## Degree Course
"Investigation Sciences (L-14)"
## Teaching Unit
Element of Computer Science and Data Analysis
## Academic Year, Course Year, Semester, CFU
A.Y. 2024/2025, I° Year, 2° Semester, 6 CFU
## Teacher
Prof. Giuseppe Agapito

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| **Content** | Element of Computer Science and Data Analysis, SSD: ING-INF/05 Information Processing Systems. |
| **Teacher** | Prof. Giuseppe Agapito<br>Associate Professor, (S.C. 09/H1, S.S.D.: ING-INF/05 Sistemi di Elaborazione delle Informazioni), Department of Law, Economics, and Sociology Univeristy "Magna Græcia" of Catanzaro.<br>e-mail: agapito@unicz.it<br>The timetable of the lectures is published on the website of the Department of Law, Economics, and Sociology. Office hours dates and times are available in the personal teacher web page. The teacher also receives by appointment before and after lessons. |
| **Teaching Unit** | The course aims to provide students with the basic knowledge of computer science relating to the automatic processing of information in all its forms. Specifically, students will learn the principles behind automated data analysis algorithms, methodologies, and software tools suitable for automated information processing. All are aimed at producing knowledge obtained through the study of large quantities and varieties of available data. |
| **Methods and Criteria for Learning Assessment** | **Knowledge and understanding skills**: the course aims to provide the knowledge of the main problems related to the organization and automatic management of the data accumulated and available in public and private organizations.<br>**Applying knowledge and understanding**: the student will be able to use the methodologies learned to support data analysis to produce precise and essential information, which allows them to guide strategies and corporate vision through a data-driven approach.<br>**Autonomy of judgment**: the student will express a critical attitude to plan, design, and manage data analysis workflows capable of homogenizing information technology with related legal issues.<br>**Communication skills: t**he student will Acquire the ability to expose the Topic covered with appropriate terminology**.**<br>**Learning Abilities**: the student will acquire the theoretical and practical knowledge to independently address and solve new problems related to data management, which may arise both during studies and during work. |
| **Program** | **Computer Science**:<br>Introduction to Automatic Information Processing using algorithms<br>**Computer Hardware Architecture**:<br>main components and characteristics of a computer (Von Neumann's model); main memory (functions, |

characteristics, and organization), Central Processing Unit-CPU (functions, operating and control parts, instruction cycle), system bus (organization, advantages and disadvantages), input/output interfaces, mass memory.

**Computer Software Architecture**:
conventional architecture of an operating system (kernel, memory manager, input/output manager, file manager, command interpreter), utility programs.

**Application Software:**
Introduction to application software, programming languages

**Computers Networks**:
Understanding the term Information and Communication, Technologies (ICT), ICT in everyday life.

**Computer Science Security**:
Fundamental Concepts
Security and Privacy

**Software licenses and open source:**
copyrights, software licenses, history of open source, open source operating systems, etc

**Cloud Computing:**
Introduction to cloud computing, the paradigms of cloud computing, the services of a cloud infrastructure

**Informative system:**
information systems, information tools for company management, CRM systems, processing of transitions

**Databases:**
Introduction, database models, relationships, queries, data warehouses, data mining

**Blockchain:**
Introduction, Distribute Ledger Technology, the communication protocol, mining activity, Blockchain and Bitcoin

**Computer science as a social fact**
Digital awareness, health protection, the problems of the digital divide

**Cyber Attacks and Threat**
Introduction to the most used cyber-attacks, protection techniques

**Computer forensics**
Introduction to computer forensics, digital evidence definition, best practice to preserve digital evidence.

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| **Student workload** | The amount of study required to prepare for an exam varies according to the personal abilities of the individual student. The indicated program requires approximately a personal study of 120 hours. |

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| | Topic: **Computer Science**<br>[2] Chapter 1. (Tot. **20** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Computer Hardware Architecture**<br>[2] Chapters 2, 3, 4. (Tot. **90** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Computer Software Architecture**<br>[2] Chapter 5. (Tot. **15** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Computers Networks**<br>[2] Chapters 8, 9, 14. (Tot. **65** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Application Software:**<br>Lectures notes: provided by the teacher.<br><br>Topic: **Software licenses and open source:**<br>[1] Chapter 7 (Tot. **18** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Programming:**<br>[1] Chapter 12 (Tot. **29** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Cloud Computing:**<br>[1] Chapter 10 (Tot. **9** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Informative system:**<br>[1] Chapter 11 (Tot. **15** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Databases:**<br>[1] Chapter 13 (Tot. **20** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Blockchain**<br>[1] Chapter 16 (Tot. **6** pages)<br>Lectures notes: provided by the teacher.<br><br>Topic: **Computer science as a social fact**<br>[1] Chapter 15 (Tot. **10** pages)<br>Lectures notes: provided by the teacher.<br><br>Total Number of pages **337** to study concerning **6 CFU** (**min** number of pages **300**, **max** number of pages **360**) |
| **Teaching Methods** | The course will be divided into a part of theoretical lectures in the |

| | classroom and another part of assisted exercises that will be held in the laboratory or classroom and require PCs made available in the University laboratories or the classroom through your own PC. The activities are mainly aimed at data analysis using software frameworks such as Weka, Python, R, Spark, Hadoop, and Knime suitable for Data Management. |
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| **Textbooks and Further References** | • [1] Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, **Informatica di base** 7$^{a}$ edizione, McGraw-Hill.<br><br>Further References<br><br>• Lectures notes provided by the teacher and supplementary useful material will be made available for the students attending the course on the eLearning platform of university (https://elearning.unicz.it/). |
| **Support Activities** | In addition to the front lectures, students will be supported during laboratory exercises. Furthermore, distributed platforms (Dropbox, Google-Drive, etc.) are used to share educational material (slides, examples, practices, and handouts). |
| **Frequency Mode** | It is desirable to attend lectures and exercises, read carefully the provided didactic material and meticulously follow the instructions provided by the teacher during the course. The slides do not replace the reference texts but offer precise detail on the program carried out. |

The course does not include intermediate evaluation tests.
The final exam will be held orally. Passing the exam is proof of having acquired the knowledge and skills specified in the course's educational objectives. The maximum mark of each test is 30L /30. The final mark reflects what is reported in the following table.

**Methods and Criteria for Learning Assessment**

| Final Mark | Knowledge and understanding of the subjects | Competence in the analysis and synthesis | Use of references, primarily bibliographic |
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| Fail | Major drawbacks. Relevant inaccuracy | Irrelevant. Frequent generalization. Inability to synthesize | Improper |
| 18-20 | At the threshold level. Obvious imperfections | Capacities are barely enough. | Merely appropriate |
| 21-23 | Conventional knowledge. | She or He can carry out correct analyzes and syntheses. Argue logically and consistently. | She or He uses standard references. |
| 24-26 | Good | She/He has | She or He uses |

| | | | knowledge of the subject. | good analysis and synthesis skills. The arguments are expressed consistently. | standard references. |
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| | | 27-29 | More than good knowledge | She or He has considerable skills in analysis and synthesis. | She or He delved into the Topic. |
| | | 30-30L | Considerable knowledge | She or He has considerable skills in analysis and synthesis. | Valuable insights. |