## MATHEMATICAL ANALYSIS

Elements of logic and set theory, cartesian product. Topology of the real line.
Sequences of real numbers, convergence, limit superior and limit inferior. Convergence criteria. Elementary properties of series of positive numbers.
Functions of one variable. Limits and continuity. Continuous functions and related theorems.
Differential calculus and applications: the notion of derivative, geometric interpretation.
Derivation rules, chain rule. Differential calculus theorems.
Integral calculus: definite Riemann integral, primitive. Integration by parts and change of variables formula.
Elements of linear algebra (vectors, matrices and operations).
Functions of several variables, extension of the concepts of limit, continuity and differentiability. Hints of integral calculus for function of several variables.

Suggested textbooks:
Muresan, M., A Concrete Approach to Classical Analysis, Springer.

## PROBABILITY

Elements of combinatorics.
Foundations of probability calculus and properties.
Conditional probabilities, law of total probabilities, Bayes' theorem.
Definition of random variable, distribution of a random variable, cumulative distribution function, expected value, moments, central moments.
Discrete random variables, probability mass function and most common examples.
Continuous random variables, probability density function and most common examples.
Monotonic transformation of a random variable. Hints on random vectors, joint and marginal distributions. Independent random variables. Sums of independent random variables.
Expectation and variance of the sum of random variables.
Moment generating function and its properties.
Central limit theorem and law of large numbers.

Suggested textbooks:
Ross S.M., A First Course in Probability, Prentice Hall.

## STATISTICS

Data Analysis: frequency distributions, graphical representations, descriptive indices.
Statistical inference: sampling and sampling distribution, point estimation, confidence intervals and hypothesis testing.
Elements of regression models.

Suggested textbooks:
Ross S.M., Introductory Statistics. Academic Press.