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

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
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- 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>
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</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>
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<tr>
<td>F77SB</td>
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<td>Probability and Statistics A</td>
<td>School of Math and Comp Sci.</td>
<td>Linked</td>
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LOCATION AND ASSESSMENT METHODS

| Y | Y | Y | Examination | 80 | 120 | Assessment | Semester 2 |
| Y | Y | Y | Coursework   | 20 | 120 | Assessment | Semester 2 |
| Y | Y | Y | Examination | 100| 120 | Reassessment | Semester 3 |