



UNIVERSITY OF  
BIRMINGHAM

<b>Module Name:</b>	<b>Probability and Statistics</b>
<b>Module Code:</b>	<b>04 21948</b>
<b>Presenter(s):</b>	<b>Dr Milorad Novovic</b>
<b>Credit Rating:</b>	<b>10</b>
<b>Venue:</b>	<b>School of Metallurgy &amp; Materials, University of Birmingham</b>

**Description:**

This module introduces the concepts and practice of probability and statistics, and covers basic probability and probability rules, discrete and continuous probability, probability distributions; statistical data analysis, and reliability analysis. Specific topics considered are: the concept of uncertainty; the rules of probability; the analysis and application of probability density functions (normal distributions, Weibull family of distributions, extreme value of distributions); calculating probability related parameters characterising raw data; the central limit theories and concept of sampling distributions; calculating confidence intervals; the principles of statistical inference in the framework of reliability analysis - in particular the application of Weibull distributions; and the relevance of probability and statistical analysis to real engineering problems.

**Learning Outcomes:**

understanding of statistical concepts;  
ability to explore and organize data for analysis, proficiency in analysing data; ability to select appropriate methodologies for analysis based on properties of particular data sets;  
understanding of the properties of probability and probability distributions; understanding of the probabilistic foundations of inference;  
ability to use formal mathematical argument in the context of probability and statistics;  
be proficient with (statistical) software appropriate for given data analysis;  
apply statistical concepts and skills to solve real engineering problems;  
ability to write reports and present the results of statistical analyses using effective graphics and giving summaries and conclusions using nontechnical language.

**Module Aims:**

This course is aimed at research students with a basic working knowledge of statistics, who are or will be required to carry out some form of statistical analysis in the course of their research. The module aims to develop students understanding of statistics and statistical methodologies, to develop an understanding that a statistical technique can be applied to a variety of contexts and that a variety of statistical techniques can give insight into a given context, and to develop an awareness of the relevance of statistics to engineering and science and to society in general.

**Syllabus:**

Descriptive statistics and numerical measures

Graphical and numerical representation of information; measures of location, dispersion, position, and dependence; exploratory data analysis.

Randomness and theory of probability

The concept of a random event and its probability. Addition law of probability. Mutually exclusive events. Multiplication law of probability and conditional probability. Independent events.

**Assessment:**

Two written assignments. First assignment is based on the use of descriptive statistics, normal distribution and probability plotting as applied to the problem of the effect of microstructure on the impact energy values for a steel weld metal, while the other is a simulation exercise and fitting of probability distribution functions, estimation of confidence intervals and hypothesis testing.