

Syllabus: Refresher Course in Mathematics and Statistics

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This course is a week-long refresher course covering various topics in differential calculus, probability, statistical inference and linear algebra. Teaching will take place for four hours each day and one chapter/topic will be covered per day. Exercises will be circulated at the end of each chapter and are to be solved at home. Solutions will then be reviewed the following morning.

Course materials will be put online at the end of each chapter.

Day 1: Single-variable calculus (Basic functions and geometric properties, differentiation and integration concepts and rules, extension to multi-variable functions + applications)

Day 2: Function maximization / minimization (constrained and unconstrained optimization problems + applications)

Day 3: Concepts in statistics and probability (Basic definitions, random variables, discrete and continuous distributions, Distribution of several random variables)

Day 4: Statistical inference (population and random sampling, estimating the population mean and population variance, hypothesis testing, confidence intervals and p-value)

Day 5: Introductory linear algebra (Vector/matrix notation, basic operations: addition, subtraction, product, inverse, transpose) and **Linear regression** (univariate model, goodness of fit and statistical significance of parameters, multivariate generalisation)

