

## School of Mathematics

### Course 454 — Statistical Inference

2001–02

(JS &amp; SS Mathematics &amp; Two-Subject Moderatorship Mathematics )

**Lecturer:** Dr. S. Wilson & Dr. B. Murphy**Requirements/prerequisites:** 251**Duration:** Michealmas, Hilary and Trinity**Number of lectures per week:****Assessment:****End-of-year Examination:****Description:**

Statistical inference is the process of learning via observations that are subject to uncertainty. This course is a fairly rigorous investigation of the theory and methods of statistical inference.

**CONTENT:***Part 1.*

Bayesian Statistical Inference

Calculus of probability, meaning of probability (the three views)

Coherence and the Bayesian paradigm

Parameters, the likelihood and the prior

Bayes' theorem

Conjugate priors, loss functions and Bayes' estimators

Elicitation of prior beliefs

Numerical methods for computing posterior distributions:

Monte-Carlo simulation, importance sampling, Markov chain methods

Examples

*Part 2.*

Classical Statistical Inference

Introduction

The Likelihood Principle, Frequentist Approach, and Bayesian Approach

Parameter estimation. Interval Estimation. Hypothesis Testing. Prediction

Comparison of Various Approaches Of Statistical Inference

Examples

**Textbooks:**

1. Casella, G. and Berger, R. (1990) Statistical Inference. Wadsworth.
2. Bernardo, J. M. and Smith, A. F. M. (1994) Bayesian Theory. Wiley.
3. Berger, J. (1985) Statistical Decision Theory and Bayesian Analysis. Springer-Verlag.
4. O'Hagan, A. (1994) Kendall's Advanced Theory of Statistics:  
Bayesian Inference, Vol 2B. Arnold.

5. Ferguson, T. (1967) *Mathematical Statistics*. Academic Press.
6. Cox, D. and Hinkley, D. (1974) *Theoretical Statistics*. Chapman and Hall.
7. Geisser, S. (1993) *Predictive Inference*. Chapman and Hall.
8. Tanner, M. (1996) *Tools for Statistical Inference*. Springer-Verlag.
9. De Finetti, B. (1990) *Theory of Probability*. Volumes 1 and 2. Wiley.
10. Lee, P.M. (1997) *Bayesian Statistics: an Introduction*. Arnold.
11. Silvey, S. D. (1975) *Statistical Inference*. Chapman And Hall

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