



Cranfield
Defence and
Security

Postgraduate
master's courses in

Defence and Security

Academic year 2022/23 entry

Engineering
Leadership and Management
Technology
The Defence and Security Programme

Cranfield University

We are the UK's only specialist postgraduate university in technology and management, with longstanding relationships with some of the most prestigious global companies. Our close collaboration with industry, and passion for the areas we operate in, will help your career.

Specialist postgraduate

A research-focused professional community

81%

of our research is world-leading or internationally excellent

Research Excellence Framework (REF) 2014



THE QUEEN'S ANNIVERSARY PRIZES FOR HIGHER AND FURTHER EDUCATION 2019

Over **£150 million** of investment in new facilities over the past five years

Six-time winner of the Queen's Anniversary Prize for Higher and Further Education

A professional network of **70,000+** alumni, from 177 countries

5,000+ postgraduate students from 100+ countries

UK Top 5 for Engineering (Mechanical, Aeronautical and Manufacturing) QS World University Rankings by subject, 2021

As we are postgraduate only, we are not listed in league tables that help compare undergraduate universities, such as *The Times World Rankings* and *The Complete University Guide*.

"The future is ever more complex, uncertain and fast-paced. Preparing our Defence Academy graduates for this reality is our greatest – and most important – endeavour. Cranfield Defence and Security continues to play an innovative and far-sighted role in achieving this objective. Defence and Security's deep expertise and reputation are key to ensuring the postgraduate education required of UK Defence is world-leading."

Major General Andrew Roe, Chief Executive, Defence Academy and Commandant, Joint Services Command and Staff College



Reasons to study **Defence and Security** with us

1 Industry links

Our courses are regularly reviewed by an advisory panel of leading industry professionals to ensure content remains up-to-date and will provide you with the skills and knowledge to be at the forefront of industry needs and expectations. We also have a number of guest lectures, which include talks from partner organisations.

2 Learning from the best academics

We attract high-quality staff from around the world, who bring a diverse mix of backgrounds and experiences, to create a rich research and teaching environment.

3 Outstanding facilities

Our unique relationship with the UK Ministry of Defence allows you access to secure facilities, many of which are unique in the university sector, to support you in applying your research and learning. The decision analysis and risk management laboratory, Cranfield Ordnance Test and Evaluation Centre (COTEC), simulation and synthetic environment laboratory and engineering dynamics centre are just a few of the exceptional, purpose-built testing units available.

4 Teaching informed by research

Our research in the fields of engineering, technology, leadership and management ensures that what you learn is relevant and current.

5 Networking opportunities

You will have the opportunity to network with valuable industry contacts. Each year our student cohort includes individuals from industry, military and government backgrounds providing you with networking opportunities to meet those with diverse experiences. After graduation support continues from the alumni team enabling networking and continuing professional development.

6 Work on real-world projects

A number of student research projects focus on finding solutions to real-world problems, working on developments initiated by industry.

7 Funding opportunities

You may be eligible for a bursary or scholarship that are available to help with fees and/or living expenses. Please see page 26 for more information.



Defence and Security courses

Cranfield is one of the world's leading universities for defence and security education, research and consultancy.

Addressing the changing needs of an evolving sector, we provide specialist knowledge to industry, security and emergency services, military, governments and NGOs, underpinning defence and security sector reform around the world. As a postgraduate academic provider to the UK's Ministry of Defence, we offer a unique gateway to delivering practical education and solutions that make a real difference to the lives of military, security and civilian personnel.

Our academics' expertise ranges from energetics and defence acquisition to international stabilisation and cyber security.

The Defence and Security course portfolio encompasses the areas of engineering, leadership and management and technology.

Engineering

Tools for both military and civilian applications require specialist engineering expertise to adapt conventional engineering techniques for deployment in this industry. These range from surveillance to communication systems through to guided weapon systems. This group of courses will provide you with the skills you need in an engineering career in the defence or security sectors. **See pages 6 to 9** for a list of courses in this stream.

Leadership and management

Drawing on established expertise in international security and defence policy, analysis and management, this group of courses will prepare you for a management and leadership career specifically focused on the needs of the defence and security sector. Whether in private enterprise or government management, aspects from change management, through acquisition techniques, to strategic capacity building are covered in this subject stream. **See pages 10 to 11** for a list of courses in this stream.

Technology

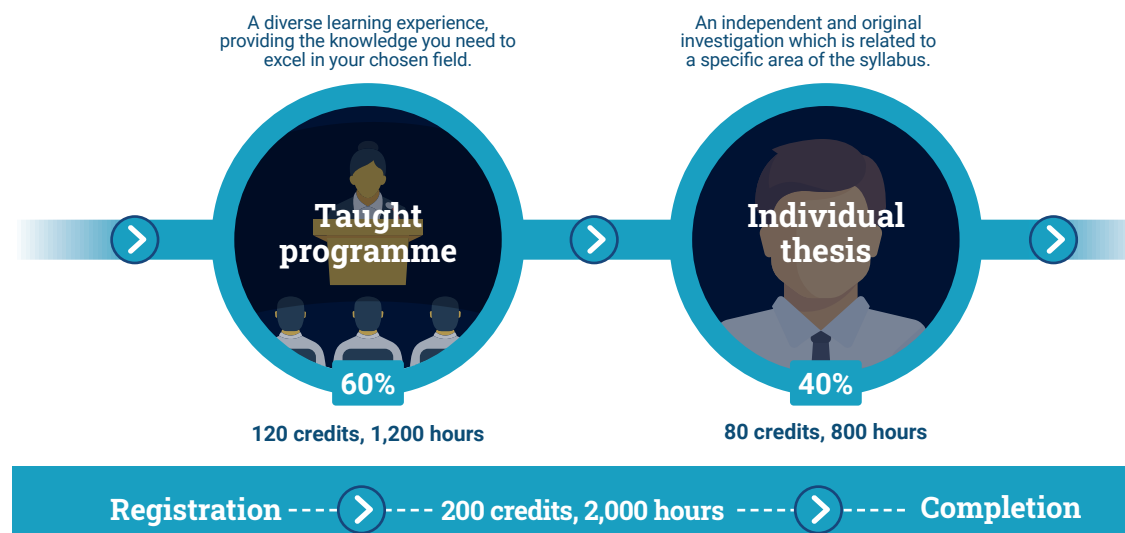
Technology is becoming an increasingly important aid to information in a modern defence and security setting. Designing suitable technology to support the effective collection of data to deploy appropriate technology systems requires extensive expertise. Choose from subjects ranging from operational research through to application modelling and simulation to gain the critical skills needed to manage complex challenges in this growing sector. **See pages 12 to 15** for a list of courses in this stream.

Course structure

There are two course structures for you to choose from to study our specialist, sector-facing master's courses. You can select a course shown on pages 6 to 15 – the typical course structure for this format is shown below.

Alternatively customise your degree in our Defence and Security Programme which you can read about on pages 16 to 21.

The below diagram is not indicative of all courses. Please check your course structure on our website for more detailed information, including the weight of each phase and full- or part-time course structure variations.



Engineering courses

Designed to develop your knowledge and skills in engineering principles and practices within the defence and security sector, our courses build on a wide variety of capabilities across the discipline. They will enable you to analyse emerging technologies to aid future defence needs, and apply engineering concepts to a range of complex defence challenges within ethical and regulatory requirements.

To keep our courses relevant and up-to-date, modules are subject to change. Modules typically form 60% of the course content, with the project or thesis making up the other 40% (see page 5). The information in this brochure regarding the number of modules normally applies to the MSc. Please see the website for alternative study options (PgCert or PgDip) and further module details.

Communications Electronic Warfare

www.cranfield.ac.uk/cew

PgCert
Part-time only

This PgCert covers a selection of communications electronic warfare topics relevant to military systems, such as the technical management of military radar, electro-optics and infrared sensor systems.

Compulsory modules

- Communications Electronic Warfare,
- Communications Principles,
- Communications Systems,
- Electromagnetic Propagation and Devices,
- Information Networks,
- Signal Processing, Statistics and Analysis.

Explosive Ordnance Engineering

www.cranfield.ac.uk/eoe • Accredited – see page 23

MSc, PgDip, PgCert
Full-time/Part-time

Designed to provide the advanced academic background necessary to contribute effectively to technically demanding projects in the field of explosive and explosion ordnance engineering.

Compulsory modules

- Computer Modelling Tools in Explosive Ordnance Engineering,
- Delivery Systems,
- Future Developments: Scanning the Horizon in Explosive Ordnance Engineering (EOE),
- Gun Propellants,
- Introduction to Explosives,
- Introduction to Pyrotechnics,
- Manufacture and Materials Properties of Explosives,
- Munitions and Target Response,
- Research Methodology,
- Testing and Evaluation of Explosives,
- Transitions to Detonations.

Elective modules (choose up to six)

- Addressing EOE Capability Gaps: Group Project,
- Commercial Explosives,
- Counter Improvised Explosive Devices Capability,
- Delivery Systems,
- Design for Vulnerability,
- Explosive and the Environment,
- Gun Propellants,
- Manufacture and Materials Properties of Explosives,
- Rocket Motors and Propellants,
- Safety Assurance for EOE,
- Testing and Evaluation of Explosives,
- Pyrotechnics.

Guided Weapon Systems

www.cranfield.ac.uk/gws • Accredited – see page 23

MSc, PgDip, PgCert
Full-time/Part-time

You will gain an understanding of the principles of guided weapon systems technology and all interrelated and multidisciplinary elements of the complete systems design process.

Compulsory modules

- Electro-optics and Infrared Systems 1,
- Electro-optics and Infrared Systems 2,
- Guided Weapon Applications – Control and Guidance,
- Guided Weapon Applications – Propulsion and Aerodynamics,
- Guided Weapon Control Theory,
- Guided Weapon Propulsion and Aerodynamics Theory,
- Guided Weapon Structures, Aeroelasticity and Power Supplies,
- Guided Weapon Systems,
- Guided Weapon Warheads, Explosives and Material,
- Radar Electronic Warfare,
- Radar Principles,
- Signal Processing, Statistics and Analysis.

Gun Systems Design

www.cranfield.ac.uk/gsd

MSc, PgDip, PgCert
Full-time/Part-time

You will benefit from education and training in selected weapons systems and gain a depth of knowledge to undertake engineering analysis or the evaluation of relevant sub systems.

Compulsory modules

- Armoured Fighting Vehicle and Weapon Systems,
- Element Design,
- Finite Element Methods in Engineering,
- Fundamentals of Ballistics,
- Ordnance Design,
- Military Vehicle Propulsion and Dynamics,
- Modelling, Simulation and Control,
- Solid Modelling CAD,
- Survivability,
- Vehicle Systems Integration,
- Weapon Systems Technology.

Elective modules (choose one)

- Guided Weapons,
- Light Weapon Design,
- Reliability and Systems Effectiveness,
- Rocket Motors and Propellants,
- Uninhabited Military Vehicle Systems.



Military Aerospace and Airworthiness

www.cranfield.ac.uk/maa • Accredited – see page 23

MSc, PgDip, PgCert
Part-time only

Designed to provide practicing engineers with further knowledge and skills in aerospace engineering, airworthiness and safety.

Compulsory modules

- Airworthiness of Military Aircraft,
- Aviation Safety Management,
- Fixed-wing Aeromechanics,
- Propulsion Systems,
- Safety Assessment of Aircraft Systems.

Elective modules (choose seven)

- Air Transport Engineering – Maintenance Operations,
- Aircraft Accident Investigation and Response,
- Aircraft Fatigue and Damage Tolerance,
- Aircraft Survivability,
- Design Durability and Integrity of Composite Aircraft Structures,

- Fundamentals of Aircraft Engine Control,
- Guided Weapons,
- Human Factors in Aviation Management,
- Introduction to Aircraft Structural Crashworthiness,
- Introduction to Human Factors,
- Mechanical Integrity of Gas Turbines,
- Military Aircraft Systems,
- Military Avionics – Surveillance and Target Acquisition, Communications and Navigation,
- Practical Reliability,
- Rotary-wing Aeromechanics.

Military Electronic Systems Engineering

www.cranfield.ac.uk/mese

MSc, PgDip, PgCert

This course will provide you with a high level of understanding and detailed knowledge of military communications and sensor systems, especially in electronic warfare. In addition, you can supplement your learning with an in-depth investigation into an area of electronic warfare to further enhance your analytical skills.

Compulsory modules

- Communications Principles,
- Communications Systems,
- Electromagnetic Propagation and Devices,
- Electro-optics and Infrared Systems 1,
- Radar Principles,
- Signal Processing, Statistics and Analysis.

Elective modules (choose six)

- Advanced Radar,
- Advanced Sensor Data Processing,
- Communications Electronic Warfare,
- Electro-optics and Infrared Systems 2,
- Foundations of Modelling and Simulation,
- Information Networks,
- Radar Electronic Warfare.

“The knowledge and skill of the lecturers in delivering their courses provided an invaluable benefit to producing competent students.”

Matthew Hume, System Engineer, Capability Acquisition and Sustainment Group, Australian Defence Force, (Military Electronic Systems Engineering MSc 2018)



Military Vehicle Technology

www.cranfield.ac.uk/mvt

MSc, PgDip, PgCert

This course is for military officers, defence industry staff and government staff in preparation for senior posts in project management teams concerned with the design, development, procurement and operation of military vehicles. You will cover all aspects of vehicle logistics and technology of military fighting, and be able to choose areas of specialisation.

Compulsory modules

- Armoured Fighting Vehicle and Weapon Systems,
- Military Vehicle Dynamics,
- Modelling, Simulation and Control,
- Solid Modelling CAD,
- Survivability,
- Finite Element Methods in Engineering,
- Military Vehicle Propulsion,
- Weapon System Technology,
- Vehicle Systems Integration.

Elective modules

Either choose two:

- Element Design,
- Fundamentals of Ballistics,
- Guided Weapons,
- Light Weapon Design,
- Military Vehicle Propulsion and Dynamics,
- Reliability and System Effectiveness,
- Rocket Motors and Propellants,
- Uninhabited Military Vehicle System.

Or choose:

- Ordnance Design.

Sensors Electronic Warfare

www.cranfield.ac.uk/sew

PgCert

Designed to benefit officers of the Armed Forces and for scientists and technical officers in government defence establishments and defence industry, this PgCert explains the expertise behind military systems such as electro-optics, infrared sensor systems and management of military radar.

Compulsory modules

- Electromagnetic Propagation and Devices,
- Electro-optics and Infrared Systems 1,
- Electro-optics and Infrared Systems 2,
- Radar Electronic Warfare,
- Radar Principles,
- Signal Processing, Statistics and Analysis.



Leadership and Management courses

The application of management and leadership concepts is key to the defence and security sector. These courses will enable you to evaluate and apply appropriate analysis tools and techniques for solving complex and uncertain problems, and drive future defence and security strategy.

To keep our courses relevant and up-to-date, modules are subject to change. Modules typically form 60% of the course content, with the project or thesis making up the other 40% (see page 5). The information in this brochure regarding the number of modules normally required applies to the MSc. Please see the website for alternative study options (PgCert or PgDip) and further module details.

Defence and Security Export

www.cranfield.ac.uk/dse • Cranfield campus

PgCert
Part-time only

This course is for those working within the defence and security sector who are looking to expand their knowledge in defence and security marketing. You will explore key aspects of defence exports, including spanning strategic trade controls, compliance, offset and negotiation.

Compulsory modules

- Defence and Security Marketing,
- Defence and Security Offset,
- Legal Ethical and Political Defence and Security Frameworks,
- Negotiations,
- Strategic Trade Controls and Compliance,
- Independent Study Project.

Systems Thinking Practice

www.cranfield.ac.uk/systemsthinking

MSc, PgDip, PgCert
Part-time only

The ever changing external climate we now find ourselves in has changed how organisations work and their decision making process. Systems thinking has become critical to success; organisations need to focus on their systems and the need for adaptability and resilience like never before.

Compulsory modules

- Fundamentals of Systems Thinking,
- Introduction to Systems Methods,
- Dialogue and Collaboration,
- Systems Practice,
- Systems Leadership and Organisational Behaviour,
- Formal Representation of Systems,
- Complex Systems,
- Systems Research Methods,
- Systems Thinking Development and Exploitation,
- Philosophy and Theory of Systems Thinking,
- Architecting Enterprises,
- Systems Thinking for Social Change,
- Requisite Variety for Organisations,
- Systems Thinking Thesis,



“The project itself was really interesting and obviously it is based at the Defence Academy site which is a very unique place to work, and that attracted me because of the opportunities that the site offers.”

Sarah Gosling, current student, (Defence and Security PhD)



Technology courses

Equip yourself with a range of models, tools and skills to assess risk and propose innovative technological solutions for products, systems, components or processes to support multiple roles across defence and security.

To keep our courses relevant and up-to-date, modules are subject to change. Modules typically form 60% of the course content, with the project or thesis making up the other 40% (see page 5). The information in this brochure regarding the number of modules required applies to the MSc. Please see the website for the PgCert or PgDip requirements and further module details.

Counterterrorism

www.cranfield.ac.uk/counterterrorism • Cranfield campus

MSc, PgDip, PgCert
Part-time

The Counterterrorism MSc will provide you with an understanding of how traditional and advanced techniques in counterterrorism are used in the modern day world. You will gain clear insight into how research and ideas can be applied to help resolve real-world problems in this critical arena.

Compulsory modules

- Introductory Studies,
- Understanding Terrorism and Counterterrorism,
- Applied Counterterrorism,
- Strategies, Ideologies and Tactics of Terrorism,
- Research Project (Thesis).

Elective modules (select 50 credits. 10 credits per module unless highlighted)

- Protecting Critical National Infrastructure,
- Cyber Terrorism,
- CBRN Terrorism,
- Terrorism Risk Management and Mitigation*,
- Risk, Crisis and Resilience,

- Counterterrorism and Intelligence,
- Diplomacy and Conflict Resolution,
- Terrorism and the Law,
- Investigation and Evidence Collection,
- Reasoning for Forensic Science,
- Analytical Techniques*,
- Courtroom Skills,
- Fires, Explosions and their Investigation,
- Introduction to Firearms Investigations and Forensic Ballistics,
- Firearms Investigations,
- Forensic Ballistics Investigations,
- Counter-Improvised Explosive Devised Capability,
- Forensic Exploitation and Intelligence.

Counterterrorism, Risk Management and Resilience

www.cranfield.ac.uk/riskandresilience • Cranfield campus

MSc, PgDip, PgCert
Full-time/Part-time

The Counterterrorism, Risk Management and Resilience MSc provides expertise on the risk management and mitigation of terror and how its role is increasingly important. This course will particularly support those already working or planning a career in the sector of risk management and mitigation.

Compulsory modules

- Introductory Studies,
- Understanding Terrorism and Counterterrorism,
- Applied Counterterrorism,
- Strategies, Ideologies and Tactics of Terrorism,
- Terrorism Risk Management and Mitigation,
- Risk, Crisis and Resilience,
- Research Project (Thesis).

Elective modules

- Protecting Critical National Infrastructure,
- Cyber Terrorism,
- CBRN Terrorism,
- Counterterrorism and Intelligence,
- Courtroom Skills,
- Fires, Explosions and their Investigation,
- Counter-Improvised Explosive Devised Capability,
- Forensic Exploitation and Intelligence.

Cyber Defence and Information Assurance

www.cranfield.ac.uk/cdia • Accredited – see page 23

MSc, PgDip, PgCert
Full-time/Part-time

Designed to develop professionals who can lead in a cyber environment, this course focuses on understanding and articulating the executive-level responses to serious present and emerging threats in the information domain.

Compulsory modules

- Applied Cyber Concepts Project,
- Critical Networks and Process Control,
- Cyber Attack – Threats and Opportunities,
- Cyber Systems Thinking and Practice,
- Foundations: Management of Cyber,
- Incident Management,
- Research Methods,

- Social Technologies,
- The Human Dimension,
- Understanding Risk.

Elective modules (choose one)

- Data-led Decision Support,
- Emerging Technology Monitoring.

Cyberspace Operations

www.cranfield.ac.uk/cyops

MSc, PgDip, PgCert
Full-time/Part-time

The Cyberspace Operations MSc is designed to develop professionals to support manoeuvres in cyberspace, in contested operations and as part of integrated planning.

Compulsory modules

- Cyber Attack – Threats and Opportunities,
- Cyber Systems Thinking and Practice,
- Cyberwarfare in Intelligence and Military Operations,
- Foundations: Management of Cyber,
- Incident Management,
- Research Methods,
- Social Technologies,
- Understanding Risk.

Elective modules (select 30 credits)

Choose 20 credits from the following modules:

- The Human Dimension (10 credits),
- Critical Networks and Process Control (10 credits),
- Applied Cyber Concepts Project (20 credits).

Choose 10 credits from the following modules:

- Data-led Decision Support (10 credits),
- Emerging Technology Monitoring (10 credits).



Defence Simulation and Modelling

www.cranfield.ac.uk/dsm

MSc, PgDip, PgCert
Full-time/Part-time

The application of modelling and simulation continues to enhance and transform both systems development and training. You will address the design, development, procurement, use and management of models and simulations for applications in experimentation, training, testing, analysis and assessment of military forces, systems and equipment.

Compulsory modules

- Computer Graphics,
- Discrete and Continuous Simulation,
- Experimentation Analysis and Trials for Simulation,
- Foundations of Modelling and Simulation,
- Intelligent Systems,
- Networked and Distributed Simulation,
- Networked and Distributed Simulation Exercise,
- War Gaming and Combat Modelling,
- Weapon Systems Performance Assessment.

Information Capability Management

www.cranfield.ac.uk/icm • Accredited – see page 23

MSc, PgDip, PgCert
Full-time/Part-time

You will focus on the value of information and the principles and practice that underlie secure, effective and efficient business systems that exploit information in order to provide business benefit.

Compulsory modules

- Cyber Security and Information Assurance,
- Data-led Decision Support,
- Data Modelling, Storage and Management,
- Digital Business Strategy,
- Emerging Technology Monitoring,
- Foundations of Information Systems,
- Methods and Tools for Information Systems Development,
- Organisational Development,
- Professional Issues,
- Programme and Project Management for Information Systems,
- Software Engineering,
- Systems Architecture.

Military Operational Research

www.cranfield.ac.uk/mor

MSc, PgDip, PgCert
Full-time/Part-time

Operational research plays an important role in supporting a broad range of decision-making in the military environment. You will examine the context, issues and methods used to analyse the increasingly complex challenges in the defence environment, and to support decision making.

Compulsory modules

- Decision Analysis,
- Discrete and Continuous Simulation,
- Intelligent Systems,
- Introduction to Operational Research Techniques,
- Logistics Modelling,
- Statistical Analysis and Trials,
- War Gaming and Combat Modelling,
- Weapon System Performance Assessment.

“The research community is very diverse, with students from across the world. This interaction with various people and cultures is a very enjoyable aspect of Cranfield University at Shrivenham. I have met some wonderful people here, and the environment is really supportive and conducive to education.”

Akhil Kallepalli, current student, (Defence and Security PhD)



Systems Engineering

www.cranfield.ac.uk/systemsengineering • Cranfield campus

MSc, PgDip, PgCert
Part-time

Systems engineers address some of the most complex challenges and problems that society faces. This course will equip you to address the root causes of a problem situation, understanding requirements from multiple perspectives and the tension that may exist between them. You will learn to think about the issues that may arise throughout the lifetime of a system, from concept to retirement, and to check robustly and rigorously that the system will meet user requirements throughout its lifecycle.

Compulsory modules

- Introduction to Systems and Systems Engineering,
- Enterprise Management,
- Problem Analysis and System Definition,
- System Design and Realisation,
- Problem Analysis and System Definition Workshop,
- System Design and Realisation Workshop,
- Research Methods,
- Human Systems Engineering,
- Dependability and Resilience,
- Simulation in the Systems Engineering Lifecycle,
- Software and Cyber Systems Engineering,
- Megaproject Systems.

Systems Thinking Practice

www.cranfield.ac.uk/systemsthinking • Cranfield campus

MSc, PgDip, PgCert
Part-time

The purpose of the systems thinking practitioner is to support decision-makers in strategic and leadership roles to understand and address complex and sometimes even multi-layered problems through provision of expert systemic analysis.

Compulsory modules

- Fundamentals of Systems Thinking,
- Introduction to Systems Methods,
- Dialogue and Collaboration,
- Systems Practice,
- Systems Leadership and Organisational Behaviour,
- Formal Representation of Systems,
- Complex Systems,
- Systems Research Methods,
- Systems Thinking Development and Exploitation,
- Philosophy and Theory of Systems Thinking,
- Architecting Enterprises,
- Systems Thinking for Social Change,
- Systems Thinking Thesis.



The Defence and Security Programme

Customise your degree

The Defence and Security Programme opens up our teaching portfolio and is designed to give you the flexibility to tailor your own learning pathway.

Who is this for?

Through the different routes, you can choose how and what you'll learn, in a way that can fit in with your lifestyle and work commitments. Whether you're a new graduate, a previous apprentice, someone with years of experience looking for senior positions, or even wanting to transition between disciplines, this programme has the flexibility to suit you.

Length of study

The programme is offered part-time. Typical completion for the MSc is three years, with two years for the PgDip or PgCert.

How is the Programme structured?

The Defence and Security Programme offers three degree streams in Engineering, Leadership and Management and Technology, which all contain extensive elective choices to meet the varying requirements of both learners and employers. There are two learning routes to the Defence and Security Programme:

MSc route

As part of the MSc route, you can decide whether you want either an increased depth or greater breadth of understanding. Within this route, you can select elective modules specific to your chosen stream, or alternatively choose two modules from across any of the three streams. Like our other degrees, this MSc route within the Defence and Security Programme is completed with a thesis.

Capstone route

The Capstone route is mostly delivered at distance, making it both more flexible and more affordable. Unlike the traditional MSc route that includes the completion of a thesis, the Capstone MSc route contains a Capstone Development and Exploitation module followed by a Capstone Portfolio Project. The Project is made up of multiple pieces of work that can be applied to a business case, with direct impact and exploitation potential within your business context.

Delivery method

Delivered through a combination of face-to-face, distance and blended modules, the Programme provides you with maximum flexibility. The high proportion of distance learning makes it ideal for those with demanding careers.

Subject streams

All streams have common core modules providing essential professional competencies (see programme structure on page 18). Through the broad choice of elective modules, each stream further provides depth in specialist topics aligned with their relevant range of disciplines.

You can centre your learning around these three subject streams – choose from the extensive list of elective modules on pages 20 and 21.

Defence and Security (Engineering)

MSc route: MSc, PgDip, PgCert
Capstone MSc route: MSc, PgCert
(Part-time only)

www.cranfield.ac.uk/dspengineering



Defence and Security (Leadership and Management)

MSc route: MSc, PgDip, PgCert
Capstone MSc route: MSc, PgCert
(Part-time only)

www.cranfield.ac.uk/dspleadership



Defence and Security (Technology)

MSc route: MSc, PgDip, PgCert
Capstone MSc route: MSc, PgCert
(Part-time only)

www.cranfield.ac.uk/dsptechnology



More details are available on our website.

See www.cranfield.ac.uk/defenceandsecurityprogramme

The Defence and Security Programme

Course structure

Once you have decided on your subject stream, you have two routes to choose from to further customise your learning pathway.

MSc route 200 credits

PgCert 60 credits

Compulsory modules

Introduction to Defence and Security	10 credits
Leadership and Management	10 credits
Stakeholder Management and Organisational Behaviour	10 credits
Decision Analysis and Support	10 credits

Elective modules

Two stream specific modules	20 credits
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PgDip 60 credits

Compulsory modules

Research Methods	10 credits
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Elective modules

Three stream specific modules	30 credits
Two additional modules from any stream	20 credits



MSc 200 credits

Thesis	80 credits
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Capstone route 200 credits

PgCert 60 credits

Compulsory modules

Introduction to Defence and Security	10 credits
Leadership and Management	10 credits
Stakeholder Management and Organisational Behaviour	10 credits
Decision Analysis and Support	10 credits

Elective modules

Two stream specific modules	20 credits
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MSc 200 credits

Capstone Development and Exploitation	40 credits
Capstone Portfolio	100 credits



“From an industrial perspective, the Defence and Security Programme will provide the much needed flexibility in supporting both practical and higher taught learning.”

Professor Nick Barlow CEng FIET FIoD MIExpE,
Technical Manager Business Development, Chemring Countermeasures Ltd



The Defence and Security Programme

Elective modules

Customise your degree using these tables, following the course structure you have selected on the previous page.

Engineering

Elective modules	Related course
Fires, Explosions and their Investigations, Forensic Investigation of Explosives and Explosive Devices, Introduction to Firearms Investigations and Forensic Ballistics.	Forensic MSc Programme (see www.cranfield.ac.uk/cfi).
Element Design, Fundamentals of Ballistics, Military Vehicle Propulsion and Dynamics, Modelling Simulation and Control, Reliability and Systems Effectiveness, Survivability, Vehicle Systems Integration, Weapon Systems Technology.	Gun Systems Design (see page 7), Military Vehicle Technology (see page 9).
Aviation Safety Management, Guided Weapons, Introduction to Human Factors, Mechanical Integrity of Gas Turbines, Military Aircraft Systems, Practical Reliability.	Military Aerospace and Airworthiness (see page 8), Military Vehicle Technology (see page 9).

Leadership and Management

Elective modules	Related course
Defence and Security Offset, Legal Ethical and Political Frameworks for Defence Negotiation.	Defence and Security Export (see page 10).
Counterterrorism and Intelligence, Defence in the 21st Century, Defence Sector and Organisational Behaviour, Global Security; Culture and Complexity, Global Security; Emerging Challenges, Sustainability in Defence, Leadership Studies Classical and Modern, National Security; Resilience and Crisis, Programme and Project Management, The Psychology of Leadership, Risk, Crisis and Resilience, Strategic Management in Defence, Negotiation, The International Dimensions of Defence Acquisition, Managing Acquisition Change, Financing Acquisition, Gender, Violence and Armed Conflict.	Defence and Security Programme.

Technology

Elective modules	Related course
Foundations of Cyber, Social Technologies, The Human Dimension.	Cyber Defence and Information Assurance (see page 13), Cyberspace Operations (see page 13).
Data-led Decision Support.	Cyber Defence and Information Assurance (see page 13), Cyberspace Operations (see page 13), Information Capability Management (page 13).
Real-Time Graphics, Foundations of Modelling and Simulation.	Defence Simulation Modelling (see page 14).
Intelligent Systems, War Gaming and Combat Modelling.	Defence Simulation Modelling (see page 14), Military Operational Research (see page 14).
Digital Crime and Investigation.	Forensic MSc Programme (see www.cranfield.ac.uk/cfi).
Emerging Technology Monitoring, Methods and Tools for Information Systems Development, Organisational Development, Programme and Project Management for Information Systems, Software Engineering.	Information Capability Management (see page 14).
Introduction to Operational Research Techniques, Logistics Modelling, Statistical Analysis and Trials.	Military Operational Research (see page 14).
Introduction to Systems and Systems Engineering, Enterprise Management, Problem Analysis and System Definition.	Systems Engineering (see page 15).

Further options

MSc by Research in Defence and Security

This is a structured programme of research involving a review of literature, collection and analysis of data and presentation of the results in a thesis. The thesis is required to demonstrate a higher academic standard than the taught MSc thesis in terms of originality, innovative features, depth of analysis or a combination of all these factors. It is not as complex as a PhD research programme, which is typically undertaken over a three-year study period. The subject area can be any area related to the defence and security sector and agreed in consultation with the master's research supervisor.

PhD in Defence and Security

Completion of a PhD involves original research work which results in either developing entirely new areas of study, or is concerned with the application of novel and existing ideas in new ways and new fields of activity. A programme of support and a dedicated supervisor, together with research training programmes, are provided to help you achieve your PhD. Our flexible approach to studying at Cranfield allows you to carry out part of your research away from the University, whether it is overseas, or you need to undertake extensive local fieldwork to research a problem of local relevance. The qualification can be completed in three years full-time, or six years part-time.

Academic staff

You will be taught by a wide range of subject specialists drawn from the University staff and supported by industry professionals, who bring their research and industrial expertise to provide stimulating and informed input to your learning experience.



Dr Stephanie Burrows, Research Fellow in Computational Modelling

Stephanie completed her PhD in Applied Mathematics at the University of Southampton in 2014. After completing her PhD, Stephanie went to work as a software developer at SFW Ltd. There she honed her programming skills, and developed an interest in modern software design and development practices. Stephanie joined Cranfield University in 2016 as part of the Centre for Simulation and Analytics as a research fellow in computational modelling and works in a variety of areas of testing and simulation using in-house software.



Dr Licia Dossi, Lecturer in Defence Chemistry

Licia is a RSC Chartered Chemist and Chartered Scientist, with expertise in synthetic polymer chemistry and explosives chemistry gained from 30 years' experience in UK and European Academic institutions. She graduated with an MSc in Chemistry from Pisa University, Italy and received her PhD in Biomaterials from Brescia University Italy. Licia worked in Italy until 1998 when she moved to the UK, and after working at Bristol University joined Cranfield University in 2008 where she is now part of the synthesis and formulation group at the Centre for Defence Chemistry and has a recognised teaching status for higher education.



Sean Price, Lecturer in Systems Engineering

After reading a BSc in Applied Mathematics at Warwick University in 1987 as an Army Undergraduate Cadet and on completion of training at the Royal Military Academy Sandhurst in 1988, Sean was commissioned into the Royal Welch Fusiliers and subsequently served in the UK and Germany. Sean completed a master's degree in Defence Simulation and Modelling at Cranfield University in 1996 and joined the academic team until 2003, returning in early 2019 after holding managerial positions in a number of defence and education companies.

"The course leader was always there for me and ready to assist with any course challenges, and would direct me to the relevant person for expert information. Equally, the support staff were always on hand to help me with any questions I had and were always incredibly helpful."

Khuthadzo Lourate Mutele-Nkuna, South African Navy,
(Explosive Ordnance Engineering MSc 2019)

Key facts and statistics

Course information



Full-time
One year



Part-time
Up to five years
See the course webpage for more information about part-time study.



Start date
Different courses have different start dates throughout the year. Please see the individual course webpage for details.



Location
Our courses are either delivered at the Defence Academy of the United Kingdom, Shrivenham or Cranfield. Please see individual course webpages.



Fees
Please see the individual course webpage for fee information and full-time or part-time options. Terms and conditions apply.

See www.cranfield.ac.uk/fee-information

Cohort profile*



Average cohort age
30-39 years



Average cohort size
14

Accreditations

Engineering

Our Explosive Ordnance Engineering MSc, Gun Systems Design MSc and Military Vehicle Technology MSc are all accredited by the Institution of Mechanical Engineers (IMechE) and the Institution of Engineering and Technology (IET).

Guided Weapon Systems MSc and Military Aerospace and Airworthiness MSc are both Engineering Council accredited degrees and are accredited by the Royal Aeronautical Society (RaES).

Technology

The Cyber Defence and Information Assurance MSc is supported by the UK Government's Cabinet Office and the Office of Cyber Security and Information Assurance. The MSc is also accredited by the Chartered Institute of Library and Information Professionals (CILIP).

The Information Capability Management MSc is accredited by the Chartered Institute of Library and Information Professionals and the British Computer Society (BCS).

The Defence and Security Programme
All MScs and PgCerts within the programme are dual-accredited by the Institute of Leadership and Management (ILM).



Careers

The applied and practical research you will do on your course will ensure that you will be valued by a wide variety of organisations across the world. Successful graduates can expect to go on to a range of careers as professional scientists or engineers in the defence and security sector, in roles across the full breadth of industrial and public sector organisations.

These are some of the specific roles our students have gone on to:

Roles

- Principal Associate,
- Materials Services Laboratory Manager,
- Programme Director (Business Aviation),
- Head of Aerodynamics,
- Engineering Director,
- Systems Engineering Officer,
- Executive Officer,
- Combat Air Subject Matter Expert.

Organisations

- QinetiQ,
- MBDA,
- Dstl,
- Renault Sport F1,
- Royal Navy,
- Rolls-Royce,
- Chilean Navy,
- BAE Systems.

Events

Join in with our virtual open days which offer you the opportunity to meet and talk with the academics, admissions staff and alumni about the Cranfield experience. www.cranfield.ac.uk/events/open-day

We also attend recruitment events both virtual and in person. These offer you the opportunity to speak to our academics and admissions team and ask any questions you may have.

To view our events calendar please visit: www.cranfield.ac.uk/events



Industry links

Cranfield has unrivalled links with industry and military organisations worldwide. You will benefit from our extensive contacts and track record of close collaboration with the defence and security sector.

QinetiQ - UK's future combat vehicle fleet research project

We are working with the Government and various partners on a three-year project exploring innovative solutions for ground vehicle mobility to boost the capabilities of future UK ground forces. The project is led by QinetiQ with a £3.2 million investment from the Defence Science and Technology Laboratory (Dstl).

Other partners in the project are Formula 1 motorsport engineers, Williams Advanced Engineering; military vehicle suspension specialists, Horstman Defence Systems; vehicle development and safety consultants, MIRA; control systems experts, Contract Innovation; and innovation and simulation leaders, Catalist Corporation.

Defence Academy UK - National Cyber Deception Laboratory (NCDL) aiding the MOD

We recently launched the National Cyber Deception Laboratory (NCDL) with the Defence Cyber School at the Defence Academy, Shrivenham. The lab aims to bring together practitioners and researchers across Government, academia and industry to facilitate research and provide guidance in the context of national security.

We are currently working together to develop a national focal point for cyber deception and help the UK Ministry of Defence (MOD) better defend their networks in cyberspace.

Examples of the organisations we work with



BAE SYSTEMS



MBDA
MISSILE SYSTEMS



Financing your studies

The Apprenticeship Levy

The Apprenticeship Levy is a levy on UK employers with a pay bill of more than £3 million. An organisation can use its levy to fund apprenticeship training against approved apprenticeship standards.

These standards are developed by industry-led Trailblazer Groups and are based on occupational competence, and the knowledge, skills and behaviours of particular roles. The standards combine on-the-job experience, and off-the-job training with an academic qualification. Your organisation may use its levy funds to sponsor UK employees on a course that is mapped to one of the standards.

Courses with apprenticeship status:

- Explosives Ordnance Engineering,
- Systems Engineering,
- Systems Thinking Practice.

Any qualifications offered under the Levy are subject to external governance and regulatory changes. Please read more on www.cranfield.ac.uk/masterships

Salary sacrifice

The use of salary sacrifice in the UK can help you and your employers reduce the net cost of paying for work-related study.

Your organisation enters into an agreement to fund your study, with you agreeing to a reduction in your salary for a defined period corresponding to an agreed portion of the course fees. Training fees are often tax deductible for organisations as well.

If you are not being sponsored by your employer or through the Apprenticeship Levy, we can provide information and a range of online tools to help you put together the funding package you need for your course and living costs.

There is more information on our website:

www.cranfield.ac.uk/funding

How to apply

Read more about our entry requirements and how to apply on our website.

www.cranfield.ac.uk/apply

Life at Cranfield

Cranfield University at Shrivenham

Cranfield University at Shrivenham is located at the Defence Academy, which is a secure Ministry of Defence (MOD) site. It is situated in beautiful countryside near Swindon, with quick and convenient links to London and major UK airports.

Cranfield Campus

Located just over an hour from London in the English countryside, Cranfield's campus environment supports close, working relationships between our multinational postgraduate students and academic and industry experts.

www.cranfield.ac.uk/visit



Important information about security clearance for courses that are held in full or part at Shrivenham

Some Cranfield University courses are delivered at the Defence Academy of the United Kingdom, Shrivenham which is a Ministry of Defence (MOD) site. All applicants to courses that are wholly or partially delivered at Shrivenham must complete the BPSS (HMG Baseline Personnel Security Standard V4 April 2014) prior to registration on the course or must already hold a security clearance to this level or higher. It will take additional time to process your BPSS clearance application and you will not be able to do this course if you fail to obtain this. Please refer to the course page on the website for full details.

Take a virtual tour to see inside some of our facilities:

virtualtour.cranfield.ac.uk

Cranfield University works with over

1,500 businesses and governments
based in over 40 countries

These organisations include:

AIRBUS



BAE SYSTEMS

BOMBARDIER



www.cranfield.ac.uk/defenceandsecurity

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E: [cadsadmissionsoffice@cranfield.ac.uk](mailto:cdsadmissionsoffice@cranfield.ac.uk)

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Every effort is made to ensure that the information in this brochure is correct at the time it is printed. Please check our website for the latest information. Photographs in this publication were taken prior to and during the coronavirus pandemic. We continue to monitor the pandemic and take all the necessary steps to ensure the health, safety and wellbeing of our Cranfield community. Selected images Crown copyright 2021. See www.cranfield.ac.uk/coronavirus

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