**COURSE DETAILS**

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

**DELIVERY LEVEL**

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<th>Undergraduate:</th>
<th>Yes</th>
<th>Postgraduate Taught:</th>
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<th>Postgraduate Research:</th>
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**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>
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<tr>
<th>Course Code</th>
<th>Level</th>
<th>Title</th>
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<td>Introduction to Statistical Science A</td>
<td>School of Math and Comp Sci.</td>
<td>Pre-Requisite</td>
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LOCATION AND ASSESSMENT METHODS

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