Module Code: STU34507

Module Name: Statistical Inference I

ECTS Weighting: 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.


Teaching and Learning Methods:

Lectures
<table>
<thead>
<tr>
<th>Assessment Details²</th>
<th>Assessment Component</th>
<th>Brief Description</th>
<th>Learning Outcomes Addressed</th>
<th>% of total</th>
<th>Week set</th>
<th>Week due</th>
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<tbody>
<tr>
<td>Examination</td>
<td>2 hour written examination</td>
<td>LO1, LO2, LO3, LO4, LO5</td>
<td>100%</td>
<td>n/a</td>
<td>n/a</td>
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**Reassessment Details**

Examination (2 hours, 100%)

**Contact Hours and Indicative Student Workload**

<table>
<thead>
<tr>
<th>Contact Hours (scheduled hours per student over full module), broken down by:</th>
<th>33 hours</th>
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<tbody>
<tr>
<td>lecture</td>
<td>33 hours</td>
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<tr>
<td>Independent study (outside scheduled contact hours), broken down by:</td>
<td>72 hours</td>
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<tr>
<td>preparation for classes and review of material (including preparation for examination, if applicable)</td>
<td>65 hours</td>
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<td>completion of question sheets (including examination, if applicable)</td>
<td>18 hours</td>
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<td>Total Hours</td>
<td>116 hours</td>
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**Recommended Reading List**


**Module Pre-requisites**

Prerequisite modules: STU1251, STU1252, STU23501, STU22005

Other/alternative non-module prerequisites: N/A

**Module Website**

Last Update: 01/10/2019 by Simon Wilson

² TEP Guidelines on Workload and Assessment