

**COURSE OF STUDY** *Business and Management Strategies (SIM)*
**ACADEMIC YEAR** 2024-2025

**COURSE NAME** *Multivariate Statistical Methods - 8 CFU*

Main information on teaching	
Year of study	1st YEAR
Disbursement period	1ST SEMESTER 16/9/2024 to 20/12/2024
University training credits (CFU/ETCS):	8
SSD	SECS/S01
Delivery language	ITALIAN
Frequency mode	NOT MANDATORY BUT RECOMMENDED

Professor	
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Site	IONIC DEPARTMENT - ECONOMICS SITE
Virtual headquarters	MS TEAMS
Receipt	FRIDAY 2.00pm - 3.00pm

Organization of teaching			
Hours			
Totals	Frontal teaching	Practice (laboratory, field, tutorial, other)	Individual study
180	48	28	104
CFU/ETCS			
8	6	2	

<b>Training objectives</b>	<i>Provide students with the basic elements, both theoretical and practical, for Data Science techniques and their applications in the economic and business fields.</i>
<b>Prerequisites</b>	<i>Basic knowledge of statistics, mathematics and applied computer science</i>

<b>Teaching methods</b>	<i>The frontal delivery method, with the use of digital media and laboratory lessons for applications on statistical software</i>
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<b>Expected learning outcomes</b>	
<b>DD1 Knowledge and understanding</b>	<i>The course aims to provide the basic elements of data inference techniques with multivariate methods.</i>
<b>DD2 Applied knowledge and understanding</b>	

<p><b>DD3-5 Soft skills</b></p>	<p><i>the student will learn to estimate and use in practice the models learned during the theoretical part of the course, through the use of the most widespread data analysis software.</i></p> <p><i>Independence of judgment or the student will be able to decide on the most appropriate model to use to extract new knowledge in the various envisaged areas of application (corporate field applications, business intelligence and marketing).</i></p> <ul style="list-style-type: none"> <li>• <i>Communication skills of the student, at the end of the course, will have acquired the necessary preparation to generate reports, in the envisaged areas of application, on the new knowledge extracted.</i></li> <li>• <i>Ability to learn independently or the course aims to provide the basic elements of Data Science techniques, knowledge on which to base the possibility of following more advanced courses aimed at preparing the figure expert in statistical methodology.</i></li> </ul>
<p><b>Teaching contents (Programme)</b></p>	<ol style="list-style-type: none"> <li>1. <i>Elements of probability and statistical inference</i></li> <li>2. <i>Elementary probability</i></li> <li>3. <i>Discrete and continuous random variables</i></li> <li>4. <i>Double and multiple random variables</i></li> <li>5. <i>Elements of multivariate statistical inference</i></li> <li>6. <i>Supervised and unsupervised learning</i></li> <li>7. <i>Association rules and Market Basket Analysis</i></li> <li>8. <i>Naïve Bayes classification</i></li> <li>9. <i>Decision trees</i></li> <li>10. <i>Clustering: hierarchical algorithms and k-means</i></li> <li>11. <i>R cran laboratory for applied analysis, which is an integral and contextual part of the theoretical delivery of the course, with the application of practical case studies:</i> <ol style="list-style-type: none"> <li>a. <i>Introduction to R, syntax notions</i></li> <li>b. <i>Functions in R</i></li> <li>c. <i>Vectors, Matrices, Arrays and Lists</i></li> <li>d. <i>The dataframe</i></li> <li>e. <i>Importing data</i></li> <li>f. <i>Missing values</i></li> <li>g. <i>Graphic representations</i></li> <li>h. <i>Principal Component Analysis (ACP)</i></li> <li>i. <i>Models of addiction</i></li> <li>j. <i>Generalized Linear Models</i></li> </ol> </li> </ol>
<p><b>Reference texts</b></p>	<p><i>Reference text: "Multivariate statistics with R. A practical introduction" by Carmine Frascella – Pisa University Press</i></p>
<p><b>Notes to reference texts</b></p>	<p><i>Teacher's handouts</i></p>
<p><b>Teaching materials</b></p>	<p><i>Teacher's handouts</i></p>
<p><b>Assessment</b></p>	
<p>Learning assessment methods</p>	<p><i>MIXED WRITTEN TEST:</i></p> <ul style="list-style-type: none"> <li>- <i>part with multiple choice questions (3 answers)</i></li> <li>- <i>starts with open-ended questions</i></li> <li>- <i>part of the exercises to be carried out.</i></li> </ul>

Evaluation criteria	<ul style="list-style-type: none"> <li>● <i>Knowledge and understanding skills:</i> <ul style="list-style-type: none"> <li>○ weight 15%</li> </ul> </li> <li>● <i>knowledge and understanding in the applied field :</i> <ul style="list-style-type: none"> <li>○ weight 25%</li> </ul> </li> <li>● <i>Complete and critical autonomy of judgement :</i> <ul style="list-style-type: none"> <li>○ weight 15%</li> </ul> </li> <li>● Communication skills on knowledge and mastery of topics : <ul style="list-style-type: none"> <li>○ weight 20%</li> </ul> </li> <li>● Ability to learn contents and applications : <ul style="list-style-type: none"> <li>○ weight 25%</li> </ul> </li> </ul>
Measurement criteria of learning and attribution of the final grade	<i>The final grade is expressed in thirtieths, with possible honors if the student shows full and maximum knowledge of the topic.</i>
<b>Others</b>	