Short Form Unit Details

Unit Title	Fundamentals of Measurement and Instrumentation
Level	4
Reference No. *(showing level)*	ASC_4_412.1
Credit Value	20
Student Study Hours	Contact hours: 72 Student-managed learning hours: 72
Pre-requisite learning	None
Co-requisites	None
Excluded combinations	None
Unit co-ordinator	Clive Steele
School/Division	Applied Sciences/Human Sciences
Short Description	This module centres on the basic skills that all scientists need to be conversant with. It comprises a series of laboratory workshops which give practical experience in the areas of physic. It also introduces one of the central principles of forensic science, that of quantitative measurements, their interpretation and manipulation. The theoretical component of the unit is based around understanding the measurement process, the significance of the measurement units and the mathematical manipulation of the data obtained to produce results of use to the analyst. The relevant mathematical skills needed to achieve this are provided within the module. Students will also be introduced to the main types of electronic measurement transducer and the electrical measurement principles needed to understand the measurement function. On completion of the module, students will have acquired knowledge in the application of basic mathematical concepts in the treatment and interpretation of measured data, covering areas such as geometry and special measurements, algebraic formulation and manipulation, graphical analysis, statistics and calculus
Aims	1. To provide an environment which encourages an enquiring, investigative approach and which develops competence and confidence 2. To consolidate knowledge of safe laboratory practice and to develop competence in specific basic laboratory techniques 3. To enable the correct use of analytical methods and procedures specific to the subject area material 4. To introduce students to key measurement principles and the concepts of computer data acquisition of some common transducer types. 5. To address key mathematical concepts and their application in

	the measurement field 6. To appreciate in depth the meaning of and differences between accuracy, precision and resolution and their importance in the measurement process 7. To apply the above to analytical instrumentation
Learning Outcomes	On successful completion of this module, students will be able to: Knowledge and Understanding • Demonstrate a fundamental understanding of the relationship between scientific measurement and mathematical manipulation, both theoretically and experimentally • Recognise units of measurement and their multipliers, starting off with the fundamental units of mass, length, temperature and time and extending to cover force, velocity, acceleration through to energy and power, concentration, electrical quantities etc. Intellectual Skills • Define real equations and demonstrate the use of mathematical manipulation to solve for real variables Practical Skills • Routinely apply health and safety precautions in the laboratory • Demonstrate accurate analytical techniques in chemistry, biology and physics Transferable Skills • Understand precision, accuracy and resolution and their statistical measures • Work effectively, both individually and in a group, to follow a laboratory schedule • Understand chromatographic and spectrographic forms of analysis • Understand how principles of measurement apply to forensic analytical instrumentation
Employability	This module will develop the practical and mathematical skills required for working in any scientific environment. The module also gives an overview of the main types of analytical instrumentation common to forensic scientists
Teaching and learning pattern	This module will be taught by a combination of lectures, seminars, group tutorials and laboratory workshops. The physics and mathematics components will be developed through a combination of lectures and practical workshops. The introduction to analytical instrumentation will be by lectures and demonstration.
Indicative content	The module covers: • Safety in the laboratory • Elementary analytical procedures and reporting of results • Units of measurement • Dimensional analysis • Understanding and manipulating equations • Measurement principles, including scientific units and notations

	• Calculations involving space, time, energy and power • Spectrometric and chromatographic forms of chemical analysis • Electrical measurements and transducers • Statistical analysis of measurements • Data manipulation
Assessment *Elements & weightings*	• Laboratory reports and calculations • 100% coursework
Indicative Sources *(Reading lists)*	Core Materials ➢ Langford *et* al (2010) **Practical Skills in Forensic Science.** *2nd Ed.* Pearson Prentice Hall ➢ Northedge *et al* (1997) **The Sciences Good Study Guide.** Open University Press Optional Materials ➢ Barnard C, Gilbert F & McGregor P (1993) **Asking questions in biology: Design, analysis and presentation in practical work.** Longman Scientific and Technical ➢ Bradbury S. (1989) **Introduction to the optical microscope** *2nd Ed.* Oxford University Press ➢ Shortland, M & Gregory, J. (1991) **Communicating Science: A Handbook.** Longman Scientific and Technical