellite data obtainable from remote sensing techniques for Food Security and Sustainable Agriculture;
• Analysis of geospatial data.

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	6	CEAR-04/A

Printed on: 19/02/2026

Technology of taste and artificial aesthetics [SG431]

Academic Activity a.y. 2028/2029

Lecturer(s):

Time period: Primo Ciclo Semestrale

Learning objectives:
The course “Technology of Taste and Artificial Aesthetics” will prepare students to operate in the management and promotion of food technologies and technological innovation aimed at supporting the ecological transition.
At the end of the course, students will develop the ability to critically analyze the philosophical and cultural implications of introducing technological innovations in the field of taste. Students will acquire basic knowledge of aesthetic mechanisms and the implications of food, exploring the interactions between aesthetics, ethics, and sustainability. They will be able to recognize and critically interpret manipulation and control devices related to food, evaluating their impact in social and cultural contexts. Students will also develop skills in designing interventions, initiatives, or products that promote sustainable food behaviors.

Prerequisites:
No prerequisites are required.

Course contents:
Program
The course is structured around some main themes:
- aesthetics and philosophy of the senses
- ecological theories of perception
- aesthetic and ethical connections between technology and food
- the gap between two models: "artificial intelligence" and "artisanal intelligence"
- artistic cases interweaving taste, smell, digital technologies, and AI
- critical theories on the implications of AI
- the relationship between algorithms, taste, and preferences
- gastronomic avant-gardes using various types of technologies

Teaching method
Teaching language: English
The teaching method consists of lectures, discussions, and conversations on the reading materials.

Criteria, rules and procedures for the exam

For full-time students
The exam consists of an oral interview in English based on the teaching materials provided by the lecturer, lasting 20/30 minutes (without the aid of notes or books), aimed at assessing the acquisition of the knowledge developed during the course.
Exam procedures are partially differentiated according to whether students have had more or less than 30% absences (in compliance with the University regulations). In particular, for students who have exceeded this threshold an additional teaching load is envisaged, to be agreed upon with the lecturer.
The oral exam grade will also take into account class participation, contributions to discussions, and the ability to develop critical and original thinking regarding the topics covered.

For part-time students
The exam consists of an oral interview (which can be taken in Italian or English at the student's choice), based on the teaching materials provided by the lecturer, lasting 20/30 minutes (without the aid of notes or books), aimed at assessing the acquisition of the knowledge developed during the course. No additional materials will be required.

Recommended readings:
For full-time students
- E. Arielli, L. Manovich, Artificial Aesthetics: Generative AI, Art and Visual Media, International Creative Commons license
- course materials prepared by the lecturer

The texts that make up the course materials will be made available to students through the University's e-learning

platform.

Before each lecture, the lecturer will indicate to the students the material to be studied, in order to carry out in-class exercises and/or discussions related to it.

For part-time students
For part-time students, the same materials are provided as for full-time students.

Further readings:

Learning objective
The professional profile of the graduate in "Food Tech for Ecological Transition" is entrusted with the task of being an innovator of food processes and products with strong ecological and cultural knowledge that enables the development of innovative strategies for sustainability. This course provides foundations in critical thinking through the discipline of aesthetics, articulated in its techno-aesthetic and artificial aesthetic dimensions, enabling students to understand market trends and operate in the most advanced food technology contexts, in order to contribute to the development of quality food businesses, whether small, medium, or large.

Response to the learning objective
With the aim of demonstrating the effective preparation for the threshold competencies the student will be asked to demonstrate, before the end of this course module, that they have attained knowledge about the following points of particular importance:
- main aesthetic and media processes, with particular attention to technologies related to food and taste in contemporary society
- main communication strategies aimed at effectively and inclusively promoting the role of technology for food sustainability and ecological transition
- ability to critically analyze the social, ethical, and cultural implications arising from the introduction of technological innovations in the agri-food sector
- interactions between cultural dimension, ethics, ecological sustainability, and food practices
and capacity to apply knowledge:
- for the interpretation and contextualization of the role of technology in the complex cultural and social framework, highlighting its opportunities and critical issues
- to communication tools and strategies for the dissemination of practices and technological innovations related to sustainability, evaluating the social and cultural impacts of technological transformations, proposing appropriate solutions and communication approaches

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	8	PHIL-04/A

Printed on: 19/02/2026

Thesis [SG436]

Academic Activity a.y. 2028/2029

Lecturer(s):

Time period: Secondo Ciclo Semestrale

Syllabus not published by lecturer.

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	5	PROFIN_S

Printed on: 19/02/2026

Water and waste management [SG433]

Academic Activity a.y. 2028/2029

Lecturer(s):

Time period: Primo Ciclo Semestrale

Learning objectives:

The course introduces the fundamentals of water management in industrial and productive sites, with emphasis on practical applications and problem-solving. It will prepare students for addressing real-world issues of water supply, pumping and storage of process water, wastewater and stormwater in factories and logistics areas.
After finishing the course, students will be able to:
Apply core fluid mechanics concepts (pressure, flow, energy, head losses) to industrial water systems.
Perform basic calculations for pump sizing, pipeline design, and open channel flow.
Estimate water demand and identify appropriate monitoring solutions with sensors.
Assess rainfall and runoff from roofs, paved areas, and productive sites.
Propose practical solutions for sustainable water management and reuse.

Prerequisites:

Basic knowledge of physics (forces, energy, pressure).
Introductory mathematics (algebra, geometry, logarithms).
Elementary statistics (averages, distributions, correlation).
Familiarity with units and conversions in engineering (SI system).
Ability to draw and interpret simple technical representations (schematics, flow diagrams, site layouts).
No prior specialized knowledge in fluid mechanics is required — fundamentals will be introduced in the course.

Course contents:

Program
Properties of fluids – density, viscosity, and other key characteristics relevant to water management. (2h)
Pressure concepts and hydrostatic forces – Stevin's law, pressure variation with depth, and hydrostatic forces on surfaces. (2h)
Flow rate, velocity, and hydraulic head – continuity of flow, velocity calculation, and the concept of energy head. (2h)
Bernoulli's theorem and industrial applications – energy conservation in fluid systems and its use in industrial contexts. (2h)
Water sources, demand, and monitoring with sensors – overview of supply sources, estimation of demand, and practical instrumentation. (2h)
Head losses in pressurized pipe systems and simple network analysis – friction and local losses; modelling and solving basic pipe networks. (2h)
Pumping principles and pump selection – pump types, curves, efficiency, and matching pumps to system needs. (2h)
Economics of pumping systems – energy costs, efficiency optimization, and life-cycle considerations. (2h)
Storage of water and sizing of tanks capacity (2h)
Open channel flow – principles of flow in non-pressurized systems, with applications to process units, treatment equipment and drainage. (2h)
Wastewater and stormwater drainage – collection systems for industrial wastewater and stormwater in productive sites. (2h)
Management of runoff from roofs and paved areas – design of detention and infiltration systems for impervious surfaces. (2h)

Teaching method
Teaching language: English or Italian
The teaching method consists in combining short theoretical introductions with extensive problem-solving and applied exercises. Each 2-hour module begins with a focused explanation of the core concept (about 30 minutes), followed by guided calculations, design tasks, and case-based applications (about 90 minutes). Students work individually and in small groups to practice pump sizing, pipeline and network modelling, flow estimation, and drainage design. Emphasis is placed on sketching and interpreting technical representations, using realistic data from industrial and site management contexts. This practice-oriented approach ensures that students directly apply theory to real-world water management problems.

Criteria, rules and procedures for the exam

For full-time students
The exam consists of a test (which may be taken in Italian or English at the student's choice): written, i.e. with multiple-choice answers or open-ended questions, lasting 90 minutes (without the aid of notes or books, as the necessary mnemonic formulas will be provided in the exam script) aimed at ascertaining the acquisition of the ability to:
Apply core fluid mechanics concepts (pressure, flow, energy, head losses) to industrial water systems.
Perform basic calculations for pump sizing, pipeline design, and open channel flow.
Estimate water demand and identify appropriate monitoring solutions with sensors.
Identify the key elements of the system and the parameters needed to model it.
Propose practical solutions for drainage, reuse, and sustainable water management.

Exam procedures are partially differentiated according to whether students have had more or less than 30% absences (in compliance with the University regulations). In particular, for students who have exceeded this threshold an additional teaching load is envisaged, consisting of the submission of class exercises completed during the course, and agreed in advance with the lecturer. For students who have not exceeded the 30% absences threshold, the final grade may be supplemented by the marks obtained in interim assessment tests (in accordance with the rules approved by the Academic Council).

The assessment criteria will be as follows 100% of the grade relating to the written exam taken. Participation in the planned teaching activities, in the form of active attendance during lessons, will also be considered. Up to 4 additional points may be awarded, but only if the written exam score is at least 18/30.

For part-time students
The exam consists of a test (which may be taken in Italian or English at the student's choice): written, i.e. with multiple-choice answers or open-ended questions, lasting 90 minutes (without the aid of notes or books, as the necessary mnemonic formulas will be provided in the exam script) aimed at ascertaining the acquisition of the ability to:
Apply core fluid mechanics concepts (pressure, flow, energy, head losses) to industrial water systems.
Perform basic calculations for pump sizing, pipeline design, and open channel flow.
Estimate water demand and identify appropriate monitoring solutions with sensors.
Identify the key elements of the system and the parameters needed to model it.
Propose practical solutions for drainage, reuse, and sustainable water management.

The assessment will be based 100% on the written exam. Keeping pace with the program is strongly recommended. Part-time students who submit the exercises completed during the course may receive additional points; submission is due within one week of the presentation of the exercise in class. Up to 4 extra points may also be awarded for active participation in teaching activities, but only if the written exam score is at least 18/30. The written exam is closed book, with all necessary formulas provided in the exam script.

Recommended readings:

For full-time students
Special teaching material has been developed for this course, which does not completely coincide with texts available on the market.
The text will be supplemented by readings that will be made available to students before the respective lectures via the University's e-learning platform.

Possible supplementary bibliography:
Mays, L. W. (ed.) – Water Resources Engineering. Wiley.
Chadwick, A., Morfett, J., & Borthwick, M. – Hydraulics in Civil and Environmental Engineering. CRC Press.
Gupta, R. S. – Hydraulics and Hydraulic Machines. Pearson.
Sanks, R. L. (ed.) – Pumping Station Design. Butterworth-Heinemann.

For part-time students
Special teaching material has been developed for this course, which does not completely coincide with texts available on the market.
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Sanks, R. L. (ed.) – Pumping Station Design. Butterworth-Heinemann.

Further readings:

Learning objective
The professional figure of the “graduate in Food tech for ecological transition” who works in the context of water supply, wastewater and stormwater management in industrial and productive sites is typically entrusted with the task

of:
- Designing and evaluating systems for water use, pumping, and distribution in industrial plants.
- Planning and managing solutions for wastewater collection, control and treatment, and stormwater management.
At the threshold level, this figure must be able to apply fundamental hydraulic principles and basic design methods to solve practical problems in water management, while understanding the constraints of efficiency, sustainability, and regulatory compliance.
This course module proposes providing at the basic level:
- Competences aimed at understanding and quantifying water-related processes in industrial contexts (flows, pressures, head losses, pumping, and runoff).
- Competences in the application of simple calculation methods, technical drawing, and schematic representation to design and assess water management systems.

Response to the learning objective
With the aim of demonstrating the effective preparation for the threshold competencies the student will be asked to demonstrate, before the end of this course module, that they have attained knowledge about the following points of particular importance:
- Fundamental hydraulic concepts (pressure, head, flow, energy, and head losses).
- Principles of pumping systems, open channel flow, stormwater estimation, and drainage in industrial contexts.
and capacity to apply knowledge:
- Performing basic calculations for pump sizing, pipe networks, and runoff estimation.
- Representing technical layouts of water supply, wastewater, and stormwater systems through simple drawings and schematics.

The academic activity is offered in:

Scienze Gastronomiche

Program type:	Program: (Curriculum:)	Curriculum:	Credits:	Sector:
Bachelor or equivalent first cycle	Food Tech for Ecological Transition (2026)	comune	9	CEAR-01/B, ICHI-02/A, CEAR-02/A

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