University of the
West of England

MODULE SPECIFICATION

Code: USSJ7J-20-1 **Title:** Scientific Inquiry **Version:** 6

Level: 1 **UWE credit rating:** 20 **ECTS credit rating:** 10

Module type: Standard

Owning Faculty: Health and Life Sciences **Department:** Applied Sciences

Faculty Committee approval: Quality and Standards Committee **Date:** August 2011

Approved for Delivery by: University Centre Yeovil (UCY)

Valid from: September 2011 **Discontinued from:**

Pre-requisites:
None

Co-requisites:
None

Entry Requirements:
N/A

Excluded Combinations:
None

Learning Outcomes:

The student will be able to:

• assess their individual capabilities in analysing and presenting scientific data, and identify personal weaknesses. (A & B)
• demonstrate an appreciation of the importance for quantification, together with an estimation of associated uncertainties, when presenting scientific information. (A & B)
• use appropriate software to display and analyse scientific information: drawing graphs, using formulae, functions and appropriate formatting. (B)
• address scientific problems using appropriate mathematical and statistical skills. (A & B)
• use electronic resources that will also support their problem solving skills throughout their undergraduate course. (A & B)
• apply simple statistical methods - including Bayesian Statistics - to evaluate evidence in forensic science (A & B)

(Location of assessment identified by component letters in parentheses)

Syllabus Outline:

Entry Level Skills

These are mathematical skills that a student with a grade C at GCSE Mathematics (or equivalent) should possess. These will not be taught explicitly, but students will be helped to remedy any deficiencies that they may have in this area:
Use of the standard form. Fractions and percentages. Powers and roots. Interpretation of graphs. Triangles: angles, Pythagoras, trig functions. Basic algebra: use of brackets, factorising. Substitution

into formulae: areas and volumes. Solving simple equations.

Core Syllabus
Scientific Investigation:
Testing of hypotheses. Making decisions. Use of standards: internal and external calibration.
Introduction to hypothesis testing: t-test, F-test, Chi-squared test.
Modelling scientific systems:
Relationships in science: equations, formulae. Theoretical modelling: analytical, graphical.
Linear relationships and regression
Exponential and logarithmic functions. Equations of growth and decay
Variability in science - system variations, experimental uncertainty:
Probability, frequency. Use of normal distribution, Z-scores, confidence interval. Combining probabilities. Binomial and Poisson distributions.
Forensic Statistics:
Bayesian statistics, likelihood ratio and probative value. Modelling in forensic casework
Presenting and analysing scientific data:
Use of IT: recording, presenting, analysing and interpreting data. Use of EXCEL to display and analyse scientific information: formatting, graphs, use of formulae and functions, absolute and relative addressing. Descriptive statistics. Differentiation and integration in science using EXCEL.

Teaching and Learning Methods:

The learning in the module is carefully structured in units from the core text, which has itself evolved out of the learning materials developed specifically for this module. These units include explicit performance attainment targets identified by indicative questions and self-assessment tests. The resources also include direct tutorial material, and references to published material, software, internet and intranet resources. Where possible, and appropriate, the mathematical and statistical topics are presented and tested in the context of scientific problems. Specific use is made of computer workshop exercises to provide the broad context of scientific inquiry.

The learning processes of the students are based on:

- A clear knowledge of expected performance through indicative questions associated with the tutorial material.
- Weekly lectures/tutorials which establish the core direction of the module (syllabus content) and provide navigation for the students through the learning resource material.
- The testing of progress through self-assessment questions linked to portfolio assessment.
- Extensive tutorial support via Blackboard, including video learning.
- Drop-in' and individual support to address specific problems.

All students sit an initial diagnostic test that concentrates mainly on Entry Level Skills. The itemised results of this test will be fed back to the students so that they can identify any deficiencies in this area. Each student will be expected to work through tutorial material and self-assessment questions appropriate to any Entry Level deficiencies.

Support for student learning in all topic areas will be given through weekly lectures/tutorials (1 or 2 hours, depending on progress) which will be integrated with the self-assessment tests to ensure focussed help can be given to those students who need help in the particular areas. Each week, the students will develop IT and data analysis skills through a 1 hour computer-based workshop.

The Portfolio assessments will include the requirement to attempt on-line self-assessment tests, together with specific IT and paper-based assignments.

Reading Strategy:

All students will be encouraged to make full use of the print and electronic resources available to them through membership of the University. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways. The University Library's web

pages provide access to subject relevant resources and services, and to the library catalogue. Many resources can be accessed remotely. Students will be presented with opportunities within the curriculum to develop their information retrieval and evaluation skills in order to identify such resources effectively.

Any **essential reading** will be indicated clearly, along with the method for accessing it, e.g. students may be expected to purchase a set text, be given or sold a print study pack or be referred to texts that are available electronically, etc. This guidance will be available either in the module handbook, via the module information on Blackboard or through any other vehicle deemed appropriate by the module/programme leaders.

If **further reading** is expected, this will be indicated clearly. If specific texts are listed, a clear indication will be given regarding how to access them and, if appropriate, students will be given guidance on how to identify relevant sources for themselves, e.g. through use of bibliographical databases.

Indicative Reading List:

The essential core text for module developed specifically by the module team is the current version of:

Currell G and Dowman A A, Mathematics and Statistics for Science, John Wiley & Son.

Students will use a dedicated website associated with this text, which gives access to additional learning resources including video feedback.

It is expected that students will use the core text, together with lectures/tutorials to address specific learning outcomes. They will work through questions from the text, supported by feedback from the associated website. The students will confirm their progress using regular self-assessment questions available through Blackboard.

In addition to the specific module resource, it is expected that the students will make full use of the print and electronic resources available to them through membership of the University. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways.

Updated guidance to the students will be available through the module handbook, via the module information on Blackboard, and through any other vehicle deemed appropriate by the module/programme leaders.

Students can also make reference to a range of texts for additional support. The following brief list indicates the type/level of material that would be appropriate (current versions of):

Croft A and Davison R, Foundation Maths, Longman.
Cann A, Maths from Scratch for Biologists, John Wiley.
Moore P and Cobby J, Introductory Statistics for Environmentalists, Prentice Hall.
Monk P, Basic Maths for Chemists: A Chemist's Toolkit, Oxford University Press.
Adam C, Essential Mathematics and Statistics for Forensic Science, Wiley.

Assessment:

Weighting between components A and B (standard modules only) A: 40% B: 60%

FIRST ATTEMPT

First Assessment Opportunity

Component A *(controlled)*	**Element Wt (Ratio)**
Description of each element	*(within Component)*

EX1	Short Test	***Assessment Period 1***		1
EX2	Short Test	***Assessment Period 2***	***Final Assessment***	1

Component B **Element Wt (Ratio)**
Description of each element *(within Component)*

CW1	Portfolio	1
CW2	Case Study	1

Second Assessment Opportunity (Resit) further attendance at taught classes is not required

Component A *(controlled)* **Element Wt (Ratio)**
Description of each element *(within Component)*

EX3	Test equivalent to EX1 + EX2	***Assessment Period 3***	***Final Assessment***	1

Component B **Element Wt (Ratio)**
Description of each element *(within Component)*

CW3	Written numerical assignment equivalent to PORT & CS above	1

<u>EXCEPTIONAL</u> SECOND ATTEMPT Attendance at taught classes is not required.

Specification confirmed by ……Date ……
(Associate Dean/Programme Director)