SYLLABUS
COURSE DESCRIPTION

COURSE TITLE	Empirical Methods
COURSE CODE	75012
SCIENTIFIC SECTOR	SECS-S/01
DEGREE	Bachelor in Computer Science and Engineering
SEMESTER	2nd
YEAR	2nd
CREDITS	6

TOTAL LECTURING HOURS	36
TOTAL LAB HOURS	18
PREREQUISITES	Discrete Mathematics and Logic, Analysis
COURSE PAGE	https://ole.unibz.it/

SPECIFIC EDUCATIONAL OBJECTIVES	• Type of course: “affini o integrativi” for L-31 and L-08 • Scientific area: “formazione affine” for L-31 and for L-8 The course offers an overview of the theory of probability in connection to its use in computer science and the use of statistics in assessing empirical data.

LECTURER	Rafael Penaloza Nyssen
SCIENTIFIC SECTOR OF THE LECTURER	INF/01
TEACHING LANGUAGE	English
OFFICE HOURS	POS 3.05, Wednesday 11.00-13.00, Rafael.Penaloza@unibz.it
TEACHING ASSISTANT	Damiano Marino Somenzi
OFFICE HOURS	TBA
LIST OF TOPICS COVERED	• Introduction to probability • Descriptive statistics – Exploratory data analysis

	• Parametric Inference – testing for normality • Non parametric Inference – bootstrap, non parametric test • Hypothesis Testing • Linear regression
TEACHING FORMAT	Lectures: chalk and talk, Lab: interactive and group work

LEARNING OUTCOMES	**Knowledge and understanding** • Language of probability and probabilistic modelling • Theoretical and practical, including computational, methods of parametric, linear and non-parametric statistics **Applying knowledge and understanding** • Understanding and ability to use Monte Carlo methods for computer simulation (using "R") and quantification of uncertainty • Understanding and ability to use standard statistical methods, regression, linear models, other parametric models and non-parametric models in practical situations (based on the computing language "R") **Making judgments** • Ability to discern between various probability models and capability to find appropriate model for a given application • Interpretation of statistics and ability to analyse statistical data **Communication skills** • Written communication of arguments involving randomness and uncertainty to experts and non-experts • Ability to transfer knowledge from mathematical probability and statistics to the computer science and wider audiences **Learning skills** • Ability to read and interpret current literature using probabilistic and statistical language • Ability to acquire further theoretical knowledge and develop new computational techniques involving probability or statistics

ASSESSMENT	Final Exam with unseen questions about the theory, bookwork and problems to be solved.
ASSESSMENT LANGUAGE	English
EVALUATION CRITERIA AND CRITERIA FOR AWARDING MARKS	relevant for assessment: clarity of answers, mastery of language (also with respect to teaching language), ability to summarize, evaluate, and establish relationships between topics; critical interpretation of results and connection to applications

REQUIRED READINGS	• C. M. Grinstead and J. L. Snell. Introduction to Probability. American Mathematical Society, 1997. • S. M. Ross. Introduction to probability and statistics for engineers and scientists. Elsevier/Academic Press, Amsterdam; Boston, 2004.

	OCLC: 123752914.
SUPPLEMENTARY READINGS	• J. Haigh. Probability models. Springer, London, 2013. OCLC: 909978104. • W. N. Venables, D. M. Smith, and the R Core Team. An Introduction to R, version 3.3.2 edition, 10 2016. Notes on R: A Programming Environment for Data Analysis and Graphics.
SOFTWARE USED	R as a recommended software, but not required for exam.