Postgraduate master's courses in Defence and Security

2020-21

Engineering
Leadership and Management
Technology
Cranfield University

We are an exclusively postgraduate UK university with long-standing 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.

Exclusively postgraduate
A research-focused professional community

81%
of our research is world-leading or internationally excellent

Over £100 million
of investment in new facilities over the past four years

Five-time winner of the Queen’s Anniversary Prize for Higher and Further Education

A professional network of 65,000+ alumni

UK no. 2
graduate employment
(DLHE longitudinal, 2017)

4,600+ learners

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.

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 the content is relevant and meets the expectations of employers. We also have a number of guest lectures, including 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, leadership and management, and technology ensures that what you learn is relevant and current.

5. Networking opportunities
   You will have opportunities to meet and network with valuable industry contacts through attending our Symposia at Shrivenham events. 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 the bursaries and scholarships that are available for help with fees and/or living expenses. Please see page 26 for more information.

“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, Academy and Commandant Joint Services Command and Staff College.
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. These are grouped into three specialisation streams, enabling you to focus on specific areas of interest.

Defence and Security courses specialisation streams

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 appropriate 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 required applies to the MSc. Please see the website for the PgCert or PgDip requirements and further module details.

Communications Electronic Warfare
www.cranfield.ac.uk/cew

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.

Defence and Security (Engineering)
www.cranfield.ac.uk/dspengineering

Collectively known as the Defence and Security Programme, the different MSc routes allow you to customise your degree and build your skills in engineering disciplines within the defence and security sector. Choose a route to suit your individual learning pathway. Read more about the Defence and Security Programme, including the different course structure, on pages 16-21.

MSc route: Choose selected modules from a variety of defence and security courses in the engineering stream, and some from across all the streams, to suit your specific area of interest, broadening or deepening your knowledge.

MSc capstone route: Perfect for applying your learning directly to your work. The capstone portfolio emphasises business application and innovation to enable you to tailor your learning specifically around your topic. This route combines an equal percentage of taught and research. You will undertake 200 credits, with 100 credits in the taught phase and 100 credits within the portfolio phase.

Guided Weapon Systems
www.cranfield.ac.uk/gws

This course is suitable for those officers seeking to work with military guided weapon systems in the MOD, and in trials and training establishments. 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.

Explosive Ordnance Engineering
www.cranfield.ac.uk/eoe

Designed to provide the advanced academic background necessary to contribute effectively to technically demanding projects in the field of explosive and explosion ordnance engineering, this course is suitable for civil servants, serving officers in the army, navy and air force and civilians employed in the explosives and defence industries, from both the UK and overseas.

Compulsory modules
- Computer Modelling Tools in Explosive Ordnance Engineering,
- Delivery Systems,
- Future Developments: Scanning the Horizon in Explosive Ordnance Engineering,
- 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 (select 25 credits)
- Design for Munitions Safety (5 credits),
- Risk Assessment for Explosives (5 credits),
- Rocket Motors and Propellants (10 credits),
- Advanced Pyrotechnics (5 credits),
- Explosives and the Environment (5 credits),
- Commercial Explosives (10 credits).

Gun Systems Design
www.cranfield.ac.uk/gsd

This unique course covers the essential technology required for participants to take a lead role within their organisations on specification, design and development of gun systems. You will benefit from education and training in selected weapons systems and provides you with the depth of knowledge to undertake engineering analysis or the evaluation of relevant sub systems.

Compulsory modules
- Armouried 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

Designed to provide practicing engineers with further knowledge and skills in aerospace engineering, airworthiness and safety, this MSc will allow you to continue in full-time employment while you are studying.

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,
- Aircraft Fatigue and Damage Tolerance,
- Aircraft Survivability,
- Design Durability and Integrity of Composite Aircraft Structures,
- Signal Processing, Statistics and Analysis.

Military Electronics 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,
- Information Networks,
- Radar Electronic Warfare.

*Please note the PgCert qualification is for Military Electronics Systems Engineering Foundations.

“"I would not be able to effectively carry out my current role without the knowledge gained on this course. I would recommend it to anyone looking to delve into a fascinating world of radars, electro-optics and electronic warfare.”

Tristan Cook, Flight Project Engineering Officer, Air Platform Protection Test and Evaluation Squadron (Military Electronic Systems Engineering MSc 2019)

Military Vehicle Technology
www.cranfield.ac.uk/mvt

MSc, PgDip, PgCert

Part-time only

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,
  - Light Weapon Design,
  - Military Vehicle Propulsion and Dynamics,
- Reliability and System Effectiveness,
- Rocket Motors and Propellants,
- Uninhabited Military Vehicle System.

Or choose one:
- 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.

Vehicle and Weapon Engineering
www.cranfield.ac.uk/vwe  •  USA delivery

MSc, PgDip

Delivered in Detroit, Michigan, USA, this course will provide you with the technical knowledge and understanding of weapon systems and military vehicles to make you effective in their specification, design, development and assessment. You will learn all aspects of technology of military fighting and logistics vehicles, and can choose to specialise in either vehicles or weapons.

Compulsory modules
- Armoured Fighting Vehicle and Weapon Systems,
- Electric Drive Technologies,
- Fighting Vehicle Design,
- Finite Element Methods in Engineering,
- Fundamentals of Ballistics,
- Light Weapon Design,
- Military Autonomous Vehicles,
- Modelling, Simulation and Control,
- Reliability and System Effectiveness,
- Survivability,
- Systems Engineering and Assured Performance

Elective modules (select weapons or vehicles specialisation)
- Weapons (complete both modules below)
  - Gun Systems Design,
  - Military Vehicle Propulsion and Dynamics.
- Vehicles (complete both modules below)
  - Military Vehicle Propulsion,
  - Military Vehicle Dynamics.
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 required applies to the MSc. Please see the website for the PgCert or PgDip requirements and further module details.

Defence and Security Export
www.cranfield.ac.uk/dse

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.

Defence and Security (Leadership and Management)
www.cranfield.ac.uk/dspleadership

Collectively known as the Defence and Security Programme, the different MSc routes allow you to customise your degree and build your skills in leadership and management disciplines within the defence and security sector. Choose a route to suit your individual learning pathway. Read more about the Defence and Security Programme, including the different course structure, on pages 16-21.

MSc route:
Choose selected modules from a variety of defence and security courses in the leadership and management stream, and some from across all the streams, to suit your specific area of interest, broadening or deepening your knowledge.

MSc capstone route:
Perfect for those who would like to apply their learning directly to their work, the capstone portfolio emphasises business application and innovation to enable you to tailor your learning specifically around your topic. This route combines an equal percentage of taught modules and research. You will undertake 200 credits, with 100 credits in the taught phase and 100 credits within the portfolio phase.

"I think the flexibility of the Defence and Security Programme, in terms of course content, and the options available for taught vs project, are welcomed. The ability to tailor the programme to the individual's needs in question is also a good thing."

Professor Nick Colosimo PgC BSc (Hons) CEng FIET FIKE, Principal Technologist and Technology Strategy Manager, Global Engineering Fellow, BAE Systems – Air
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

The need for accessible, comprehensive and reliable research and education on terrorism and counterterrorism is stronger than ever. This new MSc addresses those needs drawing on Cranfield’s expert staff and unique facilities to offer students an exceptional and cutting-edge programme in this critical area.

Compulsory modules
• Applied Counterterrorism,
• Strategies, Ideologies and Tactics of Terrorism,
• Understanding Terrorism and Counterterrorism,
• Research Project – Counterterrorism.

Elective modules (choose one)
• Analytical Techniques,
• Chemical, Biological, Radiological and Nuclear (CBRN) Terrorism,
• Counterterrorism and Intelligence,
• Counter Improvised Explosive Devices Capability,
• Cyberterror-ism,
• Courtroom Skills,
• Digital Crime and Investigation,
• Diplomacy and Conflict Resolution,
• Firearms Investigations,
• Fires, Explosions and their Investigation,
• Forensic Ballistic Investigations,
• Forensic Exploitation and Intelligence,
• Forensic Investigation of Explosives and Explosive Devices,
• Global Security: Emerging Challenges,
• Introduction to Firearms Investigations and Forensic Ballistics,
• Investigation and Evidence Collection,
• Reasoning for Forensic Science.

Counterterrorism, Risk Management and Resilience
www.cranfield.ac.uk/riskandresilience

This is a specialist course designed particularly for students working in the risk management and risk mitigation sectors. Cranfield has a long history of specialising in Defence and Security subjects and boasts unique facilities for teaching and research in these areas.

Compulsory modules
• Applied Counterterrorism,
• Protecting Critical National Infrastructure,
• Research Project Counterterrorism,
• Risk, Crisis and Resilience,
• Terrorism Risk Management and Mitigation,
• Understanding Terrorism and Counterterrorism.

Elective modules (choose one)
• CBRN Terrorism,
• Counter-Improvised Explosive Devised Capability,
• Counterterrorism and Intelligence,
• Courtroom Skills,
• Cyber Terrorism,
• Fires, Explosions and their Investigation,
• Forensic Exploitation and Intelligence,
• National Security: Resilience and Crisis,
• Social Technologies,
• Strategies, Ideologies and Tactics of Terrorism.

Cyber Defence and Information Assurance
www.cranfield.ac.uk/cdia • Accredited – see page 23

MSc, PgDip, PgCert
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,
• Understanding Risk.

Elective modules (choose one)
• Data-led Decision Support,
• Emerging Technology Monitoring.

Cyberspace Operations
www.cranfield.ac.uk/co

MSc, PgDip, PgCert
Part-time only

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 and Security (Technology)
www.cranfield.ac.uk/dsptechnology

MSc route: MSc, PgDip, PgCert
MSc capstone route: MSc, PgCert
Part-time only

Collectively known as the Defence and Security Programme, the different MSc routes allow you to customise your degree and build your skills in technology disciplines within the defence and security sector. Choose a route to suit your individual learning pathway. Read more about the Defence and Security Programme, including the different course structure, on pages 16-21.

MSc route:
Choose selected modules from a variety of defence and security courses in the technology stream, and some from across all the streams, to suit your specific area of interest, broadening or deepening your knowledge.

MSc capstone route:
Perfect for those who would like to apply their learning directly to their work, the capstone portfolio emphasises business application and innovation to enable you to tailor your learning specifically around your topic. This route combines an equal percentage of taught and research. You will undertake 200 credits, with 100 credits in the taught phase and 100 credits within the portfolio phase.
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,
- 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.

"Studying part-time has suited me, allowing me to earn an income while studying. Therefore, I’ve not lost sight of the ‘real world’ which has helped to ground my academic thinking.”

Edward Oates, current student
(Defence and Security PhD)

Systems Engineering
www.cranfield.ac.uk/systemsengineering
MSc, PgDip, PgCert
Full-time / Part-time

Designed to enable you to better understanding to focus content and delivery on systems engineering professionals working in distributed, agile teams using shared models and flexible working approaches, with an emphasis on professional skills such as leadership, team working, communication, data management and ethics.

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
MSc, PgDip, PgCert
Part-time

The purpose of the Systems Thinking Practitioner occupation 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.

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.

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.

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 overleaf). 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.

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**

- **PgCert**
  
  - 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**
  
  - Compulsory modules
    
    - Research Methods: 10 credits
  
  - Elective modules
    
    - Three stream specific modules: 30 credits
    - Two additional modules from any stream: 20 credits

- **MSc**
  
  - Thesis: 80 credits
  
  - Two stream specific modules: 20 credits

**Capstone route**

- **PgCert**
  
  - 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**
  
  - Compulsory modules
    
    - Research Methods: 10 credits
  
  - Elective modules
    
    - Three stream specific modules: 30 credits
    - Two additional modules from any stream: 20 credits

- **MSc**
  
  - 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 FloD 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

<table>
<thead>
<tr>
<th>Elective modules</th>
<th>Related course</th>
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</thead>
<tbody>
<tr>
<td>Fires, Explosions and their Investigations,</td>
<td>Forensic MSc Programme (see <a href="http://www.cranfield.ac.uk/cfi">www.cranfield.ac.uk/cfi</a>).</td>
</tr>
<tr>
<td>Forensic Investigation of Explosives and Explosive Devices,</td>
<td></td>
</tr>
<tr>
<td>Introduction to Firearms Investigations and Forensic Ballistics.</td>
<td></td>
</tr>
<tr>
<td>Element Design,</td>
<td>Gun System Design (see page 7),</td>
</tr>
<tr>
<td>Fundamentals of Ballistics,</td>
<td>Military Vehicle Technology (see page 9).</td>
</tr>
<tr>
<td>Military Vehicle Propulsion and Dynamics,</td>
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<tr>
<td>Weapon Systems Technology,</td>
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<tr>
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<td>Introduction to Human Factors,</td>
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<td>Mechanical Integrity of Gas Turbines,</td>
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<td>Practical Reliability.</td>
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### Leadership and Management

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<tr>
<th>Elective modules</th>
<th>Related course</th>
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<td>Programme and Project Management,</td>
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<td>Sustainability in Defence</td>
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### Technology

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<th>Elective modules</th>
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<td>Lifecycle Processes Introduction,</td>
<td>Systems Engineering for Defence Capability (see page 15).</td>
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<td>Systems Engineering Workshop</td>
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### 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.

Professor Jackie Akhavan, Head of Centre for Defence Chemistry
Jackie graduated from the University of Southampton with a BSc (Hons), MPhil and PhD in chemistry. She joined Cranfield University as a lecturer in polymer chemistry and soon afterwards established her research group in polymer bonded explosives. She is a Fellow of the Royal Society of Chemistry, a Chartered Chemist, a Fellow of the Institute of Explosive Engineers and a member of the Board of Trustees for the Explosives Engineers Educational and Research Trust.

Dr David James, Head of Centre for Electronic Warfare, Information and Cyber
Prior to joining the Defence Academy, David spent eighteen years at Dstl (part of UK Ministry of Defence) working in the areas of electro-optics, non-linear optics and laser threats gaining a PhD in non-linear optical materials and devices (from Cranfield University). David’s specialisation is in the field of electro-optics and lasers, particular laser-directed enemy weapon (DEW) for the defeat of sensors and he has lead on the assessment of several foreign threat laser systems. He has written classified papers on these subjects and has acted as a consultant and defence analyst to the UK Ministry of Defence. David has presented at conferences and Symposia on laser threat evaluation and laser applications.

Professor Emma Sparks, Head of Centre for Systems and Technology Management
Emma is the Director of Programme Portfolio Delivery, Deputy Director of Education and Head of the centre for Systems Engineering at Cranfield University. Responsible for strategic direction and management of the taught course portfolio for Cranfield defence and Security as well as delivery of the Systems Engineering portfolio across teaching, research and consultancy for Cranfield Defence and Security. Emma is a Systems Engineer specialising in human systems, systems thinking, enterprise architecture and Human Factors Integration.

Jeremy D Smith, Head of Centre for Simulation and Analytics
Jeremy is responsible for developing and delivering lectures to a broad range of courses from full-time MScs to short courses on- and off-site. Jeremy has done research and consultancy in systems engineering, weapon system and vehicle assessment, training needs analysis, human factors and operational analysis. Jeremy has consultancy experience across the complete project lifecycle from analysis and evaluation, planning and implementation and delivery. Jeremy has worked with leading clients such as Dstl and BAE Systems.

Key facts and statistics

Cohort profile*

- **Average cohort age**: 30-40 years
- **Average cohort size**: Seven

*These figures give an indication of the course make-up at registration across Defence and Security for 2018-2019.

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

Accreditations

**Engineering**
Our Explosive Ordnance Engineering MSc is 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.

Our Gun Systems Design MSc, Military Vehicle Technology MSc and Vehicle and Weapon Engineering MSc are all accredited by the Institution of Engineering and Technology (IET).

**Technology**
The Cyber Defence and Information Assurance MSc is supported by the UK Government’s Cabinet Office and the Office of Cyber Security Information Security.

The Information Capability Management MSc is accredited by the Chartered Institute of Library and Information Professionals.
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.

Roles
- Materials Services Laboratory Manager,
- Principal Analyst,
- Senior Trackside Aerodynamicist,
- Systems Engineering Officer,
- Meteor Support Manager,
- Wind Tunnel Testing Group Leader,
- Principal Associate,
- Senior Avionics and Mission Systems Engineer.

Organisations
- QinetiQ,
- MBDA,
- Alfa Romeo Racing,
- Dstl,
- Royal Navy,
- Rolls Royce Singapore Pte Ltd,
- Hawkins,
- Renault Sport F1.

Open days
We hold open days at both our Cranfield campus and Cranfield University at Shrivenham. These offer you the opportunity to spend time with us to experience Cranfield’s unique atmosphere and culture.

Recruitment fairs
We regularly attend recruitment events worldwide. These offer you the opportunity to meet some of our academics and admissions team in a city near you.

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 University is partnering with Purdue University in the United States to offer a suite of graduate-level education programmes for the US Department of Defense (DOD).

The first offering will be a dual master’s degree in Defence Engineering and Technology with a specialisation in expeditionary warfare – the deployment of a country’s military forces to fight abroad.

Further educational programmes are being developed, which enable military personnel and civilians in the scientific, engineering and technology communities affiliated with the DOD to either study for degrees in defence engineering or as part of Continuous Professional Development (CPD) to provide added value to ongoing projects. US DOD Associates can attend these classes in Warren, Michigan and Crane, Indiana.

A number of our students who are sponsored by their employer take the opportunity to complete an MSc thesis directly linked to their business needs. This has benefits for both the student and their employer, e.g. UK Ministry of Defence (MOD), Atomic Weapons Establishment (AWE) and BAE Systems.

Academics at Cranfield Defence and Security have also worked and collaborated with a number of prestigious clients such as BP, the United Nations, and the United States Institute for Peace.

Examples of the organisations we work with
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. Our Systems Engineering Master’s Apprenticeship MSc fulfils the needs of the Level 7 Systems Engineering Standard and the Defence and Security Programme (Leadership and Management) is now mapped and fulfils all requirements to the Senior Leader Master’s Degree Apprenticeship.

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

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.

How to apply

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

www.cranfield.ac.uk/apply

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

virtuatour.cranfield.ac.uk
Cranfield University works with over 1,500 businesses and governments based in over 40 countries.

These organisations include:

**Cyber-Secure Manufacturing MSc** (see Manufacturing brochure)
**Master of Business Administration MSc (Defence Export, Executive)** (see School of Management brochure)
**Aircraft Engineering MSc** (see Aerospace brochure)

For a full list of Cranfield courses, please see our prospectus or website.

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Shrivenham
SN6 8LA, UK

T: +44 (0)1793 785220
E: cdsadmissionsoffice@cranfield.ac.uk

www.cranfield.ac.uk/defenceandsecurity

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.
