Ballistics and firearms

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<th>Basic module information</th>
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6 **Pre, Post and Co-requisites:**

These are modules that you must have studied previously in order to take this module, or modules that you must study simultaneously or in a subsequent academic session

<table>
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<tr>
<th>Pre, Co, Post</th>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>Pre</td>
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<td>Classical Physics (Mechanics)</td>
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8 **Overview and Aims**

This module is concerned with the principles and applications of ballistics and firearms. The study of ballistics will give an essential grounding in the physical processes involved in firing a projectile, the flight path of the projectile when it leaves the firearm and the possible outcomes when the projectile interacts with the target. The study of firearms will deal with the different types of firearms and ammunitions with an emphasis on the types that would be typically encountered by a Forensic scientist working in the field. Both of these strands of study will be brought together in the Forensic and Criminological aspects of the module. These studies will be underpinned by practical work on both the underlying physical principles and on the identification of ammunition. The content of the module is commensurate with the aim of the Forensic Science course to teach topical subjects and current best Forensic practice.
Course Content

(1) Fundamental concepts in Mechanics: velocity, acceleration, momentum and energy, basic laws of motion, motion under gravity, projectiles
(2) Firearms overview and class characteristics: hand guns, rifles, shotguns, sub machine guns
(3) Ammunition: historical background and terminology, ammunition and primer cap types, cartridge cases, shot gun ammunition, identification, propellant types, primers and priming compounds.
(4) Internal Ballistics: phases of the internal ballistic cycle, pressure travel curve, propellant grain geometry, energy balance and efficiency
(5) Intermediate Ballistics: blast fields, flash fields, recoil, sound moderators, projectile launch
(6) External Ballistics: trajectory analysis, range of firing, aerodynamic drag, stability.
(7) Terminal Ballistics: regimes, target penetration, impact, obliquity and yaw, dispersion of fire.
(8) Wound Ballistics: military wound locations, cavitations, stability and tumbling, medical consequences, simulation media, firearms injury, personal protective equipment
(9) Forensic examination: proof marks, rifling and striation matching, comparison microscopy, bullet holes, range of firing estimations, analysis of residue, crime scene and recovery of evidence, distance, point of origin, reconstructing the chronological sequence of the events that took place
(10) Criminological issues: legislation and licensing, the expert witness, case study example

Indicative Reading


Learning outcomes

Learning outcomes describe what you should know and be able to do by the end of the module

Knowledge and understanding. After studying this module you should be able to:

- Execute quantitative experimental work and analyse the results in a meaningful manner;
- Communicate the results of a literature study in an area of ballistics and firearms in oral form in a clear and concise manner;
- Communicate the results of experimental work in written form in a clear and concise manner;
- Demonstrate a sound familiarity with laboratory apparatus and techniques;
- Demonstrate knowledge of common types of firearms and ammunition;
- Demonstrate knowledge of the forensic techniques for the recovery of evidence from a crime scene involving firearms (collect firearm evidences and mark firearm evidences);
- Demonstrate knowledge of the physical principles of internal, intermediate, external, terminal and wound ballistics.

Skills, qualities and attributes. After studying this module you should be able to:

- Use commonly-encountered laboratory equipment safely and competently;
- Demonstrate good written communication skills;
- Use appropriate I.T. packages for information retrieval, the analysis of data and for the identification of ammunition;
- Work effectively individually or in pairs;
- Apply problem solving skills to problems with a well-defined solution;
- Make use of appropriate texts and other learning resources.

Teaching and Learning

Range of modes of direct contact

This indicates the range of direct contact teaching and learning methods used on this module, e.g. lectures, seminars
- Lectures, including examples classes (22 hrs)
- Firearms workshop (10 hrs)
- Practical work (on the field and lab) (18 hrs)

Total contact hours: **50**

### Range of other learning methods

This indicates the range of other teaching and learning methods used on this module, e.g. directed reading, research

- Directed reading
- Preparation of seminar problems
- Preparation of laboratory reports, including data analysis
- Preparation of a literature study
- Use of I.T. resources, such as the VLP

Total non-contact hours: **50**

### Assessment methods

This indicates the type and weighting of assessment elements in the module

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<th>Weighting</th>
<th>Type</th>
<th>Description</th>
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<tr>
<td>40%</td>
<td>Coursework</td>
<td>Eight laboratory notebook entries (10 aps x 8)</td>
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<td>Oral presentation (20 aps x 1)</td>
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<tr>
<td>60%</td>
<td>Examination</td>
<td>One 3 hour end of module unseen closed-book paper</td>
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### Diagnostic/ formative assessment

This indicates if there are any assessments that do not contribute directly to the final module mark

- Feedback concerning past paper questions.
- Seminar problems.

### Further information on assessment

This section provides further information on the module’s assessment where appropriate

Each laboratory notebook entry will be marked and returned to students, complete with formative commentary, before that student embarks upon their next experiment within the course.