Course content for MT5432, Inference

Prerequisites:

Aims:
This is a graduate level course intended to provide the mathematical theory underlying the main principles and methods of statistics, in particular, to introduce the mathematical theory of parametric estimation and hypotheses testing.

Learning outcomes:
On completion of the course, students should be able to

- demonstrate a deep understanding of some of the advanced concepts and results of the theory of estimation and hypothesis testing with main emphasis on the general methodology rather than special models occurring in applications;
- formulate statistical problems in rigorous mathematical terms;
- select and apply appropriate tools of mathematical statistics and advanced probability to analyse and solve the problems;
- understand and construct mathematical proofs of some of the main theoretical results of mathematical statistics;
- understand the concepts and results in asymptotic theory of estimation.

Course content:
Estimation: Exponential Family. Maximum likelihood method. Method of moments. Sufficiency Principle. Factorisation criterion. Lehmann-Scheffe criterion. Completeness theorem in exponential family. Rao-Blackwell Theorem. Cramer-Rao inequality and efficiency. Best unbiased estimators.
Hypothesis testing: Neyman-Pearson framework. Uniformly most powerful tests. Unbiasedness. Likelihood ratio tests.
Asymptotic evaluations: Consistency. Asymptotic normality. Asymptotic properties of maximum likelihood estimators. Asymptotic relative efficiency. Robustness. M-estimators.