SYLLABUS
COURSE DESCRIPTION

COURSE TITLE	Mathematical Methods for Experimental Sciences
COURSE CODE	75005
SCIENTIFIC SECTOR	FIS/01
DEGREE	Bachelor in Computer Science and Engineering
SEMESTER	1st Semester
YEAR	2nd
CREDITS	8

TOTAL LECTURING HOURS	48
TOTAL LAB HOURS	24
PREREQUISITES	One-variable calculus (differentiation, integration)
COURSE PAGE	None. Students should refer to their notes taken during lectures and exercise classes, and consult the suggested textbook and readings

SPECIFIC EDUCATIONAL OBJECTIVES	• Type of course: "di base" for L-31 and L-08 • Scientific area: "formazione matematica-fisica" for L-31 and "fisica e chimica" for L-8 Learning how to tackle problems that require the maximization/minimization of a figure-of-merit function or the solution of differential equations. Learning the basics of Fourier transform analysis.

LECTURER	Leonardo Ricci, office POS 1.04, Faculty of CS, POS Building, piazza Domenicani 3, leonardo.ricci@unibz.it
SCIENTIFIC SECTOR OF THE LECTURER	FIS/01
TEACHING LANGUAGE	English
OFFICE HOURS	During the lecture time span, Tuesday, 12.30-13:30, Faculty of CS, POS Building, piazza Domenicani 3, office 1.04
TEACHING ASSISTANT	Same as lecturer

OFFICE HOURS	Same as lecturer
LIST OF TOPICS COVERED	• Functions of multiple variables: definition and graphs; limits; continuity. • Differential and Taylor formula (for multiple variables): partial differentiation; differentiability and linearization; gradient, differential and directional derivative. • Maxima and Minima: extreme values and saddle points; Hessian matrix. • Function spaces: metric spaces; least-squares approximation of a function by means of polynomials. • Series of functions: periodic functions and Fourier series. • Differential equations: first and second order linear differential equations; ordinary differential equations; partial differential equations. • Systems of differential equations: solution of special cases. • Integration: multiple integration via iterated integrals; change of variables and Jacobian determinant
TEACHING FORMAT	Frontal lectures, exercises

LEARNING OUTCOMES	**Knowledge and understanding** • have a solid knowledge of mathematics that is in support of computer science **Applying knowledge and understanding** • be able to use the tools of mathematics to solve problems **Ability to make judgments** • be able to work autonomously according to the own level of knowledge **Communication skills** • be able to structure and write scientific documentation **Ability to learn** • have developed learning capabilities to pursue further studies with a high degree of autonomy • be able to learn the innovative features of state-of-the-art technologies and information systems

ASSESSMENT	Written final exam only [100 % of mark].
ASSESSMENT LANGUAGE	English
EVALUATION CRITERIA AND CRITERIA FOR AWARDING MARKS	The exam consists of 4-6 exercise: at least one exercise on differential calculus (see above the first 5 points of the syllabus), one exercise on differential equations and/or systems of differential equations, and one exercise on multiple integration

REQUIRED READINGS	Textbook: R. A. Adams and C. Essex, "Calculus – a complete course" (7th edition), Pearson Canada
SUPPLEMENTARY	Other reading suggestions: excerpts from (for example)

READINGS	T. M. Apostol, "Calculus, Vol. 2: Multi-Variable Calculus and Linear Algebra with Applications to Differential Equations and Probability", Wiley F. Conti, P. Acquistapace, A. Savojni, "Analisi matematica – Teoria e applicazioni", McGraw-Hill W. H. Press, B. P. Flannery, S. A. Teukolsky, W. T. Vetterling, "Numerical Recipes in C: The Art of Scientific Computing" (2nd edition, 1992), Cambridge University Press; available online at *www.nr.com*
SOFTWARE USED	Occasionally, *gnuplot* on Linux