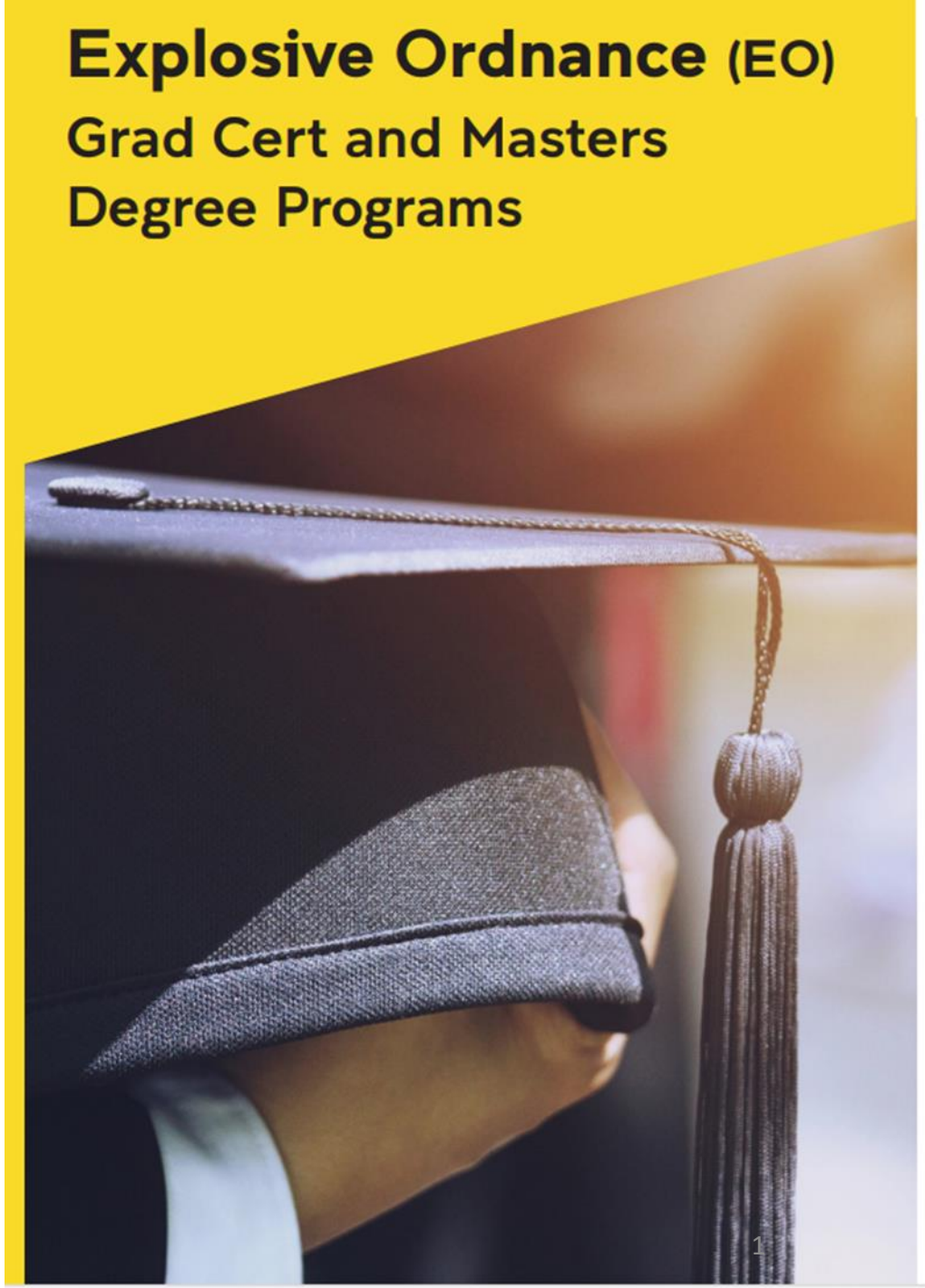
UNSW CANBERRA

ADFA campus



The Program

1. **Explosive Ordnance MSc, 48 UOC;**
2. **Explosive Ordnance Grad Cert, 24 UOC**

Teaching split between SET and SSCI

Enrolment is only open to those nominated by Defence

Subjects taught by **SSCI**

ZPEM8101 Energetic Materials, Material Properties and Manufacture (6 UOC)

ZPEM8102 Environment, Safety and the Regulatory Framework (6 UOC)

ZPEM8103 Explosive Ordnance Research Project (12 UOC, 2 x 6 UOC per semester)

ZPEM8104 Counter IED and Forensic Investigation of Explosives (6 UOC)

Subjects taught by **SET**

ZEIT 8510 Explosive Ordnance Design and Systems (6 UOC)

ZEIT8511 Testing and Evaluation of Explosive Ordnance (6 UOC)

ZEIT8512 Explosive Ordnance Effects (6 UOC)

ZEIT 8513 Rocket Motors, Propellants and Pyrotechnics (6 UOC)

ZEIT8510
Explosive Ordnance Design and Systems

This course provides a critical understanding of the construction and function of various EO systems and subsystems required for delivery to the target. The course develops an understanding of how explosives are harnessed to achieve the required capability, and the use of parametric / sensitivity analysis for iterative design.

Aero-ballistic properties will also be discussed in light of subsonic,transsonic, supersonic and hypersonic effects.

Insensitive munition (IM) design principles will also be explored.

ZEIT8511
Testing and Evaluation of Explosive Ordnance

This course provides a critical understanding of how initiation reactions in energetic materials can transition to detonation and an energetic material's response to stimuli. The course will develop knowledge and practical application of test methods, test standards, test instrumentation and measuring equipment, test requirements, and surveillance techniques for explosives and EO.

This course will enable students to develop an understanding of the scientific and engineering principles that underpin the structure and properties of explosives, including their manufacture and testing, as well as risk management.

ZEIT8512
Explosive Ordnance Effects

This course develops an understanding of the use of explosives with regards to how effects are realized during and after detonation of a warhead. This includes aspects of shock, spall, fragmentation and fragment characteristics (including velocity, shape and size).

Additionally, the theory behind shaped-charge penetration will be examined and applied to such systems as anti-tank guided missiles. The effects that could be expected on concrete structures will also be evaluated. Finally the matching of the warhead to the target (weaponeering) will be covered.

ZEIT8513
Rocket Motors, Propellants, and Pyrotechnics

This course aims to develop a critical understanding of the principles, properties, composition and combustion kinetics of propellants and pyrotechnics, and their application in gun systems, rocket motors, countermeasures, special effects, screening/signalling and other applications.

The differences between liquid, solid and gel propellants will be discussed as they relate to rocket systems and gun systems as well as looking at emerging manufacturing trends.

ZPEM8101
Energetic Materials, Material Properties and Manufacture

This course provides students with a scientific understanding of the chemistry of explosives, propellants and pyrotechnics, and how this relates to their application in commercial and military contexts. It develops an appreciation of the relationship between chemical structure and explosive properties, and covers basic chemistry of synthesis/manufacture, stability and material properties.

It introduces students to fundamental thermodynamics and kinetics of explosive reactions (including combustion, deflagration, and detonation) as well as initiation mechanisms and basic hazard/performance properties.

ZPEM8102
Environment, Safety and the Regulatory Framework

This course describes the evolution and importance of regulations and legal context for explosive safety.

It introduces dangerous goods (DG) and hazard classifications, and risk management standards and procedures. International philosophies of insensitive munition (IM) policy are covered, leading to IM testing methods and criteria. Various approaches to achieving IM compliant formulations/systems are explained.

The course also develops awareness of explosives in the environment and related issues such as environmental effects, toxicology, detection, disposal, remediation, demilitarisation and recycling, as well as the balance between environmental considerations and operational requirement.

ZPEM8104
Counter IED and Forensic Investigation of Explosives

The course presents the fundamentals of improvised explosive devices (IEDs) and develops an understanding of how chemical analysis techniques are applied in forensic explosives investigations from field through to laboratory.

It covers types of improvised explosives and devices, introduces students to the scientific principles and sampling methods for different types of chemical analysis relevant to IED detection, and provides an awareness of the strengths and limitations of each method.

ZPEM8103
Explosive Ordnance Research Project

Students in the Explosive Ordnance (EO) Masters Program will undertake a research-based project together with coursework as set by the School. As one of the aims of the EO Masters program is to develop critical thinking and independent research skills, the projects will involve ‘hands-on’ research experience in collaboration with staff members and their research teams, or with industry partners.

A supervisor, who is a member of academic staff, will work closely with the student and will manage each project. The project will be chosen after discussion between the student, the supervisor and other members of staff.

Examples of ZPEM8103 Projects

- Geometry design of 3D printed structures for tailored effects
- Studies towards replacement of lead-based primary explosives
- Domestic manufacture study
- Industry-nominated project

Contacts

- Program questions:

lynne.wallace@unsw.edu.au

- Enrolment questions:

b.west@unsw.edu.au

Questions?