

Forensic science is the application of scientific principles and methods to investigate crimes and examine evidence.

Modules in forensic science involve case studies, evidence interpretation, fieldwork and laboratory training cover all aspects of investigating criminal offences. These include crime scene processing, forensic archaeology, drugs, toxicology, DNA profiling, body fluids, entomology, fibres, fire investigation and ballistics.

Level 4 modules are introductory in nature, though prior study of biology/chemistry is still required. Their study offers a broad understanding of the major branches of biology and biochemistry. Students will develop key laboratory skills and learn to give detailed scientific explanations for the theory and practices used in modern forensic science.

Level 5 modules introduce specialist topics in forensic science. These include DNA and human identification, advanced crime-scene analysis, counterfeits and forgeries and the application of analytical techniques to the analysis of trace evidence such as fire, fibres, glass and fingerprints.

Level 6 modules are more advanced and consider the analysis of body fluids, advanced DNA analysis, forensic archaeology, examination of crime scene exhibits, drugs, toxicology, fire investigation and ballistics.

In addition to top-class laboratories, students will get to make use of KU's own designated crime scene house. This is a real semi-detached house located on-site. Its five rooms contain various types of mock crime scenes, including burglary, arson, assault and sexual crime.

Please note that if you wish to take more than one LS* module from the Forensic Science modules listed below, then it must be from the same level to ensure that there are no timetable clashes.

Updated April 2025/PJW

Entry requirements: GPA of 2.75 or above (out of 4.0) or equivalent.

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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Pre-requisites:

- **Level 4:** there are no formal pre-requisites though prior study is useful
- **Level 5:** these modules (typically equivalent to junior-level in the US system, for instance) build upon level 4 courses and as such require prior evidence of successful completion of introductory forensic science. Any further module-specific pre-requisites are clearly outlined in each module summary below.
- **Level 6:** these modules are much more specialised and require **substantial** prior study of forensic science. Any further module-specific pre-requisites are clearly outlined in each module summary below.

Taught at: Penrhyn Road campus

KEY TO MODULE DESCRIPTORS
SUITABILITY OF MODULE FOR STUDENTS VISITING KU ON STUDY OPTION _____
1: Indicates module is suitable for students visiting KU on Study Option 1 (Whole Year)
2: Indicates module is suitable for students visiting KU on Study Option 2 (Autumn)
3: Indicates module is suitable for students visiting KU on Study Option 3 (Spring)

Notes:

1. *All modules are at undergraduate level.*
2. *Students enrolled on Study Option 1 are required to study the entire module.*
3. *whilst the University makes every effort to ensure that this information is correct at the time of updating (April 2025), it cannot accept responsibility for omissions or subsequent changes. Module availability and content may be subject to change, as part of the University's policy of continuous improvement and development.*
4. *Details of assessment for students enrolled on either Study Option 2 or 3 where provided are **indicative only** and may also be subject to change as part of the above policy.*

Study Option 1 = Whole Year
 Study Option 2 = Autumn
 Study Option 3 = Spring

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Modules:

MODULE CODE	LEVEL	MODULE TITLE	SUITABILITY KEY
LS4003	4	Scientific and Laboratory Skills	1
LS4005	4	Introduction to Forensic Science	1, 2, 3
LS4012	4	Analytical Techniques in Forensic Science	1, 2
LS4014	4	Genes to Tissues	1, 2
LS5011	5	Counterfeits, Fakes and Forgeries	1
LS5033	5	Analytical Techniques for Molecular Science	1
CH5008	5	Crime Scene, Evidence and Law	1
LS6012	6	Forensic Archaeology	1, 2
LS6013	6	Biological Evidence - Advanced Techniques	1, 2

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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Module Code: LS4005
Module Title: Introduction to Forensic Science
Credits: <ul style="list-style-type: none"> • Full Year: 8 (US) 15 (ECTS) • Single Semester: 4 (US) 7.5 (ECTS)
Level: 4
Prerequisites: study of basic biology
Suitability: <ul style="list-style-type: none"> • Study Abroad/International Exchange students for Study Options 1, 2 and 3 • Not open to Erasmus students, as level 4.
Content: <p>This core module introduces Level 4 students to the multifaceted world of forensic science, providing an overview of key disciplines and their roles in criminal investigations. The module covers various forensic specialities, including DNA analysis, toxicology, fire investigations, skeletal anatomy, postmortem changes, and wildlife forensics.</p> <p>➤ Autumn Semester topics: Forensic Fundamentals and Skeletal Anatomy and Post-Mortem Interval</p> <p>❖ Forensic Fundamentals</p> <ul style="list-style-type: none"> • Criminal Justice System and the Crime Scene • Introduction to Quality <p>➤ Skeletal Anatomy and Post-Mortem Interval</p> <ul style="list-style-type: none"> • Introduction to the Human Skeleton • Skeletal Anatomy • Autopsy • PM Change • DNA Profiling <p>➤ Spring Semester topics: Toxicology and Illicit Drug Confirmation; Crime Scene and Trace Evidence</p> <p>❖ Toxicology and Illicit Drug Confirmation</p> <ul style="list-style-type: none"> • Toxicology • Doping in Sport

Study Option 1 = Whole Year
 Study Option 2 = Autumn
 Study Option 3 = Spring

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❖ **Crime Scene and Trace Evidence**

- Digital Forensics
- Forensic Entomology
- Fire Investigation
- Crime Scene - Day in the life of a SOCO
- Wildlife Forensics
- Crime Scene Workshop

Teaching: lectures, crime scene practicals, human anatomy practicals and workshops

Assessment:

➤ Study Option 1:

- MCQ test 1 (30%)
- Skeletal Anatomy Practical Test (30%)
- MCQ test 2 (40%)

➤ Study Option 2:

- MCQ test 1 (50%)
- Skeletal Anatomy Practical Test (50%)

➤ Study Option 3:

- MCQ test 2 (100%)

Note: methods of assessment are indicative only

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Module Code: LS4012

Module Title: Analytical Techniques in Forensic Science

Credits:

- Full Year: 8 (US) 15 (ECTS)
- Single Semester: 4 (US) 7.5 (ECTS)

Level: 4

Prerequisites: study of basic chemistry

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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Suitability:

- Study Options 1 and 2
- Not open to Erasmus students, as level 4

Content:

This module focuses on the analytical techniques used in forensic science for evidence such as gunshot residue, drugs, alcohol, trace evidence and biological evidence. This module also covers basic statistics for forensic scientists and the effect of cognitive bias in forensics.

➤ **Autumn Semester topics:**

- Introduction to Ballistics & Gunshot Residue
- Illicit drug confirmation
- Detection of poisons
- Physical evidence
- Techniques of trace analysis
- Cognitive bias
- Introduction to statistics for forensic science

➤ **Spring Semester topics:**

- Techniques in biological evidence
- Mass Spectrometry analysis of drugs and alcohol
- Cold case
- Introduction to quality control
- Comparison microscope case study
- Introduction to Raman spectroscopy
- Crime scene case study
- Novel techniques in forensic science

Teaching: weekly lectures and practical sessions

Assessment:

➤ **Study Option 1:**

- In Class MCQ test 1 – Autumn (35%)
- Practical test (30%)
- In Class MCQ test 2 – Autumn (35%)

➤ **Study Option 2:**

- In Class MCQ test 1

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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Module Code: LS4003

Module Title: Scientific and Laboratory Skills

Credits:

- Full Year: 8 (US) 15 (ECTS)

Level: 4

Prerequisites: None

Suitability:

- Study Option 1 only
- Not open to Erasmus students, as level 4

Content:

This module provides a firm foundation in general scientific and laboratory skills. Students are introduced to the nature of studying in higher education and the key skills they will need in developing their professional development portfolio in the biosciences. Scientific analytical and lab/practical skills are developed, together with essential mathematics and statistical skills for life scientists. A significant component of the module consists of the development of basic research skills such as practical skills in the laboratory, the principles of experimental design and the statistical analysis of data.

➤ **Generic study skills:**

- Time management and planning – use of university information systems; planning and time management of work; planning revision.
- Independent study – Learning Resource Centre (LRC) resources, research databases, and independent reading. Use of reference sources.
- Teamworking, communication, responding to feedback and reflective skills.
- Awareness of employment opportunities, career information sources and events, and identification of relevant key skills developed during the year.
- Exam preparation, revision and technique.

➤ **Maths, Computing and Data Presentation:**

- Foundation mathematics and information technology for the biosciences; accuracy; standard powers of 10; scientific notation.
- Probability, concentrations and dilutions, rates of reaction
- Mathematical models in the biosciences; exponential growth/decay and transformation of

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Study Option 3 = Spring

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- data, including logarithms
 - Use of spreadsheets for graph plotting and interpretation, model simulation
 - Scientific communication
 - Referencing, plagiarism and collusion Identifying appropriate research literature sources,
 - use of information technology and the internet.
- **Experimental design, basic statistics and SPSS:**
- Asking questions and developing hypotheses.
 - Understand the design of basic experiments (e.g. variation, sampling and the need for replication; randomisation and blocking).
 - Introduction to statistical software.
 - Statistical tests: types of data and the normal distribution, descriptive statistics, t-tests, correlation.
- **Laboratory skills:**
- Introduction to COSHH regulations and good laboratory practice.
 - Molar calculations, dilutions and conversion of units
 - Precision and accuracy in the laboratory.
 - Colorimetry – Beer-Lambert’s Law.
 - Safe handling of microorganisms.
 - Basic separation techniques.
 - Enzyme-catalysed reaction rates.

Teaching: lectures, workshops/seminars, tutorials and practicals

Assessment:

Study Option 1:

- End of year laboratory practical exam (50%)
- Professional development portfolio (20%)
- Portfolio of on-line tests which contains 6 math/statistics test, each contributing 5% (30%)

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Module Code: LS4014

Module Title: Genes to Tissues

Credits:

- Full Year: 8 (US) 15 (ECTS)
- Single Semester: 4 (US) 7.5 (ECTS)

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

Level: 4
Prerequisites: basic study of biology
Suitability:
<ul style="list-style-type: none"> • Study Options 1 and 2
Content:
<p>This module introduces basic cell biology of prokaryotes and eukaryotes, genetics, germ layers, and tissue types in the human body, as well as various microorganisms.</p> <p>Topics covered include:</p> <ul style="list-style-type: none"> • basic preparative techniques for examination of biological specimens by light microscopy and correct use of light microscopes • an introduction to the origins of life, cell structure and function of organelles in prokaryotic and eukaryotic cells • an introduction to genes, genomes, genetic variation, and chromosomes • a review of the genetic processes in cells including DNA structure, replication, transcription and translation • an introduction to patterns of inheritance, Mendelian genetics, population and evolutionary genetics, biodiversity and basic calculations in inheritance and population genetics • an introduction to genetic recombination and mapping • an introduction to cytogenetics • an introduction to modern molecular techniques including cloning, recombinant DNA technology and DNA analysis • an introduction to early human development • structural and functional characteristics of epithelium, connective tissues, muscle and nervous tissues and their subtypes • an introduction to viruses, bacteria
Teaching: lectures, workshops/seminars, tutorials and practicals
Assessment:
<p>➤ Study Option 1:</p> <ul style="list-style-type: none"> • Online test – 1 hr 45 mins (35%) • Portfolio of online tests (30%) • 2000-word workbook (35%) <p>➤ Study Option 2:</p>

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

- Part of study option 1 assessment

Note: methods of assessment and weighting are indicative only

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LEVEL 5 – INTERMEDIATE

Module Code: LS5011
Module Title: Counterfeits, Fakes and Forgeries
Full Year: 8 (US) 15 (ECTS)
Level: 5
Prerequisites: introductory university-level study of forensic science
Suitability: Study Option 1
<p>Content:</p> <p>This module focuses on the investigation of forgery and fraud and the forensic science techniques that are used to combat this type of crime. The role of a Questioned Document Examiner (QDE) is one the key elements of this module and the lecture content involves investigating the analysis of signatures, handwriting, indentations, printers and ink. By analysing these parameters QDE are able to assist police investigations into crimes such as identity fraud, kidnapping and ransom, robbery and financial fraud.</p> <p>The module also contains lectures on digital crime, art fraud, counterfeit goods, arson and fire fraud and counterfeit drugs and medications. The goal of these lectures is to understand how the differing aspects of analytical chemistry and forensic science contribute to detecting fraud.</p> <p>➤ Autumn Semester:</p> <ul style="list-style-type: none"> • Fibres and fraud • Handwriting Analysis and signatures • Raman Spectroscopy • Modern Day Fraud • Indentations • Writing Implements/Ink Analysis

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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➤ **Spring Semester:**

- Counterfeit Documents and Currency
- Arts and Antiques
- Counterfeit Goods
- Identity Fraud
- Counterfeit Medicines
- Cyber Security and Cybercrime
- Fire and Fraud

Teaching: Lectures, tutorials, workshops and practical sessions/demonstrations

Assessment:

➤ **Study Option 1:**

- In Class test 1 (25%)
- In Class test 2 (25%)
- Extended essay (50%)

Note: methods of assessment are indicative only

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Module Code: LS5033

Module Title: Analytical Techniques for Molecular Science

Credits:

- Full Year: 8 (US) 15 (ECTS)

Level: 5

Prerequisites: study of introductory chemistry at university level

Suitability: Study Options 1 and 2

Content:

The module immerses students into the world of analytical science applied to problem solving in biochemistry, clinical chemistry, forensic analysis, and pharmaceutical science applications. It develops critical thinking in being able to identify the best approaches used to prepare samples, collect results, and analyse data, whether it is quantitative or qualitative in various scenarios. Students will build their knowledge, practical skills and

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

interpretation skills whilst implementing the analytical process model using scenario-based learning.

Topics:

- Introduction to analytical methodology, the analytical process model and sample preparation in analytical science.
- Theory of chromatography: Partition coefficients, retention time, capacity factor, selectivity factor, column efficiency and resolution.
- Gas Chromatography (GLC): sample injection, ovens, detectors, GC Columns, and stationary phases.
- High Performance Liquid Chromatography (HPLC): pumps, columns, detectors.
- Partition Chromatography, normal and reverse phase. Ion-Pair chromatography and chiral stationary phases.
- Adsorption Chromatography (LSC) & Thin Layer Chromatography (TLC).
- Introduction to hyphenated Techniques (GCMS, LCMS).
- Optimisation of separation techniques in relation to method development as employed in various industries.
- The relevance of statistics, quality control and quality assurance systems in analytical science
- Introduction to electromagnetic radiation and its interaction with matter, including absorption, emission, and fluorescence.
- Principles and practice of atomic and molecular spectrometry including UV Visible and IR.
- Principles and practice of electrophoresis, including gel electrophoresis, iso-electric focusing, immuno-electrophoresis and capillary electrophoresis.
- Mass Spectrometry
- Interpretation of spectra UV-VIS, NMR, IR, Mass Spectroscopy
- Applications of all techniques above to analytical biochemistry, clinical chemistry, forensic science, and the pharmaceutical sciences.
- Develop practical analytical skills, and problem-solving skills to relate the laboratory work to theoretical aspects of the module

Teaching: weekly lectures, workshops and practicals

Assessment:

➤ **Study Option 1:**

- Open book online problem-solving assignment (max. 3500 words) (55%)
- MCQ in-class - 1.5 hours (25%)
- One in class test of 1 hour (10%) and one online excel file submission (10%)

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Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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Module Code: CH5008
Module Title: Crime Scene, Evidence and Law
Credits: Full Year: 8 (US) 15 (ECTS)
Level: 5
Prerequisites: prior university-level study of forensic science
Suitability: study option 1
<p>Content: This module will cover the various roles involved within the professional field of forensic science, ranging from those at the crime scene all the way to the expert witness. Students will gain practical experience of observation and recording, evidence collection, preservation, documentation, and chain of custody through a series of simulated crime scenes. The impact that the crime scene has on the integrity of evidence will be explored through real forensic case studies. Students will use the 'Case Assessment and Interpretation' (CAI) model in relation to prosecution and defence scenarios and this skill will be developed through mock trials with law students. The module will also introduce students to those statistical models used by forensic scientists in the court of law as well as gain an understanding of the importance of presenting to a lay audience such as a jury. Students' awareness of future employment opportunities will be enhanced through the exposure to regulations and standard operating procedures utilised by Forensic, Law and UK Criminal Justice Systems, as well as working with law students.</p> <p>Topics:</p> <ul style="list-style-type: none"> • Role of the forensic personnel at a crime scene and a range of forensic specialists and expert witnesses • The observation, collection, recording and preservation of evidence from a range of crime scenes. • To determine the most appropriate techniques to use to analyse evidence collected from a crime scene • The UK Criminal Justice System, case management, particularly relating to physical evidence and expert witnesses • The interpretation of evidence using CAI model and relevant statistics • Expert witness report and testimony – The successful completion of a case from • assessment and interpretation of evidence, the preparation of a witness statement and oral testimony in court.
Teaching: weekly lectures, workshops and practical sessions in the Crime Scene House
<p>Assessment:</p> <p>➤ Study Option 1:</p> <ul style="list-style-type: none"> • In-class test – 1 hour (40%)

Study Option 1 = Whole Year
 Study Option 2 = Autumn
 Study Option 3 = Spring

- Lay summary coursework (1,800 words or 10-minute video) (30%)
- Individual cross-examination of expert statement (30%)

Note: methods of assessment and weighting are indicative only

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Module Code: LS6012

Module Title: Forensic Archaeology

Credits:

- Full Year: 8 (US) 15 (ECTS)
- Single Semester: 4 (US) 7.5 (ECTS)

Level: 5

Prerequisites: university-level study of forensic science

Suitability: study options 1 or 2

Content:

Forensic Archaeology is the area of forensic science which concerns the location, recovery, recording, and analysis of human remains, burials and all evidence associated with these bodies and burials.

A large part of forensic archaeology concerns searching the environment for missing remains, or hidden graves, with a focus on outdoor crime scenes. However this module will also cover the range of analytical and laboratory approaches associated with archaeology, such as the scientific dating of bones and artefacts. Specialist techniques and knowledge commonly associated with the search and recovery of buried remains, such as geophysics, aerial images, and environmental evidence will also be examined.

A broad range of real-world examples and case studies, including from the UK, international contexts, current investigations, ancient skeletons, single murder victims and mass graves containing victims of war and mass fatalities will be discussed as part of the module.

➤ **Autumn Topics:**

- Missing person and search techniques
- Recovery of a single victim burial
- Recording and documenting the grave
- Aerial investigation
- Mass grave investigation
- Scientific dating and time since death

Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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<ul style="list-style-type: none"> • Radiocarboning dating • Stable isotope analysis
<p>Teaching: weekly lectures and workshops</p>
<p>Assessment</p> <p>➤ Study Option 1:</p> <ul style="list-style-type: none"> • Garden search practical report (25%) • 2000-word essay (25%) • Written exam (50%) <p>➤ Study Option 2:</p> <ul style="list-style-type: none"> • Garden search practical report (50%) • 2000-word essay (50%) <p><i>Note: methods of assessment and weighting are indicative only</i></p> <p>Last updated: 24/04/25 PJW</p>

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<p>Module Code: LS6013</p>
<p>Module Title: Biological Evidence - Advanced Techniques</p>
<p>Credits:</p> <ul style="list-style-type: none"> • Full Year: 8 (US) 15 (ECTS) • Single Semester: 4 (US) 7.5 (ECTS)
<p>Level: 6</p>
<p>Prerequisites: university-level study of forensic science</p>
<p>Suitability: Study Options 1 or 2</p>
<p>Content:</p> <p>The module focuses on topics such as Blood Pattern Analysis (BPA), the examination and analysis of biological trace evidence including presumptive testing, DNA profiling and expert witnessing (report and giving evidence).</p> <p>Topics covered may include:</p>

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Study Option 2 = Autumn
Study Option 3 = Spring

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- Use of biological trace evidence in the investigation of violent crime and sexual offences
- Case pre-assessment
- Recovery of biological evidence including body fluids from the crime scene
- Searching recovered items for blood, semen and saliva and other trace evidence (including hairs, fibres and particulates)
- Body fluid analysis - presumptive/confirmatory testing for blood, semen and saliva
- Bloodstain Pattern Analysis - Objective Criteria and Bloodstain Pattern Classification
- Effective recording of scientific findings
- Forensic DNA analysis
- Evaluation of forensic science evidence
- Presentation of forensic evidence in the form of written communication
- The use of relevant statistical models in the assessment and communication of evidence

➤ **Autumn Semester:**

- Forensic Code of Conduct and Advanced Expert Witness Skills
- Introduction To Blood Pattern Analysis
- Introduction to DNA Analysis
- Cognitive bias in forensic science

Teaching: lectures, practical sessions and simulated case scenarios

Assessment:

➤ **Study Option 1:**

- In-class test (20%)
- Case Study Report (40%)
- Closed Book Written Exam (40%)

➤ **Study Option 2:**

- In-class test

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Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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Study Option 1 = Whole Year
Study Option 2 = Autumn
Study Option 3 = Spring

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