C3A Manifesto of Studies 2021-22

Please note:
Attendance of 75% is expected for ALL courses.
It may also be possible to follow additional courses offered by other UniTN Departments/Centres.

BASIC AND ADVANCED COURSES								
Course title	**Lecturer(s)**	**Place**	**N hrs**	**ECTS**	**Synopsis and Skills Learned**	**Evaluation procedure**	**Notes and Pre-requisites**	**Month/year**
GEOframe Winter School	Riccardo Rigon, Giuseppe Formetta, Marialaura Bancheri (CNR-Ercolano Napoli)	DICAM	40+2+4	5+3	The fourth edition of the Winter School on GEOframe (GWS2022) will be held between January 10 and 14, 2022 (first available week after the Epiphany every year) at the Department of Civil, Environmental and Mechanical Engineering of University of Trento. Main topics of the School is teaching the concepts and the use of GEOframe-NewAGE, a semi-distributed model of the catchment hydrology. The course is devoted to Ph.D. Students, Post-docs, Young researchers and aims to make the participants run their simulations of the hydrological cycle on their own catchments and estimate the hydrological budget components. Besides the lectures and the hands-on sessions, the Summer School is the occasion for discussion and experience exchange among senior scholars and young researchers. To have an idea of the topics, the interested researchers should give a look at the material or previous schools(http://abouthydrology.blogspot.com/2021/10/the-geoframe-schools-index.html). Three days. around a month before the school, will be dedicated (via Zoom) to installations of the software, explanations of the main concepts deployed with OMS3/CSIP (Object Modelling System v3/Cloud Service Integration Platform) and GEOframe as an open platform to do hydrology by computer and the pursue the Digital Twin Earth Hydrology metaphor. Lectures will be	Presentation of a project where the catchment hydrology is simulated	NA	10-14 January 2022

					dedicated also to teach elementary concepts about using Jupyter Notebooks for inputs and outputs treatment and representation. Three ECTS credits are issued on the infrastructure topics. 5 credits on the hydrological topics. The material of the school will be made available on the GEOframe blog (https://geoframe.blogspot.com). .			
How to write a research project - basic	**Ilaria Pertot**		10	1 Type B	**Summary:** Basic knowledge on how to prepare a research project for my PhD. What is the aim of the research project, what are the main steps and sections, Gannt chart and other tools (8 hours lesson and 2 hours for a draft project preparation). Useful support for the PhD project preparation.	Project proposal	1st year PhD Students	17 (9-13), 19 (16-18) and 20 (16_18) January 2022
Ecological and epidemiological modelling	**Roberto Rosà**, Andrea Pugliese,	FEM	16	2	**Summary:** 8 hours of lectures on the basis of eco-epidemiological models with application both in agriculture and public health. 8 hours of practical exercises with software R using experimental data from agriculture and public health case studies. **Description:** this course will provide an insight on the development and analysis of ecological and epidemiological models with applications in agriculture and public health. **Skills acquired:** conceptual ideas and mathematical tools needed for implementing ecological and epidemiological models, especially population dynamic models as well as epidemiological models.	presentation on a topic agreed with the student	2nd year Students are expected to know the basic concepts of mathematics and statistics. Prior knowledge of open source software R use is also required	17/1-28/1/2022
Plant Physiology and Genetics of Fruit Ripening	**Fabrizio Costa**, Nicola Busatto, Michele Perazzolli	FEM	18	2	**Summary:** The course will provide the basics of plant physiology, focusing on phenology and fruit ripening. A special attention will be also given to the genetic mechanisms undertaking important physiological pathways and innovative plant physiology for precision agriculture.	Presentation	1st year	21/01-18/02

					Module 1 (4 hours) Smart plant physiology. This module will provide specific knowledge of plant physiology with particular attention to new tools for precision agriculture. **Skills acquired:** knowledge of plant physiology and precision agriculture aspects. **Module 2 (7 hours)** Fruit ripening physiology. This module will provide a general description of the type of fruits and their mode of ripening. The interplay between different hormones in regulating the fruit ripening will be discussed, introducing, moreover, the genetic analysis addressed to the detection of the main loci controlling fruit ripening related pathways. **Skills acquired:** knowledge of ripening physiology and the interplay among several hormones **Module 3 (7 hours):** Genetic regulation of fruit ripening. This module will present the road map of the functional analysis carried out to date to disclose the main regulating mechanisms of fruit ripening. The state of the art of the molecular and biotech techniques used to date to investigate the fruit ripening processes will be also discussed, from recombinant DNA to OMIC approaches. **Skills acquired:** investigation of the molecular mechanisms regulating fruit ripening using the most advanced biotechnology approaches			
Sustainable production and consumption from a social perspective	Emanuela Bozzini, Francesca Forno, Natalia Magnani	SRS	24	3	**Summary:** The objective of this course is to critically discuss the transformations in patterns and practices of production and consumption, giving particular attention to sustainability ideas and practices. The class will be articulated in three main modules (8 hours each). **Module 1 (8 hours):** Overview of long-term trends in agricultural production and its sustainability **Skills acquired:** Knowledge on historical trends in agricultural production, resource use, chemical input across world regions; knowledge on issues of sustainability of current agricultural systems in relation to demography, urbanization and resource depletion. **Module 2 (8 hours):** Consumer Culture and Society. This module offers the opportunity to engage with sociological theories of consumption and contemporary consumer society. **Skills acquired:** Familiarity with sociological concepts to investigate changes in consumption practices and lifestyles, with a special attention on food consumption trends. The focus will be on the practice of consumption with	Final written report or presentation	1st year	24/01-14/02

					regard to lifestyle, consumer subjectivity, meaning making, sustainability and 'food diversity'. **Module 3 (8 hours):** Social innovation and sustainability. The module aims to introduce students to sociological theories and debates concerning the development of social innovation for sustainability. **Skills acquired:** familiarity with debates on sustainability and social innovation, with a special attention to food and food systems.			
Aquatic ecosystems in natural and human impacted environments	**Monica Tolotti,** Maria Cristina Bruno, Walter Bertoldi, Guido Zolezzi		24	3	**Summary:** The course provides an insight on the physical, chemical, ecological and biological properties and dynamics of freshwater ecosystem, considering natural conditions (Module 1) and the effects of human stressors (Module 2). Specific case studies of different freshwater ecosystems will provide examples of the possible methodological approaches. **Module 1 (12 hours):** Aquatic ecosystem in natural conditions. This module addresses the main variables and processes driving the habitat dynamics in natural freshwater ecosystems. **Skills acquired:** ability to describe and interpret aquatic habitats in running waters and lakes, across time and space, including physical, chemical, morphological variables, such as flow, temperature, nutrients, and foodweb descriptors and the effects of vegetation on the above. **Module 2 (12 hours):** Aquatic ecosystem under direct and indirect human stressors. This module provides insight on direct (e.g., pollution, water withdrawals, engineering) and indirect (land use and climate change). **Skills acquired:** methods to recognize and quantify stressors such as source and point pollution, hydro-morphological alterations, thermal alterations, extinction and creation of habitats; methods for mitigation /restoration strategies (e-flows, morphological restoration, sediment augmentation)	Oral presentation of a scientific paper chosen by the PhD student	1st year	7-11 February 2022
Animal Conservation in Theory and Practice	**Francesca Cagnacci,** Federico Ossi, Heidi C. Hauffe		24	3	**Summary** Conservation biology strives to describe, understand, and forecast biodiversity dynamics by applying ecological and evolutionary theory within the contexts of resource management, economics, sociology and political science. This course will explore the motivation for preserving biodiversity at all levels (genetic, species, ecosystem), available decision-making tools, and the consequences of various interventions, covering mainly terrestrial and freshwater ecosystems and including wild animal and plant species. **Module 1 (8 hours)** Principles of conservation biology. We have entered the Anthropocene, the Era of humans, where human impact is widespread in all	- Project exam (problem-solution analysis) with written part and presentatio	1st year	10-25 February 2022

					biomes. The module will cover the essentials of conservation biology science, its area of application, and the analysis of major threats of humans on ecosystems. **Skills acquired:** theory of conservation biology and fields of application. **Module 2 (8 hours)** Conservation of terrestrial mammals in the Alps. The module will use the principle acquired in Module 1 to analyse conservation cases of terrestrial mammals in the Alpine range. **Skills acquired:** application of conservation biology theory to terrestrial mammals **Module 3 (8 hours)** Conservation genetics. The interactive module will focus on the application of genetics, genomics and metagenomics to conservation science, including wildlife forensics, and the importance of preserving genetic variation. **Skills acquired:** principles of conservation genetics/genomics with practical examples of current research, and active discussion of case studies.	n for Outreach		
Innovative methods in crop protection	**Gianfranco Anfora,** Ilaria Pertot, Michele Perazzolli, Gerardo Puopolo, Valerio Mazzoni, Emanuela Bozzini		16	2	**Summary:** The course will give an overview about regulation aspects and innovative procedures for the control of plant pathogens and insects on major crops. **Module 1 (4 hours):** Regulatory provisions on pesticides and biopesticides. This module will provide details on novel regulatory provisions on plant protection products and sustainable use of pesticides with a focus on the European Union. Skills acquired: knowledge of policy principles and provisions informing EU regulation on plant protection products. **Module 2 (6 hours)**: Innovative approaches for pathogen control. This module will provide details on innovative approaches to control plant pathogens. Skills acquired: knowledge of new generation tools for biological control of pathogens. **Module 3 (6 hours)**: Innovative approaches for insect control. The aim of this module is to provide expertise on the principles of plant protection strategies and alternative methods to the use of synthetic chemicals, including biological control and integrated pest management.	Final written test	1st year	15;17 February and 7 March 2022

					Skills acquired: knowledge of the pioneering low impact techniques for the integrated management of insect pests (i.e. semiochemicals, natural enemies, sterile insect technique); to learn the main types of existing bioagrochemicals, their mode of action, their application strategies, the advantages and disadvantages deriving from their application.			
Introduction to agrometeorology and environmental measurements	**Mirco Rodeghiero, Nadia Vendrame**	**DICAM**	16	2	**Module 1 (8 hours)**: overview of the main instruments and variables measured in a meteorological station. Instruments sensors and data collection. Measurement of precipitation, pressure, temperature, wind, solar radiation, humidity and soil moisture. Main features of an agrometeorological station. **Module 2 (8 hours):** Introduction to the study of vegetation-atmosphere interactions, focusing on the physical processes influencing the life of plants and determining the productivity of agricultural crops. **Skills acquired**: type of sensors used for monitoring of main meteorological/environmental variables; vegetation-atmosphere exchanges of mass and energy	Oral presentation of a scientific paper chosen by the PhD student	NA	21/02 - 4/03/2022 Timetable from Monday to Tuesday 9.00-11.00
Introduction to Nonparametric Analysis	Valerio Mazzoni		16	2	**Summary:** Introduction to the basic concepts of descriptive statistics and probability theory **Description:** the following techniques will be studied: contingency tables and goodness-of-fit tests; hypothesis testing about the probability of an event, on a single sample, on two paired samples and on two independent samples; the case of more than two (dependent/independent) samples; tests for the trend detection and correlation; measures of association and related hypothesis testing methods; non parametric inference (Jackknife and Bootstrap). **Skills acquired:** use of nonparametric techniques to solve hypotheses testing problems where the conditions for parametric tests are not fulfilled	Written exam	1st year: no prerequisites required	22/02 – 11/03
How to write a research project - advanced	**Ilaria Pertot**	FEM	20	2,5	Basic knowledge on how to prepare a research project proposal. The EU funding scheme and the evaluation process. Opportunities for project proposal application (4 hours lesson and 16 hours project preparation) Overview of the funding opportunities in the new Horizon EU.	Project proposal	2nd or 3rd year PhD Students	12 and 14 April 2022

Production and characterization of fermented foods	**Roberto Larcher,** Tiziana Nardin, Raffaele Guzzon, Tomas Roman		16	2	**Summary:** The course aims to provide, through a series of monographic seminars, notions about current issues or innovative trends in the transformation of raw food, with particular reference to traditional fermented foods. Ample space will also be given to analytical techniques for the characterization of food. **Module 1:** Oenological treatments and technological fermentation management. **Module 2:** Evolution of microbiota through wine oenological fermentations, influence of technological and environmental variables and impact on wine quality; Wine spoilage microorganisms, risk for wine quality and human health, and innovative approaches at the winery and wine hygiene. **Module 3:** Chemical characterisation of fermentative compounds; Identification and quantification of metabolites; Chromatographic separation and analytical detection: profiles of minerals, sugars, amines, amino acids, organic acids, vitamins and volatile compounds; Targeted and untargeted profiles; Models of origin and botanical traceability; **Skills acquired**: familiarity and ability to interpret and describe fermentative processes and define quality controls.	Written exam	2nd year	April 2022 Timetable not defined
Field sampling and Spatial Ecological Modelling	**Marco Ciolli,** Clara Tattoni		40	5	**Summary:** 18 hours lectures, Basis of Field sampling techniques and Spatial Ecological modelling using GIS and GPS; ; 10 hours field sampling work with biometric measuring instruments and GPS; 12 hours practical Exercises with basis of GIS Ecological modelling with QGIS and R. **Module 1 (28 hours):** Theoretical and practical basis of field sampling techniques and data collection and spatial ecological modelling. Exploration of field data and how they can be used/misused, How to perform sampling in the forest and GPS data collection in the field, basis of spatial ecological modelling, overview of various modelling techniques with special reference to landscape ecology, land use change modelling and scenarios development, Vegetation Analysis and cartography, basis of remote sensing	Presentation on a topic discussed in the course **OR**, **alternatively** Data processing using GIS or R	1st year	23-27 May 8:30-12:30 - 13:30-17:30

					for vegetation. Forest landscape change detection, Markov Chain scenarios and Landscape Ecology indexes and parameters. **Skills acquired:** How to select sampling areas in the field and the reliability and limits of field data. Importance of data understanding and of sampling procedures. Data acquisition and critical interpretation of data sources. Improving GPS data sampling in the field. **Module 2 (12 hours):** Practical exercises with a Special focus on Land use change, Vegetation Analysis and cartography, basis of remote sensing for vegetation, Past Forest landscape change detection, Production of Markov Chain scenarios future/past and Landscape Ecology indexes and parameters and modelling of different pollution sources. Overview of various modelling techniques. Comparison of different techniques, pros and cons. Alien species modelling and study cases. Interpretation of Model results and validation. GIS and R Practice on sample data. **Skills acquired: It will give a thorough introduction to the** How to use and combine the data in a GIS to perform geospatial analysis and ecological modelling. How to use QGIS plugins and basic use of R as a GIS.			
GEOframe Summer School (Soil-Critical Zone-Plant-Atmosphere interactions)	**Riccardo Rigon, Giuseppe Formetta, Niccolò Tubini**	DICAM	40+2 +4	5+3	The second edition of the GEOframe Summer Schools (GSS2022) will be held between June 13 and 17 2022 (the central week of June every year) at the Department of Civil, Environmental and Mechanical Engineering of University of Trento. Main topics of the GSS2022 will embrace the water flow (and heat transport) in porous media, the soil-plant-atmosphere continuum, and inverse problems. The aim of the course is to enable participants to run their own simulations with the GEOframe tools to simulate the critical zone. The GSS2022 deals mainly with the 1D tools and introduces the 2D ones called WHETGEO (Water. HEat and Transport in GEOframe, 1D and 2D), and GEO-SPACE (GEOframe Soil Plants Atmosphere Continuum Estimator). The course is devoted to Ph.D. Students, Post-docs, Young researchers and aims to make the participants run their simulations of the hydrological cycle on their own catchments and estimate the hydrological budget components. To have an idea of the topics, the interested researchers should give a look at the material of the previous school (http://abouthydrology.blogspot.com/2021/10/the-geoframe-schools-index.html). Besides the lectures and the hands-on sessions, the Summer School is the occasion for discussion and experience exchange among senior scholars and young researchers.	The students will be asked to run their own examples in 1D and 2D	NA	June 13-17 2022 orario 9.00-18.00

					Three days. around a month before the school, will be dedicated (via Zoom) to installations of the software, explanations of the main concepts deployed with OMS3/CSIP (Object Modelling System v3/Cloud Service Integration Platform) and GEOframe as an open platform to do hydrology by computer and the pursue the Digital Twin Earth Hydrology metaphor. Lectures will be dedicated also to teach elementary concepts about using Jupyter Notebooks for inputs and outputs treatment and representation. The material of the school will be made available on the GEOframe blog (https://geoframe.blogspot.com). Three ECTS credits are issued on the infrastructure topics. 5 credits on the hydrological topics.			
Insects as a Sustainable Feed Alternative	S. Dabbou		12	1.5	**Summary**: The aim of the course is to provide an overview on insects and the increasing interest basic knowledge on the use of insects in animal feed. **Description**: The course is organised in 3 lessons: 1. Introduction on Insects and legislation (2 hours). 2. Insect rearing (case study: Black Soldier Fly) (3 hours). 3. Potential of insect meal in monogastric animal farm nutrition (3 hours). Practical activities: 1. A journal club where students present and discuss a paper chosen from the literature on this topic (2 hours). 2. Oral presentation where students choose and present the interesting topics on Insect as feed (2 hours). **Skills acquired**: Tools for studying the importance of insects as animal feed; skills in presenting and discussing scientific articles on this topic.	Oral Presentation	1 st Year (no prerequisites required).	May-June 2022 ONLINE CLASSES Timetable to be defined
Evaluation of agri-food products and policies	**Simone Cerroni**	DEM	24	3	**Summary/Description:** The course provides students with an in-depth description of state-of the-art methods and tools that are used to evaluate the demand for innovative food products (e.g., lab meat, antibiotic-free products) and welfare benefits generated by environmental and agri-food policies of recent relevance (e.g., climate change, sustainable consumption). Among the methodologies covered in the course: stated preferences (i.e., discrete choice experiments), experimental methods (i.e., experimental auctions) and randomized control trials. The course also provides principles of statistics and econometrics to be used in data analysis. Classes will consist	- Oral presentation of an academic paper (20%) - Oral presentation and short report on	1st year	May-June 2022 Timetable not defined

					of 7 standard frontal lectures, 1 tutorial on statistics and econometrics, 1 tutorial on research ethics in policy evaluation, and 3 interactive practical lectures. **Skills acquired:** The course will improve knowledge and understanding of new trends and policies in the agri-food sector. Students will familiarize with methods and tools for demand and policy evaluation that can be useful in the job market. Strengths and limitations of these methods will be covered to stimulate critical thinking and the elaboration of new research ideas. The course also aims to improve students' knowledge and understanding of principles of statistics and econometrics applied to evaluation problems.	the development of an experimental protocol (40%) - Oral presentation and short report on conducted data analysis (40%)		
SOFT SKILLS								
Technical Scientific English	**Felicity Hope**		24 or 16	3 or 2 type B	Courses of Technical-Scientific English (Academic Writing, Presentations and Academic Writing II) addressed to PhD Students of the scientific area.	Final test	N.A.	I Semester – II Semester