Stampare su carta intestata del CdS

General information	
Academic subject	***Advanced data analysis methods for sustainable agronomic and environmental management***
Degree course	**International Master Degree Course in INNOVATION DEVELOPMENT IN AGRIFOOD SYSTEMS (IDEAS) - LM69**
Academic Year	*2021-2022*
European Credit Transfer and Accumulation System (ECTS)	6
Language	*English*
Academic calendar (starting and ending date)	*II semester (March 7th 2022 – June 17th 2022)*
Attendance	*Recommended but not compulsory*

Professor/ Lecturer	
Name and Surname	**Anna Maria Stellacci**
E-mail	*annamaria.stellacci@uniba.it*
Telephone	
Department and address	*Dipartimento di Scienze del Suolo della Pianta e degli Alimenti (DiSSPA)* *Università degli Studi di Bari "Aldo Moro"* *Via Amendola 165/A, 70126 Bari (Italy)*
Virtual headquarters	*TEAMS platform: annamaria.stellacci@uniba.it*
Tutoring (time and day)	Tutoring will take place during official visiting days and hours (Monday-Friday; 8.30-13.30), on appointments to be arranged in advance by e-mail. Tutoring could also take place on e-learning platforms (Teams).

Syllabus	
Learning Objectives	Provide knowledge and understanding to: o plan and analyze traditional and innovative experimental designs for agronomic research and environmental monitoring; o manage the decision support systems (DSS), analyze and interpret data and apply predictive models.
Course prerequisites	Prerequisites required for the access to the Master degree.
Contents	Students will acquire basic theoretical and applied knowledge with regard to: •planning and analysis of traditional and innovative experimental designs for agronomic research and environmental monitoring; •main univariate and bivariate parametric analysis techniques and overview of non-parametric approaches; •analysis of covariance and its role in agronomic and environmental research; •basic knowledge on assessment of temporal and spatial variability of observations and residuals. In addition, through the analysis of case studies, the students will understand the meaning and the importance of complex data analysis methods to improve the management of agronomic techniques, experimental designs and environmental sustainability. Contents: Recall of traditional methods of data analysis (test of hypothesis, main parametric methods for univariate and bivariate analysis - analysis of variance, linear correlation and regression); basic understanding of main univariate and bivariate non-parametric analysis techniques. Planning and analysis of traditional and innovative experimental designs for one-factor and factorial experiments. in non-hierarchical and hierarchical schemes.

	Analysis of covariance and use of auxiliary information, deriving also from proximal sensors, to improve the estimation of soil and crop variables. Basic understanding of statistical methods for the analysis of repeated measures data in time and space (different approaches, modeling the covariance structure of the residuals). Linear mixed effects models taking into account temporal and spatial correlation of soil and crop properties. Analysis and discussion of case studies will focus on: analysis of long-term field experiments (LTEs) data; identification of management zones (MZ) for agro-environmental applications (precision application of water and nutrient inputs); collection and analysis of proximal sensing information to estimate soil (TOC, SWC) and crop properties.
Books and bibliography	Lecture notes and teaching material made available during the course. • Littell R.C., Milliken G.A., Stroup W.W., Wolfinger R.D., Schabenberger O., 2006. SAS for Mixed Models, Second Edition. Cary, NC: SAS Institute Inc. • Gomez K.A., Gomez A.A., 1984. Statistical procedures in agricultural research. New York, Chichester, etc.: Wiley, 2nd edition. • Quinn G.P., Keough M.J., 2002. Experimental Design and Data Analysis for Biologists. Cambridge. • France J., Thornley J.H.M., 1984 - Mathematical Models in agriculture. Butterworths, London. • Camussi et al., 1995. Metodi statistici per la sperimentazione biologica. Zanichelli, Bologna.
Additional materials	Additional readings • Scientific papers provided by the teacher. Further material will be provided on request by the teacher.

Work schedule			
Total	Lectures	Hands on (on-class exercises, seminars by experts in the main topics studied, working groups)	Out-of-class study hours/ Self-study hours
Hours			
60	*32*	*28*	*90*
ECTS			
6	*4*	*2*	

Teaching strategy	Learning activities will consist in theoretical lectures and applied activities including exercises on statistical procedures studied, study case analysis, seminars and lessons from experts in the studied disciplines. Oral lessons will be supported by Power Point presentations, the use of the blackboard and by documents prepared by the teacher. Exercises on data analysis will be performed also by means of statistical softwares (such as SAS and R). E-learning through public platforms (e.g. Teams) can be used, on demand.
Expected learning outcomes	
Knowledge and understanding on:	• Knowledge of the principles of planning and analysis of traditional and innovative experimental designs for agronomic research and environmental monitoring. Basic knowledge of the principles of advanced data analysis methods studied, such as analysis of covariance and statistical methods for the analysis of repeated measures data in time and space. • Correctly understanding and interpreting data analysis results. Understanding,

	through the use of case studies analysis approach, the meaning and the importance of complex data analysis methods to improve the management of agronomic techniques and environmental sustainability.
Applying knowledge and understanding on:	• Ability to plan experimental designs for research in agriculture; ability to apply the methodologies studied; ability to understand results of more complex data analyses techniques.
Soft skills	• *Making informed judgments and choices* o Ability to select the most appropriate methodologies for planning an experimental design, analysing the data collected and understanding results obtained. • *Communicating knowledge and understanding* o Ability to present the results of the research activity; o Ability to transfer the theoretical and applied knowledge acquired from the scientific world to the agrifood sector. • *Capacities to continue learning* o Ability to further deepen advanced techniques for data analysis (analysis of spatial and temporal data; multivariate analysis; planning of more complex hierarchical designs).

Assessment and feedback	
Methods of assessment	The final exam consists of an oral test with questions related to the lectures, exercises and laboratory classes and a written exam. The intermediary exam consists of a written test. The evaluation of the student is based on criteria previously fixed such as those reported in the Academic Regulations for the Master Degree in Innovation Development in Agrifood Systems and in the study plan. The expected learning outcomes, in terms of knowledge and skills, are listed in the annex A of the Master Degree Course Regulation (expressed through the European Descriptors of Degree qualification).
Evaluation criteria	• *Knowledge and understanding* o Ability to plan appropriate traditional or innovative experimental designs; o Ability to understand and use the main methodologies studied for data analysis (analysis of covariance; statistical methods for the analysis of repeated measures data). • *Applying knowledge and understanding* o Ability to apply the acquired knowledge to solve case studies. • *Making informed judgements and choices* o Ability to select the most appropriate methodologies and correctly interpret the results of statistics tests studied. • *Communicating knowledge and understanding* o Ability to present the results of the research activity. • *Communication skills* o Ability to organize the acquired knowledge in form of didactic presentation and to articulate it for didactic purposes. o Ability to transfer the theoretical and applied knowledge acquired from the scientific world to the agrifood sector. • *Capacities to continue learning* o Ability to further deepen advanced techniques for data analysis (analysis of spatial and temporal data; multivariate analysis; planning of more complex hierarchical designs).

Stampare su carta intestata del CdS

Criteria for assessment and attribution of the final mark	*The final score is within 18/30 to 30/30. The exam is considered passed if a final score of at least 18/30 is reached.*
Additional information	