



Cranfield
Environment
and Agrifood

Continuing
Professional
Development

Agrifood

2019/20

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Welcome



Professor Leon Terry
Director of Environment
and Agrifood

Continuing professional development is a fundamental part of any professional career. At Cranfield University, we offer a range of options to enable you to develop professional skills throughout your career. These include our large selection of technical short courses, part-time postgraduate study, as well as our innovative level 7 apprenticeships and research degrees.

Choosing Cranfield University for your professional development gives you access to our knowledge and expertise across the agrifood sector. With an international community and a truly global reputation, our passion for the areas we operate in and our long-standing relationships with some of the most prestigious companies in industry mean that studying at Cranfield University will open doors for you.

Almost half of our students study while in employment and organisations, in turn, can rest assured that their employees will return to the workplace with enhanced skills. We can also work with your organisation on a bespoke basis, to help you solve pertinent business issues and identify new ways of growing and future-proofing your business.

We have mutually beneficial relationships with nearly 1,500 organisations around the world; from the smallest owner-managed SMEs to the largest multinational conglomerates; British and international universities, non-government organisations and governments.

At Cranfield, everything we do is concentrated on technology and management and our insight is rooted in our powerful industry links, world-class research and what really works in practice.

I look forward to welcoming you to Cranfield soon.

Progression routes

Many of the short courses in this brochure are modules from our popular MSc programmes, as such these modules can be taken for credit. Participants can accumulate credits towards a postgraduate qualification. Typically a one-week course is worth 10 credits.

In order to receive Cranfield credits, delegates must register as an associate student and successfully pass the assessment associated with the course, this is usually an assignment or examination.

Your progression route to a postgraduate qualification (PgDip, PgCert, MSc, MDes) will depend on your chosen postgraduate course of study. Those wishing to take this route will need to check with us which short courses can be considered.

Master of Science

200 credits

Typically requires an individual thesis project on top of the taught elements.

Postgraduate Diploma

120 credits

Typically the PgDip represents the taught element of the associated MSc, although occasionally the curriculum requires a group project or integrated assessment.

Postgraduate Certificate

60 credits

Comprises a subset of the syllabus for the taught element of the associated MSc/PgDip course.



Applied Bioinformatics short courses

- Advanced Sequencing Informatics and Genome Assembly,
- Data Integration and Interaction Networks,
- Exploratory Data Analysis and Essential Statistics Using R,
- Introduction to Bioinformatics Using Python,
- Machine Learning for Metabolomics,
- Next Generation Sequencing Informatics,
- Programming Using Java,
- Proteome Informatics.

Advanced Sequencing Informatics and Genome Assembly

To develop a system-level view of biological systems and their response to various internal and external factors, through the integration of advanced NGS and 3GS sequencing data with functional annotation using established concepts of graph theories widely applied for various assemblers such de-Bruijn and Overlap-layout consensus.

On successful completion of this course you will be able to:

- Apply and optimise various algorithms for short and long reads sequence assembly,
- Successfully develop and optimise de-novo genome assemblies for various species³,
- Develop in-silico gene prediction models and functional annotation⁴,
- Effectively apply graph theory and its application in biological data analysis.



Five days



This course is an MSc module.



www.cranfield.ac.uk/asi

Data Integration and Interaction Networks

Data integration represents a major challenge for bioinformatics research. This course covers the most popular data management, integration and visualisation tools within the bioinformatics community as well as the main concepts of databases design and normalisation.

On successful completion of this course you will be able to:

- Utilise systems software for the visualisation of systems and system interactions,
- Critically apply available tools for data integration,
- Design, normalise and implement databases for experimental datasets,
- Develop critical awareness of the main data standards protocols for systems biology,
- Discover systems relationships between data using bioinformatics tools and approaches.



Five days



This course is an MSc module.



www.cranfield.ac.uk/diin

Exploratory Data Analysis and Essential Statistics Using R

This course provides an overview of important concepts in statistics and exploratory data analysis. The course introduces the main concepts in analysing biological datasets using the R environment, as well as developing bespoke scripts for multivariate analysis such as principal component analysis and hierarchical clustering.

On successful completion of this course you will be able to:

- Devise basic R programs to meet given specifications,
- Apply different statistical techniques and be able to implement them programmatically in R,
- Effectively integrate and devise statistical methods into experimental protocol design.



Five days



This course is an MSc module.



www.cranfield.ac.uk/edeas

Introduction to Bioinformatics Using Python

An introduction to bioinformatics (what it is, why it is needed and what it can deliver) as well as the required skills to browse, query various relevant resources.

The course covers the programming basics required to program in Python, which is fast becoming one of the most popular programming languages in the bioinformatics community, and its application in retrieving, parsing and visualising biological sequence data.

On successful completion of this course you will be able to:

- Identify the most important programming structures,
- Retrieve relevant nucleotide, protein sequences and their corresponding metadata from online public data resources,
- Develop custom Python scripts for sequence manipulation,
- Develop Python scripts to automate data handling and curation tasks,
- Develop advanced stand-alone Python programs for the acquisition and consolidation of data from remote databases.



Five days



This course is an MSc module.



www.cranfield.ac.uk/ibp

Machine Learning for Metabolomics

This course covers the main aspects related to the analysis of the metabolic profile in living organisms and explores statistical and computational techniques that are central to the field of metabolomics with particular emphasis to machine learning.

On successful completion of this course you will be able to:

- Critically assess various metabolomics analytical and spectral platforms,
- Apply state-of-the-art best practices in machine learning to fit the purpose of the analysis,
- Critically understand the basic principles of the most common instrumental techniques used in metabolomics, the technical limitations and the underlying biological and experimental assumptions that impact on data quality,
- Demonstrate in-depth knowledge of the current approaches for modelling and warehousing of life science data,
- Develop classification and regression models based on multivariate metabolic data,
- Evidence an in-depth understand and application of machine learning algorithms and be able to provide examples of specific machine learning algorithms for each task.



Five days



This course is an MSc module.



www.cranfield.ac.uk/mlm

Next Generation Sequencing Informatics

Introducing the techniques that have given rise to the genomic data now available, and develop skills and understanding in the bioinformatics approaches that facilitate evaluation and application of this data.

On successful completion of this course you will be able to:

- Critically evaluate the operation of the most common analytical techniques used in the acquisition of genomic sequence and expression data,
- Apply various techniques to overcome the challenges of dealing with sequence data and be able to identify and apply appropriate software tools to tackle these challenges,
- Apply appropriate genome assembly software and optimise their outputs,
- Perform gene expression profiling using both first and next generation sequencing data,
- Demonstrate critical awareness of current practices and evaluate the relative strengths and weaknesses of the techniques covered and how these relate to the quality of the biological findings that result.



Five days



This course is an MSc module.



www.cranfield.ac.uk/ngsi

Programming Using Java

This short course introduces the concepts of object oriented programming using Java. Java is the pre-eminent programming language for serious application development on the Internet.

On successful completion of this course you will be able to:

- Identify the most important programming structures,
- Develop Java programs to meet given specifications,
- Implement custom Java classes, interfaces, and packages,
- Implement standalone application interfaces using Java Swing components.



Five days



This course is an MSc module.



www.cranfield.ac.uk/puj

Proteome Informatics

This course provides an awareness of the current trends in proteomics and the crucial role that bioinformatics plays within this field.

On successful completion of this course you will be able to:

- Explain the mode of operation of the most common analytical techniques used in the acquisition of proteomic data,
- Demonstrate critical awareness of current practices and recognise the relative strengths and weaknesses of the techniques covered and how these relate to the quality of the data acquired,
- Discover information using bioinformatics tools and effectively apply the information to biological problems.



Five days



This course is an MSc module.



www.cranfield.ac.uk/pi



Food Systems and Management short courses

- Food Chain Resilience,
- Food Diagnostics,
- Food Safety and Quality Management and Certification,
- Leading Corporate Sustainability,
- Postharvest Technology,
- Quality of Food and Beverages.

Food Chain Resilience

Introduction to the key aspects of supply chain management critical to improving the overall resilience of the global food supply network.

On successful completion of this course you will be able to (in the context of food and beverage networks):

- Assess the impact of different supply chain strategies on the competitive strategy in the food and drinks industry,
- Categorise the interface with a firm's suppliers to improve the visibility and alignment across the supply chain,
- Design a successful collaborative initiative through the use of frameworks and tools,
- Examine the challenges around managing sustainable supply chains,
- Evaluate the risk inherent in the supply chain through the application of tools and techniques learnt.



Five days



This course is an MSc module.



www.cranfield.ac.uk/fcr

Food Diagnostics

This course will help you gain an understanding of the concept of food diagnostics and the role of monitoring and analysis in food quality, safety, and management.

On successful completion of this course you will be able to:

- Demonstrate an independent critical awareness of the principles and techniques currently available for food analysis, monitoring and assessment,
- Understand and critically compare the different destructive and non-destructive techniques used to assess food quality parameters,
- Evaluate and argue the choice of the appropriate molecular techniques for the analysis of food components and food microbiological contaminants,
- Critically examine analytical data on food and, synthesising knowledge gained elsewhere in the course, design an appropriate and cost-effective sampling and analytical strategy for food.



Five days



This course is an MSc module.



www.cranfield.ac.uk/fdia

Food Safety and Quality Management and Certification

This course provides an overview of the food quality legal framework and examples of its application to industrially relevant cases.

In addition to the knowledge gained on this course, you will also apply the following skills;

- Demonstrate an independent critical ability to think systemically and conceptually by comparing and distinguishing among the different quality management approaches and diverse certification options,
- Design and develop the most appropriate option for specific production/processing sectors,
- Critically apply the approaches presented in the course to industrial situations.



Two weeks



This course is an MSc module.



www.cranfield.ac.uk/fsqm

Leading Corporate Sustainability

This course outlines the major sustainability challenges and explores the capabilities organisations require need to respond positively to them.

On successful completion of this course you will be able to:

- Identify global environmental and social trends, and relate how these present both challenges and opportunities to business,
- Explain why businesses need to respond to these challenges and opportunities, and assess the capabilities they require to do so,
- Classify the potential stakeholder groups businesses can work with to develop and implement their sustainability strategies, and compare collaboration approaches,
- Consider the role of personal leadership in an organisation's values, strategic direction and ability to execute its sustainability strategy,
- Critically assess the content and reporting of businesses' sustainability strategies,
- Design and recommend a sustainability-oriented innovation for a selected business.



Five days



This course is an MSc module.



www.cranfield.ac.uk/lcs

Postharvest Technology

A conceptual awareness of the key aspects of postharvest technology and the role they play in modern food supply.

On successful completion of this course you will be able to:

- Evaluate the impact of postharvest physiological factors on later stages in the supply chain,
- Critically appraise key preservation methods of fresh produce, including their advantages and limitations,
- Identify the most important postharvest diseases, evaluate their impact on raw materials and foods, and propose appropriate control methods,
- Demonstrate a conceptual understanding of quality control issues in the postharvest situation and propose strategies for assessing quality in fresh produce,
- Debate the role of postharvest technology in the supply of food and the reduction of food waste in the modern world,
- Critically evaluate scientific publications in the field of postharvest technology.



Five days



This course is an MSc module.



www.cranfield.ac.uk/pht

Quality of Food and Beverages

This short course will provide an understanding of how quality (e.g. colour, shape, aroma, taste, texture, nutrition) and value are evaluated in foods and beverages, and how this is influenced by genetic, environmental and management factors.

On successful completion of this course you will be able to:

- Explain primary and secondary metabolism and comment on its importance in relation to food production,
- Relate biochemical properties of primary food sources to key attributes that are responsible for food quality and value, including environment, management and genetics,
- Evaluate how the processes of breeding and selection can lead to improved quality,
- Develop advanced research skills in literature survey, critical appraisal and oral presentation.



Five days



This course is an MSc module.



www.cranfield.ac.uk/qfb



Future Food Sustainability short courses

- Agricultural Informatics,
- Economic Valuation and Appraisal,
- Leading Corporate Sustainability,
- Plant Based Technologies,
- Principles of Sustainability,
- Soil Systems,
- Strategic Foresight,
- Water and Sustainable Agrifood Systems.

Agricultural Informatics

The purpose of this course is to provide a set of practical applications and tools for developing, managing and analysing 'Big Data', to better deliver food security.

On successful completion of this course you will be able to:

- Formulate a comprehensive understanding of Agricultural Informatics.
- Critically evaluate the potential of sensor systems (remote/near etc.) to measure and monitor the agri-environment,
- Manage, manipulate and interrogate large agri-environmental datasets,
- Formulate a conceptual understanding of the inter-relationship between the ecology and agriculture, and the ecosystem goods and services that agriculture within its landscape provides,
- Develop systematic and creative problem solving skills, and demonstrate the ability to interpret and obtain meaningful outcomes,
- Communicate conclusions effectively, including assumptions and methodologies, to both specialist and non-specialist audiences.



Five days



This course is an MSc module.



www.cranfield.ac.uk/agrii

Economic Valuation and Appraisal

This course explores economic concepts and techniques that can be used for the valuation of the environment, how these support decisions regarding the optimal allocation of resources and the design of policy interventions.

In the search for methods that combine economic analysis and environmental assessments to achieve the goal of sustainable development, the measurement of environmental costs and benefits is an increasingly important element of the appraisal of policies and projects.

On successful completion of this course you will be able to:

- Explain the purpose and methods of environmental accounting at business, sector and national levels,
- Explain the difference between financial and economic valuation and appraisal,
- Valuation: Critically assess strengths and weaknesses of different environmental valuation methods and techniques.



Five days



This course is an MSc module.



www.cranfield.ac.uk/iev

Leading Corporate Sustainability

This course outlines the major sustainability challenges and explores the capabilities organisations require need to respond positively to them.

On successful completion of this course you will be able to:

- Identify global environmental and social trends and relate how these present both challenges and opportunities to business,
- Explain why businesses need to respond to these challenges and opportunities and assess the capabilities they require to do so,
- Classify the potential stakeholder groups businesses can work with to develop and implement their sustainability strategies and compare collaboration approaches,
- Consider the role of personal leadership in an organisation's values, strategic direction and ability to execute its sustainability strategy,
- Critically assess the content and reporting of businesses' sustainability strategies,
- Design and recommend a sustainability-oriented innovation for a selected business.



Five days



This course is an MSc module.



www.cranfield.ac.uk/lcs

Plant Based Technologies

This course provides a critical appraisal of the role of the main plant-based technologies which can be used to advance sustainable crop production and food security.

On successful completion of this course you will be able to:

- Describe the main strategies and technologies in producing new, improved varieties of crop plants,
- Critically appraise the role of plant breeding and seed technology in delivering global food security,
- Describe the process of developing a new agrochemical, and the main classes of agrochemicals currently and previously in use,
- Critically appraise the main methods of biocontrol as an alternative to fungicides and insecticides,
- Evaluate the contribution of research in developing plant-based technologies.



Five days



This course is an MSc module.



www.cranfield.ac.uk/pbt

Principles of Sustainability

This course introduces and critiques three approaches to improving sustainability: ecosystem services, the circular economy, and per capita energy use. It examines their application to resolve real-world problems and create commercial opportunities.

On successful completion you will be able to:

- Critique terms like "sustainability", "ecosystem services", and "circular economy",
- Explain how an ecosystem service approach can help society to identify and make decisions regarding the use of ecological resources, with a focus on biodiversity, greenhouse gases, nutrient loss, and water use,
- Explain how we can enhance the stability, resistance and resilience of natural systems.



Five days



This course is an MSc module.



www.cranfield.ac.uk/pos

Soil Systems

This course will focus on how decisions in land management and water resource management are informed by a fundamental understanding of the science of soils and plants driving the water, carbon and nitrogen cycles in terrestrial systems.

Food security, environmental protection and mitigation of climate change impacts depend upon effective management of soil, plant and water interactions in the environment.

On successful completion of this course you will be able to:

- Describe the role of soil systems in the context of ecosystem services and soil functions,
- Explain the principal responses of plants to solar radiation, temperature, drought and aeration stress,
- Measure and quantify the key features of the soil physical environment (ie soil texture and structure, bulk density, porosity and volumetric and gravimetric water content).



Five days



This course is an MSc module.



www.cranfield.ac.uk/ssyst

Strategic Foresight

Strategic foresight research refers to a range of methods that can be used to identify, analyse and communicate insights about the future. Standard methods include horizon scanning, trend research, and scenario planning.

On successful completion of this course you will be able to:

- Explain why organisations engage in foresight research,
- Describe what foresight research aims to achieve and what it cannot do,
- Evaluate the utility and application of different foresight research methodologies,
- Examine the role of foresight research evidence in the environmental context,
- Identify and apply the tools of foresight research in the environmental context, apply foresight research methods to support a convincing case and use foresight research evidence effectively.



Five days



This course is an MSc module.



www.cranfield.ac.uk/sf

Water and Sustainable Agrifood Systems

Water is an essential factor of production in agrifood systems; whether for growing crops, supporting livestock or food manufacture. Globally, 70% of freshwater withdrawals are used for agriculture, but increasing demand for food means that this figure is likely to increase dramatically in the future.

On successful completion of this course you will be able to:

- Describe the role of water in crop and livestock systems,
- Design and evaluate management and technological solutions to minimise the water-related impacts and risks to crop and livestock production systems in food supply chains,
- Critically appraise the role of water in future challenges to food sustainability.



Five days



This course is an MSc module.



www.cranfield.ac.uk/wasas



Part-time postgraduate study

The following postgraduate programmes are available part-time over two-to-three years. They benefit from Cranfield's long-standing expertise for delivering high-quality master's programmes alongside being relevant to industry ensuring content meets the expectation of employers.

If you already have short course credit points from an associated programme why not develop your skills further?

Applied Bioinformatics

Cranfield's Bioinformatics MSc is the first of its kind in the UK. With more than 200 alumni over the past 10 years, it became the most popular postgraduate course in Bioinformatics in Europe. Because Cranfield is a solely postgraduate university it means that every single taught module of the Applied Bioinformatics MSc is uniquely tailored to be a Masters-level. That's why it is the award-winner of the BBSRC's Masters Training Grant (MTG) for best course in life sciences. Our taught modules cover in great depth a plethora of programming languages typically applied in the bioinformatics, such as Perl, Java, R and SQL; as well as modern Web technologies such as JavaEE, NoSQL and JavaScript. Furthermore, we have two dedicated taught modules focusing on established bioinformatics protocols for the latest Next Generation Sequencing (NGS) and 3rd Generation Sequencing (3GS) technologies.

Food Systems and Management

Developed with and specifically for industry, the Food Systems and Management MSc is a gateway to a successful career for anyone passionate about improving major worldwide problems such as food security and food safety.

Through the integration of scientific, technological and managerial aspects (teaching shared with our internationally recognised School of Management, and industry experts) you will learn how to use and manage food resources more efficiently in order to achieve sustainable, secure and safe food supply chains across the globe.

Our graduates are highly valued by a variety of Agrifood businesses, which translates to a very high employment

rate of 94.5%*. Joining us could be the "golden ticket" you need to boost your career in the fast and ever-changing Agrifood sector.

Future Food Sustainability

Food security and the sustainability of our food supply chains are global major challenges and are clearly highlighted in the United Nations Sustainable Development Goals (SDGs). Climate change, political and social changes around the world and new diet trends are some of the changing forces we are currently experiencing that put more pressure on our food system. How can we transform our food system to make it more resilient and sustainable while at the same time ensuring the supply of safe and nutritious food for everyone? The Future Food Sustainability MSc is the first of its kind in the UK to provide you with a balanced mix of technology, science, strategic foresight and management skills; enabling you to develop a successful career in the food sector and make a real difference in the world. Teaching is shared with our internationally recognised School of Management and industry experts.

Developed through intensive collaboration and consultation with industry, NGOs and government agencies, our graduates are highly valued, both nationally and internationally, in the area of sustainable food production and we have a very high employment rate of 94.5%* for our School.

We have a great commitment with student excellence, from both UK and from around the world, and every year we will offer bursaries to several outstanding candidates.

www.cranfield.ac.uk/studyagri



In-company and customised training

How can you help your business and employees reach their full potential? Have you considered in-company training, tailored to your business needs?

Our insight is rooted in our powerful industry links, world-class research and what works in practice. As such, we can make a real difference to you and your organisation, whether you are a multi-national company, a growing SME or a small start-up. Benefit from having tailored-made courses specific to your business needs, at a time and place that suits you.

We can provide a range of programmes from half-day workshops, to intensive week-long training, informed by the latest research and delivered by leading experts in the field.

Talk to us about how we can develop your staff and enhance performance in your organisation.

E: shortcourse@cranfield.ac.uk



Masterships® Master's-level apprenticeships

Cranfield Masterships® are master's-level degrees which meet the requirements of the UK Government Level 7 Master's Degree Apprenticeship Standard. These enable you to use your Apprenticeship Levy to accelerate the development of your middle and senior managers, and employees in senior technical positions as they move into leadership positions.

Our current Masterships® include:

- Bioinformatics Apprenticeship Standard,
- Postgraduate Engineer Apprenticeship Standard,
- Senior Leader Apprenticeship Standard,
- Systems Engineering - Apprenticeship Standard.

www.cranfield.ac.uk/masterships



Research degrees

DBA

EngD

MRes

MPhil

PhD

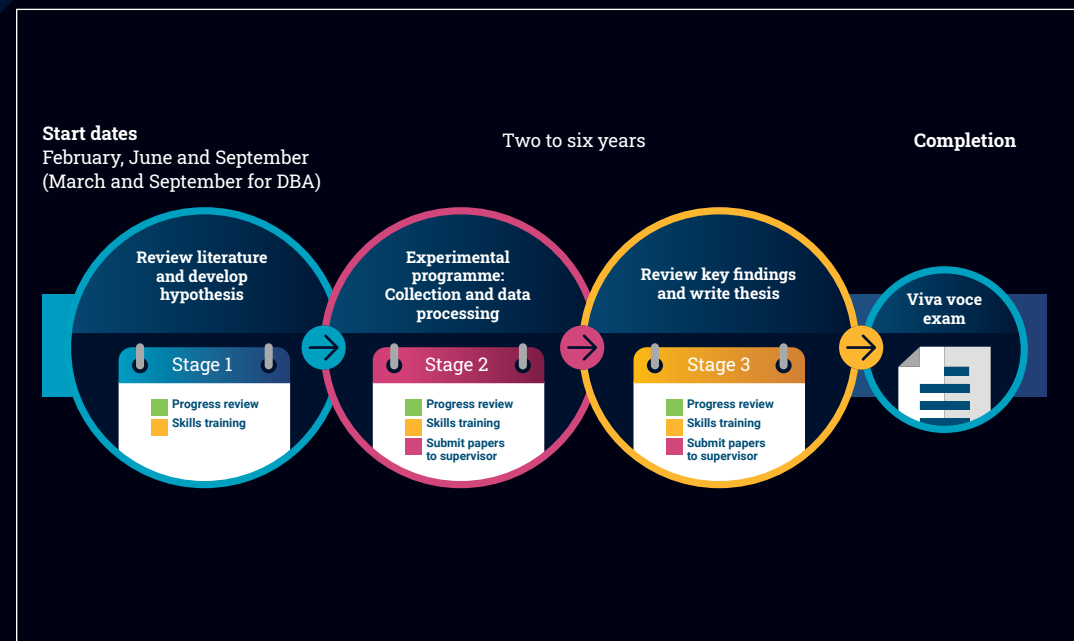
Our research degrees are also available to study part-time. As a part-time research student you will be in good company, over a third of all our students study part-time.

Cranfield's dynamic, research intensive and specialised position means our research students are able to study exciting projects that have an impact globally and make a practical difference to the world.

There are three ways to study a research degree at Cranfield:

- **Funded research opportunities** – we offer a range of fully funded research opportunities, often in collaboration with industry and research councils.
- **Individual research projects** – self funding allows you to explore an area of research that you are passionate in, you will first need to develop a research proposal with support from an academic supervisory team.
- **Employment related research projects** – if you and/or your employer have a concept for a research project linked to your area of work then we can help develop and support this.

For more information on our research degree opportunities, entry requirements or to make the first step in an individual research project visit: www.cranfield.ac.uk/research



Staff

One of the strengths of Cranfield is that we bring together a world-class group of experts to share their experiences.



Professor Andrew Thompson, Professor of Molecular Plant Science, Head of Cranfield Soil and Agrifood Institute



Dr Angel Medina Vaya, Senior Lecturer in Food Mycology



Dr Fady Mohareb, Reader in Bioinformatics



Dr Sofia Kourmpetli, Lecturer in Plant Sciences



Dr Daniel Simms, Lecturer in Remote Sensing



Dr Jacqueline Hannam, Senior Research Fellow in Pedology



Dr MariCarmen Alamar, Lecturer in Postharvest Biology



Dr Paul Burgess, Reader in Crop Ecology and Management



Dr Natalia Falagan Sama, Research Fellow in Food Science and Technology



Dr Rosina Watson, Senior Lecturer in Sustainability Strategy

Past attendees

Across our range of courses, we have welcomed many high-profile organisations. These include, but are not limited to:

- Branston Ltd,
- British Society of Soil Science,
- Dairy Crest,
- Florette UK & Ireland Ltd,
- Food Industry Support Ltd,
- Marks and Spencer,
- National Farmers Union,
- New Cross Fruit Farms Ltd,
- Sainsbury's Supermarkets Ltd,
- Syngenta Ltd.

Location


How to find us

Cranfield University is located about halfway between London and Birmingham, and on the outskirts of Milton Keynes. Junctions 13 and 14 of the M1 are five minutes away and Milton Keynes railway station is 20 minutes away by taxi. London Luton, Stansted and Heathrow airports are 30, 90 and 90 minutes away respectively by car, offering superb connections.



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