# SYLLABUS
# COURSE DESCRIPTION YEAR 2024/2025

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| **COURSE TITLE** | **Computational Security** |
| **COURSE CODE** | |
| **SCIENTIFIC SECTOR** | INF/01 |
| **DEGREE** | Bachelor in Computer Science |
| **SEMESTER** | 1st |
| **YEAR** | 3rd |
| **CREDITS** | 12 |
| **MODULAR** | Yes |

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| **TOTAL LECTURING HOURS** | 80 |
| **TOTAL LAB HOURS** | 40 |
| **ATTENDANCE** | Attendance is not compulsory; non-attending students may contact the lecturer at the start of the course to get support on the modalities of the independent study |
| **PREREQUISITES** | Students should have done the following courses: Software Engineering, Linear Algebra, Computer Programming, Programming Project. Students should have a solid mathematical foundation and be familiar with basic programming concepts, data structures and algorithms. These prerequisites are covered in any Bachelor degree in Computer Science. |
| **COURSE PAGE** | https://ole.unibz.it/ |

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| **SPECIFIC EDUCATIONAL OBJECTIVES** | • Type of course: "attività formativa affine o integrativa"<br><br>**MODULE 1 Computational Mathematics**:<br>The aim of this module is to teach students how to derive, analyze and implement numerical methods for solving systems of linear equations, computing eigenvalues and singular values of matrices, approximating functions and roots. To achieve these aims, students will solve mathematical problems in both exact and finite precision arithmetic, and analyze the mathematical theory to build the methods used for the numerical solution. The module will cover the basic topics of stability, error analysis and efficiency for various numerical linear algebra and approximation algorithms. A software environment for numerical computing known as Matlab will be introduced that allows high-performance matrix manipulations, data plotting, efficient implementation of algorithms. |

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| | **MODULE 2 Information Security**: The main aim of this exam is to provide an introduction to the field of information security. The students learn about the technical as well as the management side of security in information systems. They acquire knowledge about fundamental principles of security and also about practical approaches to securing information systems. |

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| **MODULE 1** | **Computational Mathematics** |
| **MODULE CODE** | 76253A |
| **MODULE SCIENTIFIC SECTOR** | MAT/08 |
| **CREDITS** | 6 |
| **LECTURER** | Carpentieri Bruno |
| **SCIENTIFIC SECTOR OF THE LECTURER** | MAT/08 |
| **TEACHING LANGUAGE** | **English** |
| **OFFICE HOURS** | Thursday 16:00-17:30. By previous email appointment:<br>bruno.carpentieri@unibz.it<br>Office POS 3.10, third floor, Faculty of Engineering. |
| **TEACHING ASSISTANT** | Same as lecturer |
| **OFFICE HOURS** | - |
| **LIST OF TOPICS COVERED** | • Introduction to computational modeling and principles of finite precision computation<br>• Numerical methods for solving ordinary differential equations<br>• Iterative methods for solving nonlinear equations and optimization problems<br>• Matrix factorization methods: LU, Cholesky, QR, and singular value decomposition<br>• Applications in data science: regression, data compression, and principal component analysis<br>• The Google PageRank problem and its applications: power method, shifted power method, and inverse power method |
| **TEACHING FORMAT** | Frontal lectures, exercises. |

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| **MODULE 2** | **Information Security** |
| **MODULE CODE** | 76253B |
| **MODULE SCIENTIFIC SECTOR** | ING-INF/05 |

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| **CREDITS** | 6 |
| **LECTURER** | Maggi Fabrizio Maria |
| **SCIENTIFIC SECTOR OF THE LECTURER** | ING-INF/05 |
| **TEACHING LANGUAGE** | **Italian** |
| **OFFICE HOURS** | By previous email appointment: maggi@inf.unibz.it<br>Office POS 3.08, third floor, Faculty of Enginnering |
| **TEACHING ASSISTANT** | Same as lecturer |
| **OFFICE HOURS** | - |
| **LIST OF TOPICS COVERED** | • Basic definitions: CIA, threat, attack, vulnerability, access control<br>• Risk assessment<br>• Basics of cryptography<br>• Network attack and defense<br>• Usability<br>• Security policies |
| **TEACHING FORMAT** | Frontal classroom lecture and lab sessions |

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| **LEARNING OUTCOMES** | **Knowledge and understanding:**<br>• know critical security aspects of information systems, the basic concepts of security and techniques for the development of secure systems;<br>**Applying knowledge and understanding:**<br>• be able to evaluate the quality of information systems and to identify critical aspects;<br>• be able to apply the own knowledge in different working contexts;<br>**Making judgements**<br>• Must have the ability to independently select the documentation required to keep abreast of the frequent technological innovations in the field by using a wide variety of documentary sources: books, web, magazines;<br>**Communication skills**<br>• Must be able to coordinate the work of a project team and to interact positively with members of the group;<br>**Learning skills**<br>• Must also be able to independently keep up to date with developments in the most important areas of Computer Science. |

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| **ASSESSMENT** | Final exam: the exam covers the topics addressed in MODULE 1 and MODULE 2 and consists of two parts:<br><br>• MODULE 1 (50% of the final exam):<br>The written exam will consist of a set of verification questions, transfer of knowledge questions and exercises. |

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| | • MODULE 2 (50% of the final exam):<br>  ○ Project work to test knowledge application skills and communication skills<br>  ○ Oral exam with verification questions and questions to test knowledge application skills<br><br>At the end of MODULE 1, a midterm test will be offered covering only the topics of MODULE. Students who get at least 18/30 at the midterm test, will have to pass only MODULE 2 at the final exam. |
| **ASSESSMENT LANGUAGE** | English (Module 1)<br>Italian (Module 2) |
| **EVALUATION CRITERIA AND CRITERIA FOR AWARDING MARKS** | The exam is evaluated based on correctness of answers, clarity of answers, ability to summarize, evaluate, and establish relationships between topics, skills in critical thinking, quality of argumentation, problem solving ability.<br><br>In order to pass the exam, the students should get at least 18/30 in each module. The mark related to each part contributes to the final grade as follows:<br><br>• MODULE 1: 50%<br><br>• MODULE 2: 50%<br>  ▪ Assessment 1: project work (30%)<br>  ▪ Assessment 2: oral exam (70%)<br><br>Relevant for assessment 1: skill in applying knowledge in a practical setting, ability to summarize in your own words. |
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| **REQUIRED READINGS** | MODULE 1:<br><br>Greenbaum, A. and Chartier, T. P. (2012), Numerical Methods. Design, Analysis, and Computer Implementation of Algorithms, Princeton University Press<br><br>Lindfield, G. R. and Penny, J. E. T. (2012), Numerical Methods Using MATLAB, Academic Press<br><br>Attaway, S. (2016), Matlab: A Practical Introduction to Programming and Problem Solving, Butterworth-Heinemann<br><br>MODULE 2:<br><br>Material provided in the form of slides and scientific papers provided by the teacher. |
| **SUPPLEMENTARY READINGS** | MODULE 1:<br><br>Atkinson, K. E. (1989), An Introduction to Numerical Analysis, Wiley |

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| | Moler, C. (2004), Numerical Computing with MATLAB, SIAM, Philadelphia<br><br>MODULE 2:<br><br>CompTIA Security+ Guide to Network Security Fundamentals 6thEdition, Mark Ciampa ISBN 978-1337288781<br><br>Computer & Internet Security: A Hands-on Approach 3rd Edition ISBN: 978-17330039-4-0<br><br>Computer Security: A Hands-on Approach 3rd Edition ISBN: 978-17330039-5-7<br><br>Internet Security: A Hands-on Approach 3rd Edition ISBN: 978-17330039-6-4 |
| **SOFTWARE USED** | MODULE 1: MATLAB<br><br>MODULE 2: Provided by teacher and tutor during lectures/lab sessions |