1. **Title of the module**

PSCI6010 (PS601) Fires and Explosions

1. **School or partner institution which will be responsible for management of the module**

Physical Sciences

1. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**

Level 6

1. **The number of credits and the ECTS value which the module represents**

15 credits (7.5 ECTS)

1. **Which term(s) the module is to be taught in (or other teaching pattern)**

Autumn and Spring

1. **Prerequisite and co-requisite modules**

Pre-requisite:

Successful completion of Stage 2 in the Forensic Science or Chemistry and related degree programmes, or equivalent at another University.

1. **The programmes of study to which the module contributes**

Forensic Science (BSc)

Forensic Science with a Year in Industry

Forensic Science (MSci)

Chemistry (BSc)

Chemistry with a Year in Industry

Chemistry (MChem)

1. **The intended subject specific learning outcomes.
On successfully completing the module students will be able to:**

Have a knowledge and understanding of:

1. The physics and chemistry of fires and explosions.
2. The principal areas of forensic investigation of fires and explosions.
3. The analysis and identification of accelerants, incendiary devices, explosives and explosive residues.
4. The management of fire and explosion scenes.
5. The observation and assessment of damage to buildings and vehicles, and injury to persons.
6. Identification of the causes of fires and explosions, and their classification as natural, accidental, negligent or deliberate.
7. **The intended generic learning outcomes.
On successfully completing the module students will be able to:**

Have:

1. Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to the subject areas identified above.
2. Ability to apply such knowledge and understanding to the solution of qualitative and quantitative problems.
3. Skills in essay writing and presenting scientific material and arguments clearly and correctly, in writing and orally, to a range of audiences including legal contexts.
4. Problem-solving skills, relating to qualitative and quantitative information, extending to situations where evaluations have to be made on the basis of limited information.
5. Numeracy and computational skills, including such aspects as error analysis, order-of-magnitude estimations, correct use of units and modes of data presentation.
6. **A synopsis of the curriculum**

Physics and chemistry of fires and explosions:

Fire and arson – occurrence and importance. Combustion – definitions. Thermodynamics and enthalpy. Flammability limits, flash point, fire point, ignition temperature. Pyrolysis of wood and plastics. Fuels and accelerants. Propagation and spread of fires. Sampling and laboratory analysis of fire scene residues.

Explosions – definitions. Vapour phase and condensed phase explosions. Detonation and deflagration. High and low explosives. Primary and secondary high explosives. Molecular design of explosives. Survey of important explosives. Stoichiometry, oxygen balance, gas volumes, thermodynamics and enthalpy. Sampling and laboratory analysis of explosives residues. Preventative detection of explosives in contexts such as airports.

Fires:

Fire dynamics. Propagation and spread of fires – flames, fire types, flashover. Fire investigation. Forensic Science Service procedures at the scene. Damage observation and assessment. Fire and smoke patterns. Sources of ignition. Injuries and fatalities. Evidence recovery: sampling and laboratory analysis. Establishing the origin: the seat of the fire. Finding the cause: natural, accidental, negligent or deliberate? Indicators of arson. Evidence procedures. Case studies.

Explosions:

Control of the explosion scene and procedures for recovery of evidence. Damage observation and assessment. The work of the Forensic Explosives Laboratory. Identification of explosives: organics and inorganics. Bulk analysis. Trace analysis of explosives: recovery, extraction and analysis of samples. Physical evidence: detonators. Preventative detection. Precursor identification. Explosives evidence in court: legal definitions and procedures. Terrorism. Case studies.

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**
* Crime Scene to Court, the Essentials of Forensic Science, 4th edition, ed. P. White. Royal Society of Chemistry, 2016.
* Criminalistics, 10th edition, R. Saferstein. Prentice Hall, 2010.
* Forensic Science, 4th edition, A.R.W. Jackson & J. M. Jackson. Pearson, 2016.
* The Chemistry of Explosives, J. Akhavan. Royal Society of Chemistry. 3rd edition, 2011
* Kirk's Fire Investigation, J. DeHaan. Prentice Hall. 7th edition, 2011
1. **Learning and teaching methods**

Total contact hours: 30

Private study hours: 120

Total study hours: 150

1. **Assessment methods**
	1. Main assessment methods

Assignment 1 (4 hours, 10%)

Assignment 2 (4 hours, 10%)

Examination (3 hours, 80%)

13.2 Reassessment methods

Like-for-like

1. **Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *8.6* | *9.1* | *9.2* | *9.3* | *9.4* | *9.5* |  |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |
| Private Study | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |
| Lectures | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |
| Assignment 1 | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |
| Assignment 2 | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |
| Examination | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |  |

1. **Inclusive module design**

The School recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

1. **Campus(es) or centre(s) where module will be delivered**

Canterbury

1. **Internationalisation**

Forensic Science is an international subject with physical laws discovered and techniques developed and refined by scientists across the globe. Mastery of the learning outcomes relating to Fires and Explosions will equip students to apply the theories and techniques of this module in a wide range of international contexts. The module team is drawn from the School of Physical Sciences, which includes many members of staff with international experience of teaching and research collaboration, and two external lecturers who are renowned experiments in their fields and have real-world experience of forensic investigations involving fires and explosions. In compiling the reading list, consideration has been given to the range of texts that are available internationally and a selection of texts has been identified to complement the delivery of the material. The support SPS provides to its students is also internationally attuned given our international student body.

**FACULTIES SUPPORT OFFICE USE ONLY**

**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

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| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 28/02/19 | Major | September 2019 | 7,8,9,13,14 | no |
|  |  |  |  |  |

Revised FSO Jan 2018