SYLLABUS
COURSE DESCRIPTION

COURSE TITLE	**Mathematics II**
COURSE CODE	76202
SCIENTIFIC SECTOR	MAT/05 and MAT/08
DEGREE	Bachelor in Computer Science
SEMESTER	2nd
YEAR	1st
CREDITS	12
MODULAR	Yes

TOTAL LECTURING HOURS	40 pro modules
TOTAL LAB HOURS	20 pro modules
PREREQUISITES	There are no prerequisites.
COURSE PAGE	https://ole.unibz.it/

SPECIFIC EDUCATIONAL OBJECTIVES	• Type of course: “di base” for L-31 • Scientific area: “Formazione matematica-fisica” for L-31 MODULE 1: The aim of this module is to introduce students to the following topics: 1) sequences and series ; 2) univariate functions ; 3) derivatives, differentials and Taylor theorem ; 4) Riemann integral ; 5) logarithmic and exponential functions ; and 6) normed vector spaces. Module 2 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.

MODULE 1	**Analysis**
MODULE CODE	76202A
MODULE SCIENTIFIC SECTOR	MAT/05
CREDITS	6
LECTURER	Tammam Tillo
SCIENTIFIC SECTOR OF THE LECTURER	ING-INF/05
TEACHING LANGUAGE	English
OFFICE HOURS	• Tuesday 15:00-17:00, Faculty of computer science, Piazza Domenicani 3, Office 1.17. • It is recommended to make an appointment beforehand by email.
TEACHING ASSISTANT	Tammam Tillo, Piazza Domenicani 3, Office 1.17, ttillo@unibz.it Simone Ugolini, Piazza Domenicani 3, Office 1.04, Simone.Ugolini@unibz.it
OFFICE HOURS	By appointment via email.
LIST OF TOPICS COVERED	• Sequences and series • Univariate functions • Derivatives, differentials and Taylor Theorem • Riemann integral • Logarithmic and exponential functions • Normed vector spaces
TEACHING FORMAT	This course will be delivered through a combination of formal lectures and exercises

MODULE 2	**Computational Mathematics**
MODULE CODE	76202B
MODULE SCIENTIFIC SECTOR	MAT/08
CREDITS	6
LECTURER	Bruno Carpentieri
SCIENTIFIC SECTOR OF THE LECTURER	MAT/08
TEACHING LANGUAGE	English

OFFICE HOURS	Faculty of Computer Science, Piazza Domenicani 3, Office 3.10, Bruno.Carpentieri@unibz.it, By appointment via email.
TEACHING ASSISTANT	Faculty of Computer Science, Piazza Domenicani 3, Office 3.10, Bruno.Carpentieri@unibz.it Simone Ugolini, Piazza Domenicani, 3, Office 1.04, Simone.Ugolini@unibz.it
OFFICE HOURS	TBA, Simone Ugolini, Piazza Domenicani, 3, Office 1.04, Simone.Ugolini@unibz.it
LIST OF TOPICS COVERED	• Matrix computation • Singular value decomposition • Iterative methods for linear algebra • Functional approximation • Bisection and fixed-point iterations • Newton–Raphson method
TEACHING FORMAT	Frontal lectures, exercises in lab.

Learning outcomes	**Knowledge and understanding** • Have a solid knowledge of mathematics that are in support of computer science; **Applying knowledge and understanding** • Be able to use the tools of mathematics to solve problems; **Making judgments** • Be able to work autonomously according to the own level of knowledge and understanding; **Ability to learn** • Have developed learning capabilities to pursue further studies with a high degree of autonomy.

ASSESSMENT	Written exam for each of the two modules. The written exam will consist of a set of verification questions, transfer of knowledge questions and exercises. The aim of the assessment is to check to which degree students have mastered the following learning outcomes: 1) knowledge and understanding, 2) applying knowledge and understanding, 3) making judgment.

ASSESSMENT LANGUAGE	English
EVALUATION CRITERIA AND CRITERIA FOR AWARDING MARKS	Final Written Exam, 100% covering the full program. Written exam questions will be evaluated in terms of correctness, clarity, quality of argumentation, problem solving ability. Both modules must be positive to pass the course. A positive evaluation of one module remains valid for all three regular exam sessions of the academic year.

REQUIRED READINGS	Module 1: Students should refer primarily to their notes taken in class (lectures and exercise classes) and consult the suggested textbooks. Module 2: *Greenbaum, A. and Chartier, T. P. (2012), Numerical Methods. Design, Analysis, and Computer Implementation of Algorithms, Princeton University Press* *Lindfield, G. R. and Penny, J. E. T. (2012), Numerical Methods Using MATLAB, Academic Press* *Attaway, S. (2016), Matlab: A Practical Introduction to Programming and Problem Solving, Butterworth-Heinemann*
SUPPLEMENTARY READINGS	Module 1: • Title : Real analysis ; Author : John M. Howie ; ISBN : 978-1-4471-0341-7 • Title : Analysis by Its History ; Authors : Gerhard Wanner, Ernst Hairer ; ISBN : 978-0-387-94551-4 • Title : Calculus: A Complete Course ; Author : Robert A Adams ; ISBN : 0-321-27000-2 Module 2 *Atkinson, K. E. (1989), An Introduction to Numerical Analysis, Wiley* *Moler, C. (2004), Numerical Computing with MATLAB, SIAM, Philadelphia*
SOFTWARE USED	No software is needed for Module 1 *Matlab* for Module 2