Module Definition Form (MDF)

Module code: MOD006606	**Version:** 9 **Date Amended:** 10/Jul/2025

1. Module Title
Applied Science for Forensic Investigators

2a. Module Leader
Agatha Grela

2b. School
School of Life Sciences

2c. Faculty
Faculty of Science and Engineering

3a. Level
4

3b. Module Type
Standard (fine graded)

4a. Credits
30

4b. Study Hours
300

5. Restrictions			
Type	**Module Code**	**Module Name**	**Condition**
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	BSc (Hons) Forensic Science BSc (Hons) Forensic Science (Extended) BSc (Hons) Forensic Science (Sandwich) BSc (Hons) Crime and Investigative Studies BSc (Hons) Crime and Investigative Studies (Extended) BSc (Hons) Crime and Investigative Studies (Sandwich)		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

All forensic investigators require a strong grounding in science and in this module, you will be introduced to the basic scientific principles needed for the rest of your course and beyond. You will be introduced to the broad scientific disciplines within forensic science, including chemistry, biology, physics and mathematics. You will develop the analytical skills necessary to interpret forensic evidence and be able to apply scientific principles to forensic case studies. Your introduction to chemistry will include a discussion of the periodic table and properties of elements, atomic structure and chemical bonding, as well as aspects such as thermodynamics, redox reactions, pH and buffering.

We will also look at the basic physical principles underlying various forms of instrumentation, as well as blood spatter analysis, collisions and ballistics. Throughout the module, you will also develop your mathematical and data handling skills, and be introduced to the principles of statistics. You will learn through a series of lectures and tutorials where you will apply your knowledge to realworld forensic situations and contexts. A significant practical element is included, so that you gain competence and confidence in performing basic laboratory techniques such as the use of micropipettes, microscopy and a variety of analytical processes. By completing practical sessions, you will also develop your numeracy, problem solving and critical thinking skills. Interactive lectures will also help to develop your communication skills and teamwork. Your learning here will benefit you in career pathways such as a forensic scientist, analytical science, scientific support, crime scene examination and police officers.

6b. Outline Content

Applied physical sciences

- Health and safety and assessment of risk when working in a lab
- Introduction to organic, inorganic and physical chemistry
- Atomic structure and chemical bonding
- Moles, molarity and dilutions
- Chemical structures, organic compounds and functional groups
- Thermodynamics
- Redox reactions
- pH and buffering
- The electromagnetic spectrum and its applications
- Physical principles of instrumentation – chromatography, spectrophotometry, spectroscopy and others
- Physical principles of ballistics analysis, collisions and blood patterns

Quantitative skills

- Importance of quantitative skills in biological/analytical sciences: understanding processes, asking and answering questions, case studies
- Scientific method and experimental design and the importance of a hypothesis
- Understanding data: variables (dependent, independent, interdependent, confounding)
- Units of measurement; including size and scale; scientific and standard notation; converting between units, prefixes
- Use of exponentials, logarithms
- Using formulae and equations as models
- Using graphs as models – exploring and communicating data, presentation of graphs following scientific conventions; regression and correlation
- Understanding sampling: probability, populations, samples and sample error, related and unrelated designs; probability distributions
- Descriptive statistics and estimation; mean, median, mode, range, interquartile range, variance and standard deviation, frequency distributions, standardization and confidence intervals.
- Introduction to statistical tests – significance, null hypothesis; choosing the appropriate test; use of SPSS
- Use of spreadsheets: principles of data organisation and presentation using spreadsheets, programmes and programming.
- Basic data skills, data transfer technology, data organisation, data storage, data appraisal and data presentation and reporting.
- Introduction to coding: writing and executing code to organise, analyse and present data

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources

Specialist laboratories and practical equipment

7. Learning Outcomes (threshold standards)		
No.	**Type**	**On successful completion of this module the student will be expected to be able to:**
1	Knowledge and Understanding	Recall fundamental principles of chemistry, physics and instrumentation, appropriate for forensic and investigative sciences
2	Knowledge and Understanding	Apply the rules of mathematical calculations within the topics of arithmetic, algebra, scientific notation and molarity
3	Intellectual, practical, affective and transferrable skills	Present data graphically using IT applications.
4	Intellectual, practical, affective and transferrable skills	Carry out basic practical investigations in respect of a well-defined problem, and evaluate the data obtained using defined techniques.
5	Intellectual, practical, affective and transferrable skills	Show how data has been obtained and conclusions formed, with external guidance.
6	Intellectual, practical, affective and transferrable skills	Use and perform probability calculations and statistical tests of significance.

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2025/6	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	44	1-6	11 x 4 hours lectures/active learning
Other teacher managed learning	28	1-6	6 x 2 hour practicals + 11 x 1 hour workshops + 3 hours assessment literacy/revision + 2 hours test
Student managed learning	228	1-6	Engagement with online activities, preparation for lectures, practicals, directed reading and completion of assessments
TOTAL:	300		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Coursework	3,6	40 (%)	Fine Grade	30 (%)
Coursework 1000 words (2x workbooks 500 word equivalent)					

Assessment components for Element 010				
Component No.	**Assessment Title**	**Submission Method**	**Weighting (%)**	**Components needed for Mark Calculation?**
010/1	Workbook 1	Canvas	50 (%)	All
010/2	Workbook 2	Canvas	50 (%)	

Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Coursework	4,5	40 (%)	Fine Grade	30 (%)
Lab report 1000 word equivalent					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
012	Coursework	1,2	20 (%)	Fine Grade	30 (%)
In-class test (2000 words-equivalent)					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]