

**COURSE OF STUDY: STATISTICS**
**ACADEMIC YEAR: 2022 - 2023**
**ACADEMIC SUBJECT: Introduction to Statistics (Istituzioni di Statistica)**

General information	
Year of the course	First year
Academic calendar (starting and ending date)	First semester (11 September – 15 December 2023)
Credits (CFU/ETCS):	10
SSD	SECS-S/01 (Statistics)
Language	Italian
Mode of attendance	Optional but strongly recommended

Professor/ Lecturer	
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Department and address	Largo Abbazia Santa Scolastica, 53 (room n. 17)
Virtual room	Microsoft Teams, code: rfl3ft0
Office Hours (and modalities: e.g., by appointment, on line, etc.)	Tuesday: 9.30 - 11.30; Wednesday: 9.30 - 11.30. During the period of the lessons: Tuesday: 9.00 - 11.00 (first and second semester); Wednesday: 9.00 - 11.00 (first semester); Wednesday: 11.30 - 13.30 (second semester).

Work schedule			
Hours			
Total	Lectures	Hands-on (laboratory, workshops, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
250	49	21	180
CFU/ETCS			
10	7	3	

<b>Learning Objectives</b>	The course aims to provide the basic statistical tools suitable for analyzing real phenomena and preparatory to the methodological and applied disciplines of the second year. The topics in the program are those of descriptive statistics and are treated with the aim of presenting statistical methods both in the statistical-mathematical part and in the application one, ensuring that the ability to identify a problem and solve it with an appropriate approach is developed. Topics of exploratory data analysis are addressed, starting from their classification and representation up to synthetic indicators for analyzing a single population with reference to quantitative and qualitative characteristics. Furthermore, the methods of analysis relating to two observed characters are addressed in order to study their relationships both in the case of mutable double statistics, mixed tables, double series and double statistical variables. The purpose with which these topics are presented is to make the student master of the mathematical statistical aspect and capable of being autonomous in the exploratory analysis of data with reference to phenomena that occur in various application contexts (experimental, economic, social, etc. ...).
<b>Course prerequisites</b>	Basic knowledge of mathematics

<b>Teaching strategie</b>	Lectures on the theoretical topics and exercises, closely connected to the lessons,
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	during which problems are exposed to develop the student's ability to apply the theory in the context of real phenomena. Furthermore, laboratory activities are carried out with the R software, for a number of hours equal to one third of the entire duration of the course, with applications of statistical methods to real phenomena. The laboratory materials and teaching materials relating to theory and exercises are available on the e-learning platform ( <a href="http://dief.osel.it">dief.osel.it</a> ) which can be accessed after registration.
<b>Expected learning outcomes in terms of</b>	The expected learning outcomes are contained in these points: <ul style="list-style-type: none"> <li>- knowing how to classify data according to their type and being able to identify the most suitable graphic tool to represent them;</li> <li>- know the synthetic indicators (mean, variance, shape indices, etc. ...) and know how to apply them according to the type of data;</li> <li>- be able to establish, given a double table, which analysis should be used to identify the presence of any relationships between the two observed characters;</li> <li>- knowing how to interpret the results obtained and being able to describe the phenomenon using statistical indicators;</li> <li>- be familiar with the methods and acquire mastery of the tools in order to be able to operate in total autonomy when concrete problems are faced,</li> <li>- acquire the logic of the discipline both in methodological and applicative terms.</li> </ul>
<b>Knowledge and understanding on:</b>	At the end of the course, the student must know the tools of statistical methods for explore the population, their applications in various application contexts and must have acquired the necessary training to deal with the following applied statistics disciplines: In particular, his training concerns: <ul style="list-style-type: none"> <li>- Classification and graphical representations of data: Knowing what is meant by classification and acquiring the critical spirit with reference to the tools used for the classification of one or more variables and their graphical representation.</li> <li>- Position and summary measures and variability measures: Knowing which synthetic measures are used to describe one or more variables, their main properties and being able to apply the appropriate tools according to the type of data analysis and the phenomena being studied study.</li> <li>- Shape analysis: Learn the shape analysis tools and know how to use the study methods of a normal model (calculation of areas under the curve)</li> <li>- Analysis of the relationship between two variables: Knowing and being able to distinguish the various classification tools in relation to a double variable. Learn to data analysis the relationships between the components of a cross table and know how to use the appropriate tools to highlight the relationships (case of two nominal variables, one nominal variable and one quantitative variable and two quantitative variables) distinguishing their meaning. Know the indicators for measuring the relationship between the components of a ranking.</li> </ul>
<b>Applying knowledge and understanding on:</b>	The student must be able, at the end of the teaching course, to logically apply, following knowledge of the method used, the methods of exploratory data analysis, presented during the course, to concrete phenomena and be able to interpret the results obtained from the application of these methods.
<b>Soft skills</b>	The methodological tools of explorative analysis are constantly presented with reference to real phenomena. Therefore, given the transversal nature of the discipline, through exercises and laboratory activities the student analyses phenomena such as social, economic, biomedical, etc., using ad hoc tools and comments on the results of the analysis. Therefore, the student not only acquires the methodological skills but is also able to acquire the mental flexibility to apply the tools in a transversal way. Laboratory tests and exercises are systematically carried out in the classroom and involve the students.
<b>Syllabus</b>	
<b>Content knowledge</b>	<ul style="list-style-type: none"> <li>o Introduction to Statistics.</li> <li>o Data collection and classification.</li> </ul>

	<ul style="list-style-type: none"> <li>o Statistical series.</li> <li>o Various types of statistics tables.</li> <li>o Statistical reports.</li> <li>o Graphic representations. or medium.</li> <li>o Complex index numbers.</li> <li>o Variability, measures of dispersion and inequality.</li> <li>o Asymmetry, normal curve and abnormality.</li> <li>o Internal relationships between components of a double statistical variable.</li> <li>o Analysis of the mean dependence between statistical variables.</li> <li>o Analysis of the interdependence between statistical variables.</li> <li>o Analysis of the relationships between two ordinal variables.</li> </ul>
<b>Texts and readings</b>	<p><u>Theory</u> D. PICCOLO, Statistica per le decisioni – terza edizione, Il Mulino, Bologna, 2020 (capitoli 1 – 7) FREED S., JONES S., BERGQUIST T., BONNINI S., Statistica per le scienze economiche e aziendali, Iseidi, Torino, 2019 (capitoli 1 – 3) S. BORRA, A. DI CIACCIO, Statistica - Metodologie per le scienze economiche e sociali– terza edizione. McGraw-Hill, 2014 G.CICCHITELLI: Statistica: Principi e Metodi- seconda edizione, Pearson, 2012 (capp.1 - 11 e App. A)</p> <p><u>Applications</u> MURRAY R. SPIEGEL, Statistica, Collana Schaum, McGraw Hill Italia, Milano 2003</p> <p><u>Laboratory</u> COCCARDA R., FRASCATI F., Manuale interattivo di statistica con R con MyLab, Pearson 2015 IACUS S., MASAROTTO G., Laboratorio di Statistica con R, seconda edizione, McGraw-Hill, 2007</p>
<b>Notes, additional materials</b>	The student is free to choose any of the texts indicated both for the theoretical and for the practical part
<b>Repository</b>	The didactic material related to the in-depth study is available on the e-learning platform ( <a href="http://dief.osel.it">dief.osel.it</a> )

<b>Assessment</b>	
Assessment methods	<ul style="list-style-type: none"> <li>• During the course tests are carried out which have no validity for the purposes of the profit exam but have the purpose of evaluating and verifying the skills acquired by the students on the topics covered up to the moment of the test.</li> <li>• The exam includes a written test, at the end of the course, in which the student is asked to solve problems concerning real cases using suitable statistical methods. This test is followed by an oral discussion which can be held on one of the dates indicated in the exam calendar.</li> <li>• Any negative outcome of the test taken or failure to participate in the end-of-course test does not affect admission to the exam, which will be carried out according to the following methods:               <ol style="list-style-type: none"> <li>1) a written test which contains questions to be resolved through the application of statistical methods and which has the purpose of verifying the skills acquired by the student in the analysis of data that refer to concrete cases;</li> <li>2) an oral test that takes place immediately after the written test and involves the discussion of the results obtained and the verification of knowledge on additional topics, which are not covered by the written test, and which intends to verify not only the theoretical knowledge acquired but also the logical ability of the student in relation to the topics that are addressed during the test.</li> </ol> </li> </ul>
Assessment criteria	The written and the oral contribute to the final evaluation. What contributes to the final evaluation, as well as the correct application of the methods to the

	concrete problems that are submitted during the written test, the mental flexibility, and the logical capacity of the student in interpreting the results and, above all, in the presentation of the methods.
Final exam and grading criteria	The evaluation is out of thirty and the evaluation of the written and of the oral contribute equally to determining the final grade. The exam is passed when the student has achieved a minimum of 18/30.
<b>Further information</b>	
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