



UNIVERSITÀ
DI TORINO

Master in Economics, ESOMAS Department

INTRODUCTORY COURSES

Fall 2022

Introduction

Our Master in Economics features many quantitative courses. We offer two introductory courses for students to acquire the required background for our program: one in Mathematics and one in Probability and Statistics. **We strongly advice all incoming students to take these two courses.**

The introductory courses take place in September 2022, before classes officially start. Each course lasts for 24 hours. Both courses take place at the Corradetti Classroom.

Essentials of Mathematics

Instructor: Alberto Turigliatto, (alberto.turigliatto@unito.it)

Dates: Wednesday 7th, Thursday 8th, Friday 9th and Monday 12th (September 2022)

Time: From 9am to 12pm and from 2pm to 5pm.

Essentials of Probability and Statistics

Instructor: Guillaume Kon Kam King, (guillaume.konkamking@gmail.com)

Dates: Tuesday 13th, Wednesday 14th, Thursday 15th and Friday 16th (September 2022)

Time: From 9am to 12pm and from 2pm to 6pm.

Essentials of Mathematics. List of topics

Functions. Global/local maximum and minimum. Infimum, supremum. Concavity and convexity of functions of one or more variables. Limits of functions of one and more variables. Continuity, derivability and differentiability of functions of one or more variables. Polynomial expansions (Taylor's and Mc Laurin's expansions) of functions of one or more variables. Necessary and sufficient conditions for local maxima and minima of differentiable functions of one or more variables. Criteria for concavity and convexity of differentiable functions of one or more variables. Constrained optimization, Lagrange multipliers. Numerical sequences, convergence and divergence criteria. Numerical series and series of functions, uniform convergence, radius of convergence. Riemann integral, integrability of continuous functions, and monotonic functions. Improper integrals. Mean value theorem for integrals. Fundamental theorem of calculus. Computation of indefinite and definite integrals by means of different methods such as: immediate integrals, integrals by parts, integrals by substitution, integrals of rational functions. Riemann-Stieltjes integral. Vector spaces and subspaces. Linear combinations and spans. Linear dependence/independence. Basis and dimension of a subspace. Matrices, operations on matrices, rank of a matrix, Gaussian elimination procedure. Determinant, inverse matrix. Solution to linear systems. Rouché-Capelli theorem and Cramer rule. Eigenvalues and eigenvectors.

Essentials of Probability and Statistics. List of topics

Classical approach, frequentist, subjectivist and axiomatic of probability. Conditional probability and independence. Bayes' theorem. Probability distributions of discrete random variables: Bernoulli, binomial, Poisson, geometric. Probability density functions and distributions functions of the continuous random variables: uniform, normal, exponential, gamma. Mixed random variables. Moments of a random variable, moment generating function and its existence. Monotonic function of a random variable. Multivariate probability distributions. Covariance matrix and correlation coefficients. Laws of large numbers and central limit theorem. Sampling distribution, point estimation, confidence interval. Hypothesis testing, power of a test. Maximum likelihood estimation, properties of estimators.