Module Code	STU34507
Module Name	Statistical Inference I
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Professor Simon Wilson
Module Learning Outcomes	On successful completion of this module, students will be able to: LO1. Explain what subjective probability is and how it can be motivated; [SL01, SL03, SL04] LO2. Explain how Bayesian statistical inference is the result of adopting the subjective approach to probability; [SL01, SL03, SL04] LO3. Contrast the Bayesian and frequentist approaches to statistical inference; [SL01, SL02] LO4. Explain the meaning of a likelihood, parameter and probability model; [SL04, SL05] LO5. Apply Bayes' Law to a given model and prior distribution to form a posterior distribution, and recognise the functional form of the common probability distributions; [SL03, SL04, SL05] LO6. Identify a point estimate to take from knowledge of a loss function; [SL04] LO7. Select an interval estimate from a posterior distribution; [SL04] LO8. Summarise the different numerical analysis approaches to calculating the integrals involved in multi-dimensional posterior distributions or the calculation of marginal distributions from them; [SL05] LO9. Describe the Monte Carlo approaches of rejection or importance sampling to approximate a given posterior distribution; [SL05] LO10. Show how Monte Carlo methods can be used to estimate the normalising constant of a posterior distribution; [SL05] LO11. Demonstrate methods of elicitation of prior distributions. [SL03, SL04]
Module Content	This module will describe the theoretical and practical aspects of Bayesian statistics inference. Specific topics addressed in this module include: Quantifying Uncertainty, Some Laws of Probability, Probability Models and Prior Distributions, Statistical Inference, Simple Examples: Conjugate Priors, A More Complex Example, Point and Interval Estimates, Numerical Methods of Computing Posterior Distributions, Basic Simulation Methods, Markov chain simulation, Prior Elicitation, Some Real Applications.
Teaching and Learning Methods	Lectures

[1] TEP Glossary

Assessment Details[2]

Assessment Component	Brief Description	Learning Outcomes Addressed	% of total	Week set	Week due
Examination	2 hour written examination	LO1, LO2, LO3, LO4, LO5	100%	n/a	n/a

Reassessment Details

Examination (2 hours, 100%)

Contact Hours and Indicative Student Workload

Contact Hours (scheduled hours per student over full module), broken down by:	33hours
lecture	33 hours
Independent study (outside scheduled contact hours), broken down by:	**72 hours**
preparation for classes and review of material (including preparation for examination, if applicable)	65 hours
completion of question sheets (including examination, if applicable)	18 hours
Total Hours	**116 hours**

Recommended Reading List

Lee, P.M., "Bayesian Statistics: an Introduction", 2nd edition, published by Edward Arnold, 1997.
de Finetti, B., "Theory of Probability (Volumes 1 and 2), published by Wiley, 1990. Lindley, D.V., " Making Decisions", 2nd edition, published by Wiley, 1985. Ross, S.M. , " Simulation", 2nd edition, published by Academic Press, 1997.

Module Pre-requisites

Prerequisite modules: STU1251, STU1252, STU23501, STU22005

Other/alternative non-module prerequisites: N/A

Module Co-requisites

Module Website

Last Update

01/10/2019 by Simon Wilson

[2] TEP Guidelines on Workload and Assessment