

## Programme Specification

### Section 1: Basic Data

<b>Awarding institution/body</b>	University of the West of England
<b>Teaching institution</b>	University of the West of England
<b>Faculty responsible for programme</b>	Faculty of Health and Life Sciences
<b>Programme accredited by</b>	The Forensic Science Society Programme also "Recognised" by the Royal Society of Chemistry
<b>Highest award title</b>	BSc(Hons) Forensic Chemistry
<b>Default award title</b>	
<b>Interim award title</b>	Cert. HE in Forensic Chemistry Dip. HE in Forensic Chemistry
<b>Modular Scheme title (if different)</b>	
<b>UCAS code (or other coding system if relevant)</b>	F413
<b>Relevant QAA subject benchmarking group(s)</b>	Chemistry, Biosciences
<b>On-going/valid until* (*delete as appropriate/insert end date)</b>	
<b>Valid from (insert date if appropriate)</b>	September 2010
<b>Authorised by:</b> SLS Quality and Standards	<b>Date:</b> September 2010
<b>Version Code:</b> 4	

## **Section 2: Educational aims of the programme**

Traditionally, recruitment by forensic science providers has had to rely on either chemistry or biology graduates. However these graduates have not had a working knowledge of forensic science. The BSc(Hons) programme in Forensic Chemistry is part of a suite of programmes at UWE, which aim to provide a solid grounding in one or more of the sciences and impart sufficient forensic skills to give graduates a "flying start" in one of the forensic graduate professions. The Forensic Chemistry programme is designed to offer training in forensic science commensurate with all three accreditation standards of the Forensic Science Society (ForSciSoc), the professional body for Forensic Science in the UK. At the same time the programme will provide training in one of the traditional science subject areas.

Forensic Chemistry is designed for forensic science students who wish to concentrate on the chemical sciences, in particular analytical chemistry, with the addition of genetics, which underpins the study of DNA-typing, an important forensic technique not dissimilar from chemical analysis methods. The programme contents cover forensic science, organic, inorganic, physical and analytical chemistry, particularly as related to substances of forensic interest such as drugs and poisons and underpinning biology in the areas of genetics and toxicology.

Graduates will be competent analytical chemists and able to compete successfully for positions in this area, thus opening a wide vista of non-forensic as well as forensic job opportunities. The programme also lays the foundation for further studies in any chemistry related discipline, such as environmental science, food analysis or toxicology.

Forensic Chemistry, in common with the majority of the programmes in the Department of Applied Sciences, emphasises the importance of scientific inquiry. This is a connecting strand of all modules, and is supplemented by special instruction in research methodology at all levels.

A graduate in Forensic Chemistry will be able to:

- analyse, record and report forensic chemistry evidence to at least the accreditation standard set by the professional body
- process scenes of crime to at least the accreditation standard set by the professional body
- plan and conduct research, record and analyse data and disseminate information to the scientific community in the fields of forensic science and the chemical sciences
- understand, interpret and critically evaluate research papers, instructions, memoranda and other publications by the relevant scientific communities.

Acquisition of these competencies requires knowledge and understanding of the subject areas in sufficient breadth and depth, as well as a high level of intellectual and transferable skills outlined in detail below. The University, Faculty and programme team create the conditions which enable the student to achieve these learning outcomes in a friendly and supportive atmosphere.

### Section 3: Learning outcomes of the programme

*The award route provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas: ...*

#### A Knowledge and understanding

Learning outcomes

Teaching, Learning and Assessment Strategies

#### **A Knowledge and understanding of:**

1. The scope and nature of scientific evidence, its value to society and the roles and responsibilities of forensic scientists
2. The techniques used in crime scene investigation (ForSciSoc component standard 1)
3. The theory and application of the principal laboratory methods used routinely in forensic science (ForSciSoc component standard 2) and forensic chemistry in particular
4. Principles and procedures relating to the interpretation, evaluation, and presentation of evidence (ForSciSoc component standard 3)
5. The facts, principles, practices and applications of organic, inorganic and physical chemistry (various chemistry standards)
6. The principles and procedures used in chemical analysis and the characterisation of chemical compounds (chemistry standard, ForSciSoc component standard 2)
7. The range of techniques used for the extraction and analysis of DNA (ForSciSoc component standard 2, no. 9) and the underlying facts and principles
8. Methodology of scientific inquiry and research

#### **Teaching/learning methods and strategies:**

*Acquisition of 1- 4 is through the specific forensic science compulsory modules. Mini projects with a forensic theme at level 2 also contribute to the specific forensic science related learning outcomes. Analytical chemistry modules and the spine of research skills modules (see below) underpin the understanding of 3 in particular and there is considerable overlap between learning outcomes 3 and 6.*

*Learning outcomes 5 and 6 are addressed through the modules in chemistry at all levels, some of which have titles that reflect particular substance types. As laboratory analysis is one of the main concerns of forensic scientists, analytical chemistry is particularly emphasised.*

*Learning outcome 7 is addressed by the genetics module at level 1 and by parts of the specific forensic science modules, especially at level 3.*

*Acquisition of 8 is developed through a 'data analysis and research methodology' spine of modules from level 1 through to level 3 giving a mixture of lectures, instruction, tutorials, practical work and coursework in mathematical, statistical, IT, and information skills, integrated with lectures and tutorials on research methods, and leading to an individual project.*

*The teaching and learning methods employed are a combination of lectures, practical classes, tutorials, discussions, computer-based activities, workshops,*

*coursework and student-centred learning. The practical component is strong, with a large proportion of the contact time on taught modules being spent in the laboratory. Some modules employ 'problem centred learning', such as mini-projects and individual case-based crime scene investigations. Guest lectures ensure topicality and conformity with professional practice. Teaching is widely informed by research, consultancy and scholarly activity.*

*Additional support is provided through extensive use of a Virtual Learning Environment to enable access to on-line learning and support, both at UWE, and off-campus. Other e-learning resources include, 'forensicnetbase', and the journals and abstracts on 'science-direct'. Throughout, the student is encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject.*

*To increase the effectiveness of their learning, students may approach academics directly for advice and assistance, but also have access to dedicated student advisers, who are available full-time to give general advice, assist with access to the facilities and help with personal difficulties and special needs.*

**Assessment:**

*Knowledge and understanding is assessed using a variety of methods, including:  
formal examinations, tests and assignments,  
essays and different styles of reports,  
computer-based assessments,  
problem solving exercises and data analysis,  
presentations, case studies,  
research assessment.*

## B Intellectual Skills

### B Intellectual Skills

A successful graduate will be able to:

1. Select appropriate strategies, techniques and procedures for the examination of a scene of crime (ForSciSoc component standard 1)
2. Select appropriate strategies, techniques and procedures for the examination of forensic evidence (ForSciSoc component standard 2)
3. Interpret and evaluate evidence and report on it appropriately (ForSciSoc component standard 3)
4. Apply knowledge and understanding outlined above to the solution of qualitative and quantitative problems of a familiar and unfamiliar nature (intellectual skills standard chemistry)
5. Critically analyse, synthesise and summarise information, including published research or reports, and use several lines of information to form and test hypotheses (incorporates various intellectual skills standards chemistry)
6. Recognise and implement good measurement science and practice (intellectual skills standard chemistry, ForSciSoc component standard 2)
7. Recognise the moral and ethical issues of investigations and appreciate the need for ethical standards and professional codes of conduct (implied standard for all ForSci Soc components)

### Teaching/learning methods and strategies

*Intellectual skills are developed through the range of teaching and learning strategies outlined under section A above. They are developed in all modules, partly through examples of the 'academic approach' but mainly through student activities such as discussions, essay writing, case studies, problem solving sessions and practical/ project planning. Intellectual skills 1, 2 and 3 are initially taught and practised separately, but brought together in a mini-project like exercise as part of the level 3 forensic science module.*

### Assessment

*Assessment of Intellectual Skills is through the full range of methods identified in section A.*

*In particular, the wide range of different types of coursework, case studies, various forms of report/essays, problem-solving, and presentations, is important in assessing the student's ability to demonstrate generic intellectual skills. The Faculty has an agreed procedure for formative feedback, which is incorporated into the coursework submission sheet, and provides timely and helpful feedback outlining strengths and weaknesses in the student's intellectual approach to a set task. For assessment in skills 1-3 students will be required to recover evidence, select appropriate analytical techniques, write a report, and give oral and written presentations.*

## C Subject, Professional and Practical Skills

<b>C Subject/Professional/Practical Skills</b>	<b>Teaching/learning methods and strategies</b>
<p>A successful graduate will be able to:</p> <ol style="list-style-type: none"><li>1. Plan, design and execute practical investigations competently, from the problem-recognition stage through to the evaluation and appraisal of results and findings; this to include the ability to select appropriate techniques and procedures (practical skills standard chemistry; implied standard for ForSciSoc components 1 and 2)</li><li>2. Conduct standard laboratory procedures for synthetic and analytical work and competently operate standard equipment (amalgamation of two practical skills standards chemistry; standard for ForSciSoc components 1 and 2)</li><li>3. Handle, analyse, and report forensic samples with awareness of validity and contamination issues.</li><li>4. Communicate results and their interpretation clearly and unambiguously.</li><li>5. Synthesise a variety of appropriate skills to meet the requirements of forensic analysis.</li><li>6. Adhere to safe working practices and conduct risk assessments (practical skills standard chemistry; standard for ForSciSoc components 1 and 2)</li><li>7. Comply with ethical, legal and quality assurance principles, such as the data protection act or the requirements of the chain of custody (standard for ForSciSoc component 3)</li></ol>	<p><i>Subject, professional and practical skills are developed through practical and project activities, within the range of teaching and learning strategies outlined under section A above. A large proportion of contact time on taught modules is spent on practical work, emphasising the philosophy of 'learning by doing'.</i></p> <p><i>Set practicals, particularly at levels 1 and 2, place emphasis on developing practical, data analysis and interpretation skills and train adherence to safe working practices without deep reflection on ethical, legal and health and safety issues. Project work requires more planning and reflection from the students and incorporates a detailed analysis of ethical and health-and-safety issues associated with the project. The data analysis and research methodology modules prepare students for their roles as initially guided and later independent researchers. At level 3, the project supervisor provides individual guidance and assistance as and when required. The project includes a progression report, project work, a report and a presentation.</i></p> <p><i>Skill 4 is developed in a specific forensic science context through lectures, tutorials and coursework relating to the communication of science in a legal environment, and is underpinned by the development of communication as in section D below.</i></p> <p><i>Skill 5 is developed through the spine of specifically 'forensic' modules which use case studies throughout the course to develop the overview of understanding that is required in forensic science. Forensic practical and professional skills are developed through a mock-case, which trains all skills from scene examination to analysis of evidence and reporting.</i></p>

**Assessment**

*Assessment is through a range of methods as in section A.*

*The practical skills, in particular, are assessed through practical work and resulting practical reports, leading to the independent project. Reflection on a Health-and-Safety assessment and an ethics form are prerequisite for the commencement of practical work on the level 3 project.*

*The subject skills relating to forensic science are primarily assessed in the specifically 'forensic' modules using examinations, case studies, practical reports, contemporaneous notes, presentations, including a courtroom exercise, and a practical exam on processing a crime scene. See also skills 1 & 2 in B above.*

## D Transferable Skills and other attributes

### D Transferable skills and other attributes

A successful graduate will be able to:

1. Evaluate their own academic performance and plan work accordingly (interpersonal skills standard biosciences, part)
2. Study independently in a variety of learning styles (self-management skills standard biosciences, part)
3. Work effectively as a team member (teamwork skills standard biosciences; implicit standard for all ForSciSoc components)
4. Practise good time management, prioritise workloads and recognise deadlines (self-management skills standard biosciences)
5. Communicate effectively in a variety of media and contexts; in particular, express the interpretation of results in a manner comprehensible to the intended recipient such as lawyers or a jury and write comprehensive, comprehensible, rational and impartial reports (communication skills standard biosciences; standard for ForSciSoc component 3).
6. Use mathematical and statistical methods effectively in problem solving (numeracy skills standard biosciences)
7. Use a variety of IT skills for data processing, communicating and supporting scientific research (numeracy and IT skills standard biosciences).

### Teaching/learning methods and strategies

*Support for Skill 1 is provided through the availability of an online Personal Development Record programme for all students, and the Graduate Development Programme. This also encourages an appreciation of the importance of the other skills.*

*Skill 2 is developed through the wide spread of theoretical and practical science on this programme, in which the students are required to employ a diversity of study styles, and are exposed to a wide range of assessment procedures.*

*Skill 3 is developed through small group work in laboratory exercises and larger discussion groups in various modules. In particular, joint crime scene investigations and forensic casework encourage teamwork. The importance of the role of the forensic scientist as part of the investigative team is stressed throughout the curriculum.*

*Skill 4 is not taught explicitly, but the variety of subjects, classes and assessments, encourages the development of these skills.*

*Skill 5 is developed through a spread of assessment methods on this programme: essays, seminars, use of IT, practical reports, project proposal presentation and report, in addition to the specific communication of science in a forensic context in C above.*

*Skills 6 and 7 are taught using lectures, training, tutorials, practical workshops, in specifically designed modules, and are practised in a variety of contexts across the full subject range of the programme.*



**Assessment**

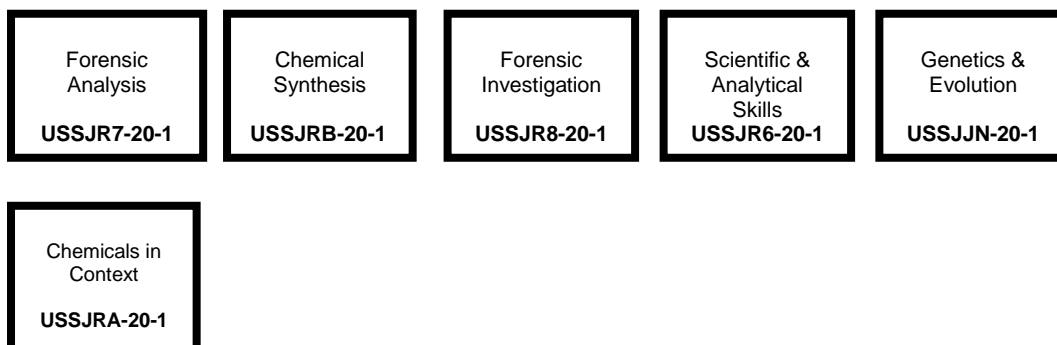
*All of these skills contribute to the general performance across the programme and, as such, performance is evidenced by the overall grade of award. The wide range of different forms of assessment and coursework (as in B above) requires the students to demonstrate the full range of transferable skills.*

*Skill 5 is assessed in a forensic science context by written reports and oral presentation. See also skills 2 & 3 in B above.*

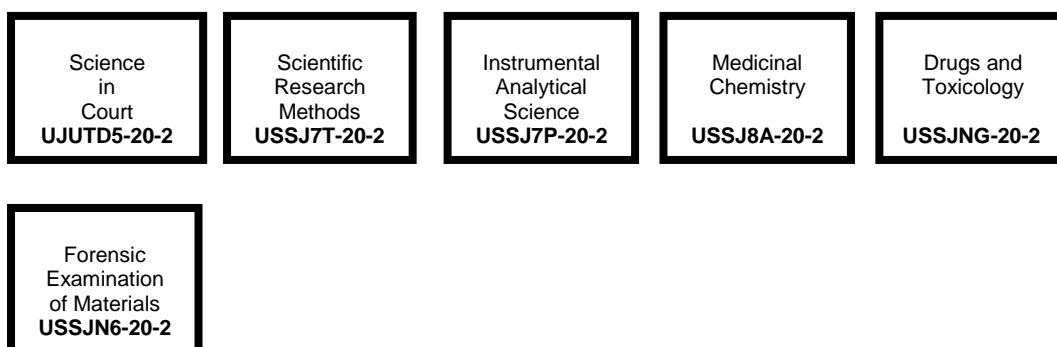
*Skills 6 and 7 are also specifically assessed through worked assignments and short tests.*

# BSc (Hons) Forensic Chemistry – from 2010

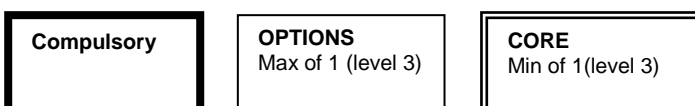
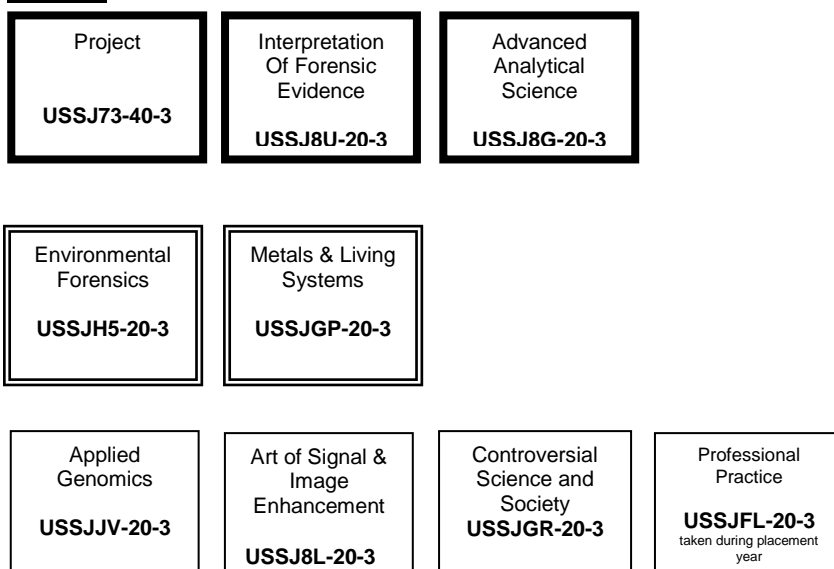
## Level 1 six 20 credit modules



## Level 2: six 20 credit modules



## Level 3: one 40 credit and four 20 credit modules



**Interim Awards:**

**Certificate of Higher Education: Forensic Chemistry**

Credit requirements: 120 ( of which 100 are level 1 or above)

**Diploma of Higher Education: Forensic Chemistry**

Credit requirements: 240 ( of which not less than 100 are level 2 or above and 120 are at level 1 or above). Exchange students will have results converted into UWE credits.

**Award/s:**

**Degree with Honours: Forensic Chemistry**

Credit requirements:

360 ( of which not less than 100 are level 3 or above, and 100 are at level 2 or above, and 140 are level 1 or above)

**Degree: Forensic Chemistry**

Credit requirements:

300 ( of which not less than 60 are level 3 or above, and 100 are at level 2 or above, and 120 are level 1 or above)

## **Section 5: Entry requirements**

Admissions into the Forensic Chemistry Programme are administered within the Undergraduate Programmes in FACS (Forensic, Analytical and Chemical Sciences). The standard UCAS entry for the programme at UWE is 240-300 points. Successful application to the programme must also meet one of the following minimum requirements:

- GCE A2 level at grade E or above in two science subjects, including Chemistry, and grade C or above in three GCSE subjects. (Two GCE AS level passes are considered to be equivalent to one A2 level). GCSE subjects should include Mathematics, English Language and at least Double Science.
- National Certificate or Diploma in an appropriate subject matter such as chemistry.
- Higher National Certificate or Diploma in Chemistry or related area.
- Pass in a recognised Access or Foundation course.

Additionally, applicants may be admitted to the Programme provided they meet one of the following requirements and can demonstrate to the Faculty that the GCE A level and GCSE subject areas specified above have been studied at an appropriate level:

- The Advanced General National Vocational Qualification (AGNVQ) or Advanced General Scottish Vocational Qualification (AGSVQ), a twelve unit or full AGNVQ award being equivalent to two GCE A levels, a six unit or single AGNVQ being equivalent to one A level and a three unit or part AGNVQ award being equivalent to one GCE AS Level.
- The Irish Leaving Certificate at Higher level grades BBBC.
- The Scottish Leaving Certificate of Education at Higher level grades BBBC.
- National Vocational Qualifications or Scottish Vocational Qualifications at level III.
- The European Baccalaureate 68%.
- The International Baccalaureate 26pts.
- Other European or International qualifications that the University considers to be equivalent to the above.

## **Section 6: Assessment Regulations**

Academic Regulations and Procedures 2010/11 (Academic Registry)

## **Section 7: Student learning: distinctive features and support**

The Forensic Chemistry programme offers a distinctive combination of training in forensic science with the main areas of the chemical sciences of interest to practising forensic scientists. The forensic science component encompasses the training in forensic techniques, an appreciation of the legal system and the role of expert witnesses in court. The chemistry component encompasses training in inorganic, organic, physical and analytical chemistry, with a clear emphasis on the latter subject area. In addition, training in genetics is provided as a solid foundation for the understanding of theory and practice of DNA-typing. By emphasising problem solving skills, such as experimental design, the programme encourages independent thinking, and the large practical component on state-of-the-art equipment gives a solid grounding in the relevant experimental techniques. This prepares the student well for a career as a working experimental scientist.

In order to provide students with the full range of relevant chemistry as well as forensic science, most of the modules in the programme are compulsory. Students may choose two modules at level 3 to reflect their interests.

The programme is fully integrated with the other programmes from 'Forensic, Analytical and Chemical Sciences' and also contains elements from 'Biosciences', and so it benefits from the support, resources, experience and excellent facilities provided by the Faculty for these subject areas. The Faculty has undergone a complete refurbishment since 2004 and has state of the art teaching facilities and well-equipped general and specialist laboratories to match its commitment to excellence in teaching.

Forensic science at UWE is well established and has benefited from recent and ongoing large investment: facilities include a fully equipped Scenes-of-Crime house and vehicle examination facility. Specific forensic instrumentation includes a Video Spectral Comparator, Microspectrophotometer, electrostatic document analysers (ESDA), Infra-Red microscope and golden gate attachment, comparison microscopes, glass refractive index and breath alcohol instrumentation. Forensic DNA analysis facilities include a filtered cabinet for sample preparation, a real-time DNA amplification instrument, capillary electrophoresis for DNA analysis and ancillary equipment.

The chemical sciences teaching laboratories are well equipped with a wide range of modern equipment, including specialist instrumentation for analytical chemistry, such as a full range of spectrometers, spectrophotometers and chromatography instruments including coupled techniques. There are extensive facilities for microscopy, including an electron microscope suite with an environmental SEM. For project work the programme is further underpinned by the research facilities of the Centre for Research in Analytical, Materials and Sensor Science (CRAMSS).

The students make extensive use a Blackboard based Virtual Learning Environment (VLE), both as a source of information and lecture notes, and for on-line tutorials and self-assessment. The WWW is also widely used for access to services, such as library catalogues and facilities and web-based learning resources such as 'science-direct'. Email is used as an important means of communication between students and staff and within the student community.

The programme is administered within the FACS (Forensic, Analytical and Chemical Sciences) group of programmes which establishes common and mutual support for students across a range of overlapping programmes.

A Student Handbook is provided during Induction to year 1 that includes information on the Faculty and the University, its regulations and procedures, and is supplemented at a programme level by a FACS Handbook and Guides for each module. Students are supported during their time at UWE by student advisers, with the backup of central student support services for students with needs that cannot be dealt with directly within the Faculty.

The Graduate Development Programme, centred around groups of approximately 15 students with a tutor, provides support and encourages reflection on learning and skills development leading to consideration of careers and employability.

Part-time attendance of the programme is possible, and part-time students will be advised by a part-time study tutor to optimise their timetable and assist with any specific problems.

## **Section 8 Reference points/benchmarks**

- **Qualification descriptors used in the QAA Framework for Higher Education Qualifications**

The learning outcomes for the programme have been developed with reference to the level descriptors used in the QAA Framework for Higher Education Qualifications. In particular, the learning outcomes for modules at level one and level two have been considered to be consistent with the award of a Certificate in Higher Education and a Diploma in Higher Education respectively. Graduates of the award achieving an Honours classification will develop an understanding of a complex body of knowledge related to the relevant subject areas. In addition, the graduate will develop analytical techniques, problem-solving skills and communication skills that can be applied to a range of employment opportunities.

- **Subject benchmark statements**

As indicated with the learning outcomes, the design of the programme has taken into consideration the QAA subject benchmarks for Chemistry and for the Biosciences and also benchmarks derived from the accreditation standards of the Forensic Science Society.

The learning outcome lists for chemistry in particular are very specific and have been paraphrased in places to accommodate more than one chemistry learning outcome in one statement in the document. The transferable skills learning outcomes for the biosciences have been used in this document, as they are more comprehensive than those for chemistry and do include the latter. As the list of learning outcomes listed in this summary document is naturally restricted, the programme will cover many other not specifically listed learning outcomes as well.

- **Requirements of Professional Bodies**

The Forensic Science Society is the professional body which operates an accreditation scheme for university courses in forensic science, and this course has been accredited (UWE being one of the first four universities to have been recognised in this way) in all three component standards – (1) Crime Scene Investigation, (2) Laboratory Analysis and (3) Interpretation, Evaluation, and Presentation of Evidence. Students may join The Forensic Science Society as student members. The programme is also “Recognised” by the Royal Society of Chemistry and so graduates may become Associate Members of the RSC.

- **University’s Mission Statement**

Students with a science background will have an educational opportunity to establish a career foundation in forensic science, together with the development of an analytical approach to science that will further enhance their career and further study opportunities. The programme builds on subjects in UWE which have a high reputation for teaching excellence, and makes extensive use of advanced learning strategies which build on the successes of consultancy and research.

- **University’s teaching and learning policies**

In line with the University’s teaching and learning policies, this programme takes a student centred approach to learning by allowing students to take control of aspects

of their learning and providing a learning environment that stimulates active participation and engagement in the learning process. The programme seeks to create an environment that will stimulate students to take responsibility for aspects of their learning, while lecturers take responsibility for facilitating that learning. Module learning outcomes have been designed to ensure that students meet the overall programme learning outcomes on completion of the programme. In addition, staff in the FACS (Forensic, Chemical and Analytical Science) group in the Faculty have been active in developing and strengthening key skills.

A variety of assessment methods is incorporated within the programme to cater for a diversity of student strengths and abilities. Although this document focuses on summative assessment, the course team recognise the importance of both summative and formative assessment activity as an integral part of the learning and teaching process. All assessments will comply with the University Assessment Policy and Academic Regulations.

#### • **Research carried out by staff**

Research and consultancy is undertaken in the following areas of particular relevance to forensic science:

- forensic entomology
- statistical methods and databases for the estimation of evidential value
- design of crime scene related equipment
- genealogy using DNA profiling
- improvements of MSMS methods used in the detection of illicit drugs
- elemental composition of soil
- forensic image analysis
- chemical sensors for drugs and arson accelerants

Some projects are carried out with regional forensic science companies or police forces.

Research specifically in forensic science topics is also supported by a wide range of other research interests across numerous biological and chemical fields.

The programme is also supported by other research in “The Centre for Research in Analytical, Materials and Sensor Science” (CRAMSS). Current research projects include:

- Improving food quality and safety
- Medical and veterinary diagnosis
- Purifying and analysing water for trace pollutants
- Application of separation science to pharmaceutical analysis
- Chemical separation using magnetic fields and biological systems
- Smart materials
- Surface Analysis using X-ray photoelectron spectroscopy for analysing the chemical constitution of the surfaces of inorganic and organic materials
- Research into inorganic precipitating reactions of the Liesegang type. Particularly, interest in synthesising functional materials via self-assembly type mechanisms.
- Research into oscillating chemical reactions such as the Belousov-Zhabotinsky reaction and using these reactions to model biological systems and implement novel types of computation.

- **Employer feedback/interaction**

The faculty has excellent links with the forensic science practitioners in the area. The Avon and Somerset Constabulary are very supportive of the forensic science teaching at UWE, and collaborates for research projects. The Chief Constable launched the BSc (Hons) Forensic Science in 2001 and commented on the value such a degree would have for recruits to his force. Local Home Office Forensic Pathologists have also been involved with the faculty for many years - one is involved in teaching the level 3 forensic science module.

A local independent laboratory has strong links with the Forensic Science team at UWE – staff assist with statistical evaluations required for court presentations and some students undertake their independent research project with this company.

- **Conclusion**

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of individual modules can be found in module specifications. These are available on the University website.

Programme monitoring and review may lead to changes to approved programmes. There may be a time lag between approval of such changes/modifications and their incorporation into an authorised programme specification. Enquiries about any recent changes to the programme made since this specification was authorised should be made to the relevant Faculty Administrator.