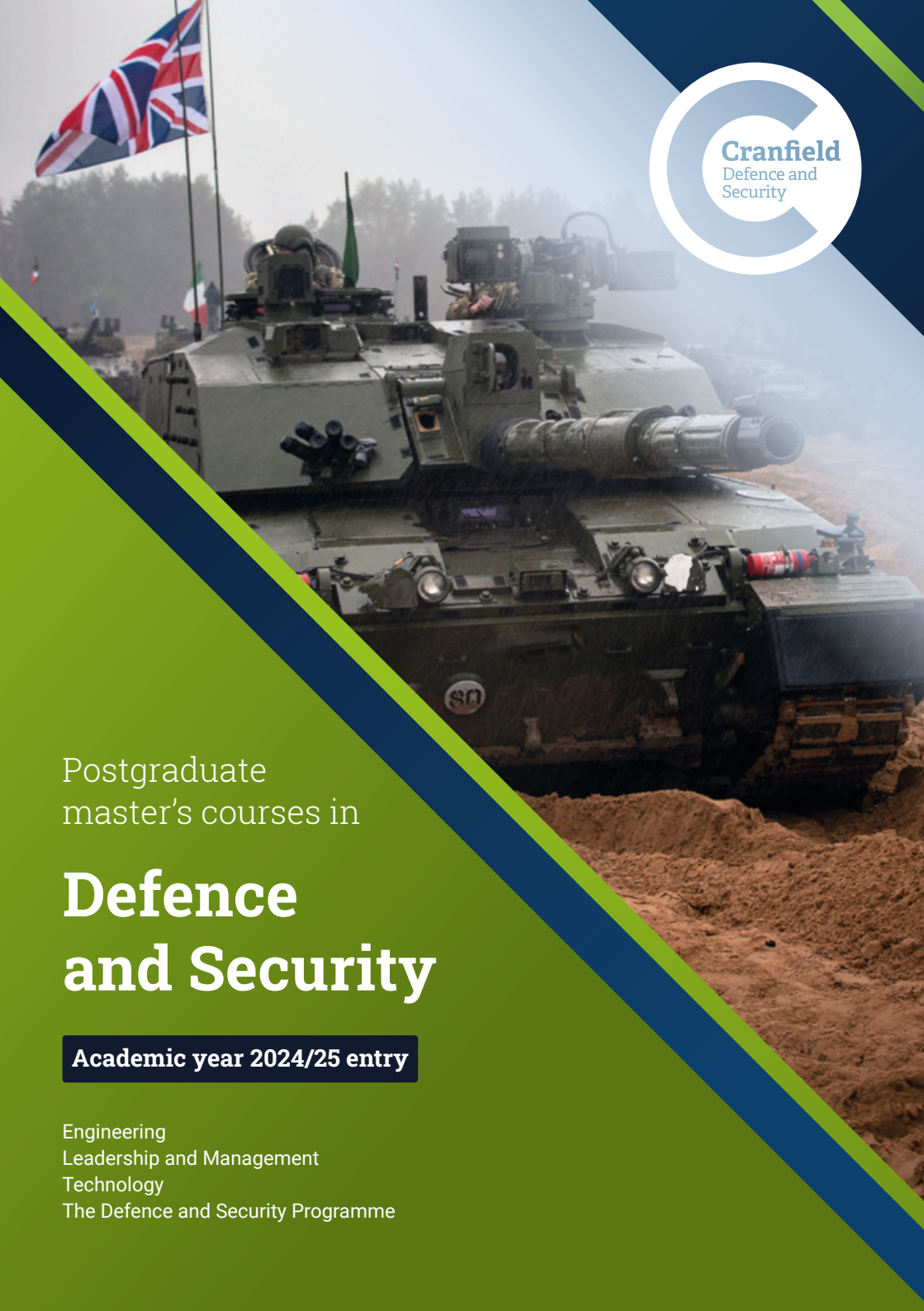


Cranfield
Defence and
Security

Postgraduate
master's courses in

Defence and Security

Academic year 2024/25 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

88%
of our research is **world-leading or internationally excellent**
Research Excellence Framework (REF) 2021

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

Top 30 in the world
for Engineering – Mechanical, Aeronautical and Manufacturing
QS World University Rankings by subject, 2023

A professional network of 75,000+ alumni, from 177 countries

5,000+ postgraduate students from 100+ countries

Unique aerospace facilities
We have our own **runway,** our own **airport,** our own **aircraft** and our own **air navigation service provider.**

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 opportunites
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.


Guided Weapons Hall.


Innovate future developments.

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

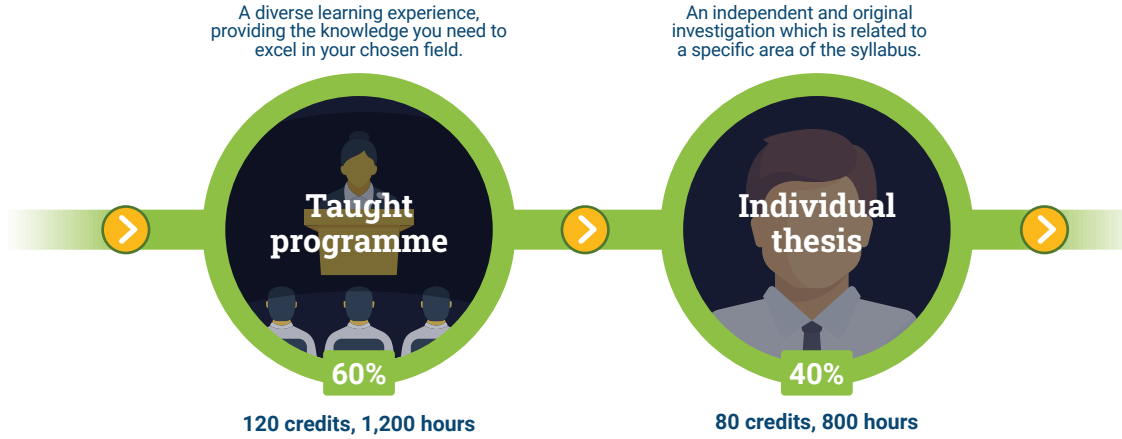
Technology is becoming an increasingly important aid to information in a modern defence and security setting. Designing suitable technology to support the effective collection of data to deploy appropriate technology systems requires extensive expertise. Choose from subjects ranging from operational 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

Whether you are a student interested in our wide portfolio of defence university courses, or you would like to exploit our excellent research, test and evaluation capabilities, we offer a unique gateway to delivering defence education and solutions that make a real difference to the lives of our military, security and civilian personnel.

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

Designed for officers of the armed forces and for scientists and technical officers in government defence establishments and the defence industry. This PgCert will cover military communications systems, including the specification, analysis, development, procurement and technical management of military information systems.

Compulsory modules

- 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

We see, hear and use thousands of explosives around the world every day, from the military and defence sector to mining and other industrial operations. This means the requirement for expertise in explosives and their engineering is crucial.

It will teach you the necessary understanding behind explosives engineering, munitions and target response and look to the future in explosives development.

Compulsory modules

- Future Developments: Scanning the Horizon in Explosive Ordnance Engineering (EOE),
- Introduction to Explosives Engineering,
- Munitions and Target Response.

Elective modules (choose up to six)

- Commercial Explosives,
- Counter Improvised Explosive Devices Capability,
- Delivery Systems,
- Design for Vulnerability,
- Explosives 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

As one of our flagship courses, we have an outstanding reputation within the guided weapons community. The course meets the requirements of all three UK armed services and is also open to students from NATO countries, Commonwealth forces, selected non-NATO countries, the scientific civil service and industry.

It takes you on to an understanding of the principles of guided weapon systems technology and all interrelated and multi-disciplinary facets involved with the complete systems design process.

Compulsory modules

- Introductory and Foundation Studies,
- Electro-optic and Infrared Systems 1,
- Electro-optic and Infrared Systems 2,
- Guided Weapons - Control Theory,
- Guided Weapons - Propulsion,
- Guided Weapons - Aerodynamics,
- Guided Weapons - Energetics,
- Missile Systems Design,
- Guided Weapons - Structures, Aeroelasticity and Materials,
- Radar Principles,
- Signal Processing, Statistics and Analysis.

Gun Systems Design

www.cranfield.ac.uk/gsd

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

Built for officers of the armed forces and for scientists and technical officers in government defence establishments and the defence industry. The Gun Systems Design MSc focuses on the specification, analysis, development, technical management or operation of weapons systems.

We provide education and training in selected weapons systems and provide you with the depth of knowledge to undertake engineering analysis or the evaluation of relevant subsystems.

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.

Reacher Large mobile X-Band Satellite ground terminal.

Military Aerospace and Airworthiness

MSc, PgDip, PgCert
Part-time only

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

Today's military aviation platforms are complex systems and it is essential, therefore, that they are deployed and maintained in such a way as to ensure their continued airworthiness and the safety of the crew operating them. Achieving this requires engineers to be cognisant of a broad-range of aerospace engineering, airworthiness and safety disciplines.

Our MSc distinguishes itself from similar courses offered by leading UK universities by offering one focused specifically on the military context, and offers unique subject areas unavailable elsewhere.

Compulsory modules

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

Elective modules (choose seven)

- Aircraft Fatigue and Damage Tolerance,
- Aircraft Survivability,
- Air Transport Engineering – Maintenance Operations,
- Design Durability and Integrity of Composite Aircraft Structures,
- Fundamentals of Aircraft Engine Control,
- Guided Weapons,
- Human Factors in Aircraft Maintenance,
- Introduction to Human Factors,
- Mechanical Integrity of Gas Turbines,
- Uninhabited Aircraft Systems (UAS) Technology,
- Military Avionics – STA Communications and Navigation,
- Practical Reliability,
- Rotary-wing Aeromechanics,
- Introduction to Aircraft Structural Crashworthiness.

Military Electronic Systems Engineering

MSc, PgDip, PgCert

www.cranfield.ac.uk/mese

Specifically developed for those who will be involved with the specification, analysis, development, technical management or operation of military radar, electro-optics, communications, sonar or information systems, where the emphasis will be on an electronic warfare environment.

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

MSc, PgDip, PgCert

www.cranfield.ac.uk/mvt

Gain an understanding of the technologies used in the specification, design, development and assessment of weapon systems and military vehicles.

The course will focus on both armoured and support vehicles and build your expertise on the important steps and data that is taken into consideration when designing the next generation of military hardware.

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

PgCert

www.cranfield.ac.uk/sew

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.

Weapons Technician loading ordnance.

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 PgCert has been designed for professionals either working in or seeking to move into the sales and marketing arena of defence, security and aerospace organisations.

It will focus on marketing, but skills such as negotiations, offsets and trade compliance will prove attractive to employers seeking personnel in wider managerial fields, including contracts, commercial management as well strategic management.

Compulsory modules

- Defence and Security Marketing,
- Defence and Security Offset,
- Legal, Ethical and Political Frameworks for Defence,
- 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.

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

- Analytical Techniques,
- Chemical, Biological, Radiological and Nuclear Terrorism (CBRN),
- Counterterrorism and Intelligence,
- Counter Improvised Explosive Devices Capability,
- Courtroom Skills,
- Cyberterrorism,
- Negotiating with Violent Extremist and Terrorist Organisations,
- Firearms Investigations,
- Forensic Ballistic Investigations,
- Forensic Exploitation and Intelligence,
- Introduction to Firearms Investigations and Forensic Ballistics,
- Introduction to Fire Investigation,
- Investigation and Evidence Collection,
- Protecting Critical National Infrastructure,
- Reasoning for Forensic Science,
- Risk, Crisis and Resilience,
- Terrorism Risk Management and Mitigation.
- Terrorism and the Law.

Counterterrorism, Risk Management and Resilience

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

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

This course brings together a distinctive mix of different subjects, providing students with the fundamental knowledge, core expertise and evidence-based methodological tools and approaches necessary to understand, analyse, prevent and mitigate terrorism.

Compulsory modules

- Introductory Studies,
- Applied Counterterrorism,
- Risk, Crisis and Resilience,
- Strategies, Ideologies and Tactics of Terrorism,
- Terrorism, Risk Management and Mitigation,
- Understanding Terrorism and Counterterrorism.

Elective modules

- Chemical, Biological, Radiological and Nuclear Terrorism (CBRN),
- Counterterrorism and Intelligence,
- Counter Improvised Explosive Devices Capability,
- Cyberterrorism,
- Courtroom Skills,
- Forensic Exploitation and Intelligence,
- Introduction to Fire Investigation,
- Protecting Critical National Infrastructure,
- Terrorism and the Law.

Cyber Defence and Information Assurance (Defence)

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

- Foundations of Cyber.

Elective modules

- Cyber Deception,
- Critical Networks and Cyber-Physical Systems,
- Cyber Attack - Threats and Opportunities,
- Cyber Law,
- Data-led Decision Support and Artificial Intelligence,
- Emerging Technology Monitoring,
- Systems Thinking for Organisational Viability,
- Information Operations,
- Incident Management,
- Social Technologies,
- The Human Dimension,
- Understanding Risk.

Cyberspace Operations

www.cranfield.ac.uk/cyops

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

Designed to develop military and defence industry professionals who can lead in a defensive cyber environment, to effectively exploit the threats and opportunities of cyberspace at the organisational level.

Compulsory modules

- Cyber Deception,
- Cyber Law,
- Cyberwarfare in Intelligence and Military Operations,
- Foundations of Cyber,
- Information Operations.

Elective modules (select 30 credits)

Choose 20 credits from the following modules:

- The Human Dimension,
- Critical Networks and Process Control,
- Applied Cyber Concepts Project*.

Choose 10 credits from the following modules:

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

Defence Simulation and Modelling

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

www.cranfield.ac.uk/dsm

The application of modelling and simulation continues to enhance and transform both systems development and training. It allows representation of increasingly complex equipment, systems and scenarios for the purposes of decision support and helps to reduce wear on live equipment and on test and training areas.

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

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

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

We aim to create skilled professionals who can source, analyse and strategise improvements, assess digital infrastructure and keep up with an ever-increasing and developing world of information and technology.

Compulsory modules

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

Military Operational Research

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

www.cranfield.ac.uk/mor

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.

Systems Engineering

MSc, PgDip, PgCert
Part-time

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

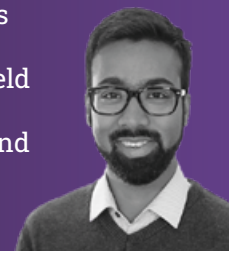
Systems engineers address some of the most complex challenges and problems that society faces. This course will equip you to address the root causes of a problem situation, understanding requirements from multiple perspectives and the tension that may exist between them.

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.

"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)



Digital Forensics Computer Laboratory.

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

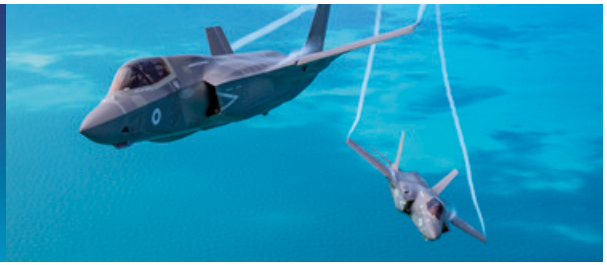
Delivered through a combination of face-to-face, distance and blended modules, the Programme provides you with maximum flexibility. The high proportion of distance learning makes it ideal for those with demanding careers.

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

PgDip — 60 credits

Compulsory modules

- Research Methods — 10 credits

Elective modules

- **Three** stream specific modules — 30 credits
- **Two** additional modules from any stream — 20 credits

MSc — 200 credits

- Thesis — 80 credits

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

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
Forensic Investigation of Explosives and Explosive Devices, Introduction to Firearms Investigations and Forensic Ballistics, Introduction to Fire Investigation.	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).
Leadership and Organisation • Leading and Managing Change, • Instructional Practice, • Strategic Leadership in the Security Sector, • Negotiation, • Foundations of Programme and Project Management, • The Psychology of Leadership, • Security Sector Strategy and Policy Development. Management • Strategic Management in Defence, • The International Dimension of Defence Acquisition • Financing Acquisition, • Managing Post-Conflict Peace Interventions, • Financial and Economic Security, • Security and Defence, • National Security and Emerging Global Trends, • Cyber and Information Security, • Managing Security in a Regional Context, • Gender, Violence and Armed Conflict, • Counterterrorism and Intelligence, • National Security: Resilience and Crisis.	Defence and Security Programme.

Elective modules	Related course
Governance and Law • Building Integrity in the Public Sector, • International Humanitarian Law and Command Responsibility, • Governance and the Rule of Law, • Introduction to International Law and Use of Force, • Legal, Ethical and Political Defence and Security Frameworks, • International Law and Command Responsibility.	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 Pathmeswaran Raju, Senior Lecturer - Systems Engineering

Pathmeswaran is a Senior Lecturer in Systems Engineering for Defence Capability, and the Business Lead for the Centre for Systems and Technology Management within the Cranfield Defence and Security. He has previously taught at both the University of Birmingham and University of Salford. Whilst at Birmingham, he also worked as a Knowledge Modelling Specialist in the Technology Strategy Board (TSB)/Rolls-Royce funded Strategic Investment in Low-carbon Engine Technology 2 (SILOET2) programme developing enterprise-level Platform Independent Knowledge Management (PIKM) system for Rolls-Royce. He is also a Fellow of the Higher Education Academy.

Professor Jackie Akhavan, Professor of Explosive Chemistry

Jackie has a BSc (Hons) in Chemistry, and an MPhil and PhD in Polymer Chemistry from Southampton University. She was a Research Fellow in surface enhanced Raman spectroscopy at Southampton University and a Senior engineer at Pirelli General in polymeric optical fibres for short distance communication before joining Cranfield University in 1987. She is a Fellow of the Royal Society of Chemistry and a Fellow of the Institute of Explosives Engineers and in 2018 she was selected as an independent member on the Defence Science Expert Committee as the UK expert in energetics, explosives and weapon technologies for a three-year term.

Professor Gareth Appleby-Thomas, Head of the Centre for Defence Engineering

Gareth began his postgraduate academic studies undertaking a MSci in Physics and Astronomy, Durham University in 1999-2003. He then studied for a DPhil in Materials Science at Oxford University before beginning his academic career at Cranfield University in 2007 as a Research Fellow in the Dynamic Response Group. He took on the role of Head of Centre for Defence Engineering in 2019 and was made a Professor in High Strain-Rate Material Response for Defence Applications in 2021.

"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/fees**

Cohort profile*

Average cohort age
30-39 years

Student to staff ratio
10:1

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 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).

*Figures as at August 2023.

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

- Senior Mechanical Systems Engineer,
- Air Certification Engineer,
- Capability Integration Officer,
- Project Manager,
- Border Force Officer,
- Modelling and Simulation Engineer,
- Academic Advisor,
- CEO.

Organisations

- Defence Equipment & Support,
- Home Office,
- Raytheon Systems Ltd.,
- Royal Navy,
- Babcock International Group PLC,
- Nigerian Army,
- Japan Ministry of Defence,
- Pelorus Technologies.

More than a degree with the **Cranfield Enhance programme**

Cranfield graduates are valued for their distinctive skills and capabilities. We have developed these programmes to complement and enhance what you learn on your chosen qualification. On the Cranfield Enhance programme, you will be able to earn 'digital badges' in areas such as Employability, Entrepreneurship, Sustainability and Outreach to showcase your new skills to prospective employers.

Read more at **www.cranfield.ac.uk/enhance**

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.

Cranfield celebrates partnership with the National Crime Agency

Cranfield University and the National Crime Agency (NCA), which leads the UK's fight to cut serious and organised crime, have signed a Memorandum of Understanding to share expertise and collaborate on projects of mutual interest.

Cranfield's expertise in security is long-standing, and the University is the lead for the Academic Resilience and Security Community (A-RiSC), a network of over 60 universities formed to help government and industry access academic experts and the latest research in national security.

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

AWE · dstl The Science Inside · MBDA · QINETIQ

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.

Have a look at some of our facilities in this virtual experience:

virtualexperience.cranfield.ac.uk

Cranfield University works with over

1,500 businesses and governments based in over 40 countries

These organisations include:

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www.cranfield.ac.uk/defenceandsecurity

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