F78PB Probability and Statistics B

COURSE DETAILS
Course Code: F78PB
Full Course Title: Probability and Statistics B
SCQF Level: 8
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes
Postgraduate Taught: Yes
Postgraduate Research: No

Additional Information:

COURSE AIMS

• To reinforce basic ideas related to the description and analysis of data
• To provide an introduction to statistical modelling, estimation, hypothesis testing and regression and develop the basis for their application

LEARNING OUTCOMES – SUBJECT MASTERY

After studying this module, students should be able to:

• Understand, interpret and describe data using appropriate numerical and graphical summaries
• Compare distributions of data with theoretical distributions
• Understand issues related to data collection, model construction and model choice
• Distinguish between population parameters and sample statistics
• Explain the concept of a sampling distribution and be familiar with properties of estimators
• Calculate point estimates using the method of moments
• Understand the concept of maximum likelihood estimation and derive maximum likelihood estimates in various applications
• Compare data from two populations
• Construct, calculate and interpret confidence intervals for parameters of interest in one or two populations
• Understand and interpret the concepts of null hypothesis, alternative hypothesis, critical region, level of significance and P-values
• Perform hypothesis tests for population parameters
• realise and understand the connection between hypothesis testing and confidence intervals
• Investigate associations between two variables
• Perform linear regression analysis and interpret findings meaningfully
• Simulate from probability distributions using the inverse CDF method
• Demonstrate results related to sampling distributions, the central limit theorem and confidence intervals using simulation

LEARNING OUTCOMES – PERSONAL ABILITIES

At the end of the module, students should be able to:

• Demonstrate the ability to learn independently
F78PB Probability and Statistics B

- Manage time, work to deadlines and prioritise workloads
- Use an appropriate computer package to describe and simulate data and to perform parameter estimation and testing
- Present results in a way which demonstrates that they have understood the technical and broader issues of statistical estimation and testing
- Communicate statistical results effectively to non-specialists

SYLLABUS

- Analysis of simple data (single variable distributions)
- Construction of statistical models
- Sampling distributions, some properties of estimators
- Introduction to the method of moments and maximum likelihood
- Statistical inference for data from one population
- Comparisons of data from two populations
- Confidence intervals with samples from one or two populations
- Hypothesis Testing: introduction, terminology and test statistics for typical situations
- Issues related to association between two variables: graphical techniques, correlation and contingency tables
- Linear regression
- Simulation and statistical computing

COURSE RELATIONSHIPS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Level</th>
<th>Title</th>
<th>School</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>F77SA</td>
<td>7</td>
<td>Introduction to Statistical Science A</td>
<td>School of Math and Comp Sci.</td>
<td>Pre-Requisite</td>
</tr>
<tr>
<td>F77SB</td>
<td>7</td>
<td>Introduction to Statistical Science B</td>
<td>School of Math and Comp Sci.</td>
<td>Pre-Requisite</td>
</tr>
<tr>
<td>F78PA</td>
<td>8</td>
<td>Probability and Statistics A</td>
<td>School of Math and Comp Sci.</td>
<td>Linked</td>
</tr>
</tbody>
</table>

LOCATION AND ASSESSMENT METHODS

<table>
<thead>
<tr>
<th>Edi</th>
<th>SBC</th>
<th>Ork</th>
<th>Dub</th>
<th>Malay</th>
<th>IDL</th>
<th>COLL</th>
<th>ALP</th>
<th>OTH</th>
<th>Method</th>
<th>Weight</th>
<th>Exam Mins</th>
<th>Type</th>
<th>Diet</th>
<th>Synoptic Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Examination</td>
<td>80</td>
<td>120</td>
<td>Assessment</td>
<td>Semester 2</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Coursework</td>
<td>20</td>
<td>120</td>
<td>Assessment</td>
<td>Semester 2</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Examination</td>
<td>100</td>
<td>120</td>
<td>Reassessment</td>
<td>Semester 3</td>
<td></td>
</tr>
</tbody>
</table>