



Continuing
Professional
Development

Water

2019/20

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Welcome



Professor Paul Jeffrey
Director of the Water Theme

Continuing professional development provides us all with updated skill sets and new opportunities to make our mark in the world. At Cranfield University, we offer a range of options to enable you to enhance your understanding and develop new competencies 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 gives you access to our knowledge and expertise across the water sector. Cranfield Water Science Institute has a proud reputation for its research on the science, engineering and management of water. Our lives and livelihoods are dependent on the natural and engineered water cycles. Accordingly, research and skills development in water treatment and management have never been more vital. Cranfield's research in these areas is applied and industry focused, and we have been driving innovation for over 40 years.

Almost half of our students study while in employment. 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.

Cranfield has highly productive and 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.

Everything we do is concentrated on developing technologies that serve society and providing learning opportunities for people who want to make a difference.

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.



Short courses in Advanced Water Management

- Aquatic Ecosystems,
- Catchment Water Quality,
- Drought and Water Scarcity,
- Flood Risk Management,
- Integrated River Basin Management,
- Modelling Environmental Processes,
- Surface and Groundwater Hydrology,
- Water in Cities.

Aquatic Ecosystems

This short course specifically considers the basis for understanding how the landscape and the aquatic system interact.

It covers topics related to ecological processes, species distribution and community structure, function and how they can change, and it provides the necessary understanding of the appropriate methods to quantify aquatic ecological attributes which have become of central importance to environmental management of water bodies.

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

- Explain the key elements of aquatic ecosystems in the landscape,
- Describe the linkage between biological, chemical and hydro-morphological attributes of a water body,
- Discuss the ecological and hydromorphological processes that determine the ecological status of a water body,
- Explain how aquatic related organism occurrence, distribution and movement are determined by the aquatic landscape,
- Compare methods to determine ecological attributes and construct a monitoring plan relevant to the location, species and spatial temporal scale of investigation.



Five days



This course is an MSc module.



www.cranfield.ac.uk/ae

Catchment Water Quality

For those working in water management, it is important to understand the rationale for and be practically competent in the sampling of water and the measurement and interpretation of water quality parameters.

On successful completion of this short course you will be able to evaluate water quality data and the monitoring strategies that generate them.

Topics covered on this course include:

- Water quality issues; acceptability for human consumption and aquatic life,
- Water quality standards,
- Water quality monitoring principles and strategies.



Four days



This course is an MSc module.



www.cranfield.ac.uk/cwq

Drought and Water Scarcity

This short course considers the different definitions of drought and the derivation and application of selected drought risk metrics, the engineering and management measures available to reduce impact, and economic techniques for evaluating drought impacts and managing drought risk.

The course focuses on impact and management responses in three key sectors, domestic (public water supply), agriculture (rainfed and irrigated cropping) and the environment (aquatic and terrestrial ecosystems).

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

- Evaluate the relevance of the various definitions of drought, including meteorological, agricultural, hydrological and socio-economic, and the current policy drivers for managing water scarcity and drought risk,
- Explain how to calculate and apply different drought indicators (metrics) including assessing their utility and limitations,
- Critically evaluate and compare different approaches to assessing drought risk and water scarcity impacts within the domestic (public water supply), agriculture and environment sectors.



Five days



+10 credits
This course is an MSc module.



www.cranfield.ac.uk/dws

Flood Risk Management

The 'risk' of flooding can be considered as the product of the probability of a flood occurring and the consequences of the flood.

This course considers the techniques for estimating flood probability, engineering and non-structural measures to reduce flood probability, economic techniques for evaluating flood consequences and current approaches to managing flood risk.

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

- Select the appropriate method to determine the likelihood of a flow of a given magnitude for ungauged catchments and for catchments with some historical data,
- Critically use the Flood Estimation Handbook (FEH) method to estimate the likelihood of peak flows in ungauged catchments in the UK,
- Evaluate the impacts of alternative channel designs for flood alleviation.



Five days



+10 credits
This course is an MSc module.



www.cranfield.ac.uk/frm

Integrated River Basin Management

There is growing recognition that sustainable solutions to environmental water management problems require a coordinated approach centred on the river basin scale.

On this course, you will develop the skills to analyse and interpret environmental data within a spatial context and to assess them in light of current drivers (e.g. regulatory and socioeconomic).

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

- Explain the spatial dimensions to and linkages between major environmental water management problems, including water supply, flood risk, water quality and habitat conservation and restoration,
- Describe the socio political context for integrated river basin management, including the relevant policy environment and the role of stakeholders,
- Analyse and interpret geospatial and temporal data, drawing appropriate, justifiable conclusions in the context of integrated catchment management.



Five days



+10 credits
This course is an MSc module.



www.cranfield.ac.uk/irbm

Modelling Environmental Processes

An introduction to the full suite of environmental models and modelling methods that are currently used to describe and predict environmental processes and outcomes.

The objective of this course is to give an overview of the different types of models currently being used to describe environmental processes and how they are being applied in practice.

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

- Examine the major environmental models currently being applied in soil, water, ecosystems and atmosphere,
- Recognise the standard types of numerical models in use in environmental sciences,
- Formulate the generic process of model design, building, calibration and validation. Recognise some of the uncertainties introduced in this process.



Five days



+10 credits
This course is an MSc module.



www.cranfield.ac.uk/mep

Surface and Groundwater Hydrology

This short course concentrates on the quantification of surface and groundwater hydrological processes.

An understanding of rainfall, evapotranspiration, runoff, groundwater recharge, groundwater storage, and groundwater movement is essential for those involved in the science, engineering or management of the water environment. This course provides a conceptual and quantitative understanding of hydrology and the basic principles of hydraulics as a basis for later applied studies of water quality, water engineering, and water management.

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

- Understand the basic hydraulic principles of static and moving water,
- Measure point and estimate areal rainfall,
- Estimate potential evapotranspiration from weather data and understand the relationship between actual and potential evapotranspiration.



Five days



This course is an MSc module.



www.cranfield.ac.uk/sgh

Water in Cities

This short course will focus on the growing recognition that, as a result of rapid urbanisation, many of the key global challenges in water management will be faced by cities.

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

- Explain key global challenges for urban water management and their implications (including climate change, population growth, and infrastructure provision),
- Describe the socio political context for urban water management in cities (UK, EU, global),
- Identify and evaluate emerging technologies and approaches in urban water management.



Five days



This course is an MSc module.



www.cranfield.ac.uk/wc



Short courses in Water and Sanitation for Development

- Communities and Development,
- Emergency Water Supply and Environmental Sanitation,
- Management and Governance for Water and Sanitation,
- Surface and Groundwater Hydrology,
- Water and Wastewater Treatment for Development,
- Water in Cities.

Communities and Development

This short course focuses on understanding the complex processes of change that are going on around us every day plus the sustained improvements in human wellbeing that programmes of guided change seek to bring about in a particular place.

It will also equip you with relevant tools and methodologies for the management and implementation of WASH (Water, Sanitation and Hygiene) development interventions. On successful completion of this course you will be able to:

- Critically discuss the concepts of development, community and community development, and evaluate how these shape the WASH sector,
- Identify and explain historical and emerging trends in the practices and policies of rural water supply and sanitation in low and middle income countries,
- Explain the complexities of "getting things done" in development, especially at the community level (knowing our limits!),
- Apply relevant tools and methodologies (e.g. LogFrames, Monitoring and Evaluation Frameworks) that can (sometimes) help "get things done" in development.



Five days



This course is an MSc module.



www.cranfield.ac.uk/cd

Emergency Water Supply and Environmental Sanitation

This short course focuses on the provision of safe water supply and introduction of environmental sanitation under difficult circumstances, especially due to the frequency of displaced populations as a consequence of conflict and the inevitable occurrence of natural disasters.

On successful completion of this short course you will:

- Differentiate and describe the characteristics of different types of emergency situation and phases,
- Understand the main issues surrounding logistics and management of emergency situations,
- Evaluate, select and design appropriate emergency water supply including its treatment.



Five days



This course is an MSc module.



www.cranfield.ac.uk/ewses

Management and Governance for Water and Sanitation

This short course introduces you to the theory and practice of financing and management approaches in supplying water and sanitation, focusing upon the role of cost-reflective pricing targeted subsidies, to ensure financial and service sustainability for all.

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

- Describe the economic and social drivers for the effective, equitable and efficient management of water and sanitation services,
- Explain the different institutional models for water and sanitation services, understanding strengths and weaknesses in different contexts,
- Assess the principle cost-categories for sustainable water and sanitation services, with respect to capital and recurrent costs.



Five days



This course is an MSc module.



www.cranfield.ac.uk/mgws

Surface and Groundwater Hydrology

This short course concentrates on the quantification of surface and groundwater hydrological processes.

An understanding of rainfall, evapotranspiration, runoff, groundwater recharge, groundwater storage, and groundwater movement is essential for those involved in the science, engineering or management of the water environment. This course provides a conceptual and quantitative understanding of hydrology and the basic principles of hydraulics as a basis for later applied studies of water quality, water engineering, and water management.

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

- Understand the basic hydraulic principles of static and moving water,
- Measure point and estimate areal rainfall,
- Estimate potential evapotranspiration from weather data and understand the relationship between actual and potential evapotranspiration.



Five days



This course is an MSc module.



www.cranfield.ac.uk/sglh

Water and Wastewater Treatment for Development

This 4.5 day course covers the conventional unit operations employed in water and wastewater treatment from a development perspective. This includes the scientific engineering principles on which they are based.

This short course is perfect for those working in Water, Sanitation and Hygiene (WASH) or the development sector who wish to learn more about fundamental engineering principals for effective water treatment and distribution in a low-income setting.

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

- Describe different water quality parameters and how they are measured,
- Describe the basic principles of drinking water treatment and how these can be used at different scales including household, community and municipal,
- Evaluate simple methods of wastewater treatment and how these are being applied to treating conventional waterborne sewage as well as in faecal sludge management.



Four and a half days



This course is an MSc module.



www.cranfield.ac.uk/wawtd

Water in Cities

This short course will focus on the growing recognition that, as a result of rapid urbanisation, many of the key global challenges in water management will be faced by cities.

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

- Explain key global challenges for urban water management and their implications (including climate change, population growth, and infrastructure provision),
- Describe the socio political context for urban water management in cities (UK, EU, global),
- Identify and evaluate emerging technologies and approaches in urban water management.



Five days



This course is an MSc module.



www.cranfield.ac.uk/wc



PROTECTED BY ASSISTED

Short courses in Water and Wastewater Engineering

- Anaerobic Digestion of Sewage Sludge,
- Biological Processes,
- Chemical Processes,
- Hydraulics and Pumping Systems,
- Introduction to Potable Water Treatment,
- Physical Processes,
- Water and Wastewater Treatment Principles.

Anaerobic Digestion of Sewage Sludge

Anaerobic digestion is a key process for sewage sludge stabilisation and energy generation in wastewater treatment plants. The course covers basic principles as well as the latest developments on anaerobic digestion operation and design.

The course covers:

- Microbiology and links to anaerobic pathways,
- Description of the anaerobic digestion processes principles, design, operation optimisation,
- AD troubleshooting and efficiency through calculations,
- Principles of heat transfer for optimum anaerobic digestion performance,
- Calculations and real examples.



One day



www.cranfield.ac.uk/adss

Biological Processes

This course will provide an understanding of the design principles, practice and operational experience of biological treatment processes.

On successful completion of this short course you will:

- Identify the range of conventional and advanced biological treatment processes for the treatment of bulk organics, nutrients and micropollutants,
- Understand the underlying biological principles on which the processes are based, and be able to apply these principles to unit process design and operation,
- Select appropriate processes for specific applications, and have some knowledge of practical design considerations,
- Execute and assess laboratory work for wastewater quality analysis.



Five days



This course is an MSc module.



www.cranfield.ac.uk/bp

Chemical Processes

This short course provides an understanding of the design principles, practice and operational experience of conventional and advanced chemical treatment processes.

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

- Identify the range of conventional and advanced water and wastewater treatment processes for the removal of dissolved impurities (including toxic metals and trace organics) and the inactivation of pathogenic organisms,
- Understand the underlying chemical principles on which the processes are based, and be able to apply these principles to unit process design and operation,
- Select the appropriate processes for specific applications, and have some knowledge of practical design considerations,
- Execute and assess laboratory work examining disinfection by-products.



Five days



This course is an MSc module.



www.cranfield.ac.uk/cp

Hydraulics and Pumping Systems

This short course provides a foundation in hydraulics with reference to water and wastewater treatment flow sheets.

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

- Calculate hydraulic profile through a treatment works,
- Design flow division and combination devices,
- Understand the basic principles of hydraulics,
- Understand the effects of flow variations through a treatment works.

For those unable to attend the full five-day course, the following options are available:

- Two day intensive course in Hydraulics,
- Two day intensive course in Pumping Systems.

Please contact us for further information.



Five days



This course is an MSc module.



www.cranfield.ac.uk/hps

Introduction to Potable Water Treatment

This course provides an understanding of technologies used for the treatment of water for potable water supply.

On successful completion of this course you will gain:

- An appreciation of scope of available process technologies, as applied to the purification of raw water for potable supply,
- An indication of the capability of these processes,
- An opportunity to demonstrate understanding through participation in design exercises in water treatment.



Two days



www.cranfield.ac.uk/pwt

Physical Processes

This short course will provide you with an understanding of the design principles, practice and operational experience of conventional and novel physical separation processes.

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

- Understand the fundamental physical phenomena governing solid-liquid separation processes,
- Understand the factors affecting the selection, design and operation of conventional and innovative physical separation processes,
- Design and specify appropriate operating conditions the unit processes for physical separation as applied to water and wastewater treatment,
- Execute and assess laboratory work examining physical processes used in the solid-liquid separation sector.



Five days



This course is an MSc module.



www.cranfield.ac.uk/pp

Water and Wastewater Treatment Principles

This 4.5 day course covers the conventional unit operations employed in water and wastewater treatment, including the scientific engineering principles on which they are based.

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

- Understand the nature of impurities in waters and wastewaters, their concentrations and significance,
- Understand the basic principles of conventional treatment processes,
- Select appropriate processes, depending on the nature of the impurities to be removed and the intended use of the treated water or effluent,
- Complete a flow-sheet selection assignment showing how unit processes are selected based on incoming water quality.



Four and a half days



This course is an MSc module.



www.cranfield.ac.uk/wwtp

Research and skills development in water treatment and management have never been more vital. Cranfield's research in these areas is applied and industry focused, and we have been driving innovation for over 40 years.



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?

Advanced Water Management

Managing water is one of society's greatest challenges. Droughts, floods, poor water quality and uneven water provision have social, economic and environmental consequences. Through our strong industry connections, you will gain the up-to-date knowledge and skills needed to propose sustainable policy, practice and technological solutions now and for our changing future.

Water and Sanitation for Development

Although much progress has been made over the last three decades, still more than one billion people lack access to a safe, reliable and affordable water supply; and more than twice that number still lack access to basic sanitation. This course provides the essential skills and knowledge required to plan and implement water supply and sanitation projects and programmes in any part of the world, particularly in low and middle income countries.

Water and Wastewater Engineering

Water is under increasing pressure from demographic and climatic changes. Water engineering and treatment processes play a key role in delivering safe, reliable supplies of water to households, industry and agriculture, and in safeguarding the quality of water. This course equips you with the skills to solve practical problems, communicate effectively and work successfully making you highly sought after by industry and government.

www.cranfield.ac.uk/studywater

"My degree at Cranfield equipped me with a solid foundation in water and wastewater engineering - I still find myself referring to my lecture notes from time to time - even though they are now 18 years old! Studying at Cranfield and maintaining links with the university has provided me with a fantastic network of contacts across the industry - and not just limited to the UK."

Emma Sharp, Area Operations Business Lead, Severn Trent (Water Pollution Control Technology Programme MSc and PhD 2002 and 2005)



In-company and customised training

How can you help your business and employees reach their full potential? Have you considered in-company training, tailor-made 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 tailor-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.

www.cranfield.ac.uk/incompanywater



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,
- Through-life Engineering Services (TES) Specialist Standard.

www.cranfield.ac.uk/masterships



Research degrees

DBA

EngD

MRes

MPhil

PhD

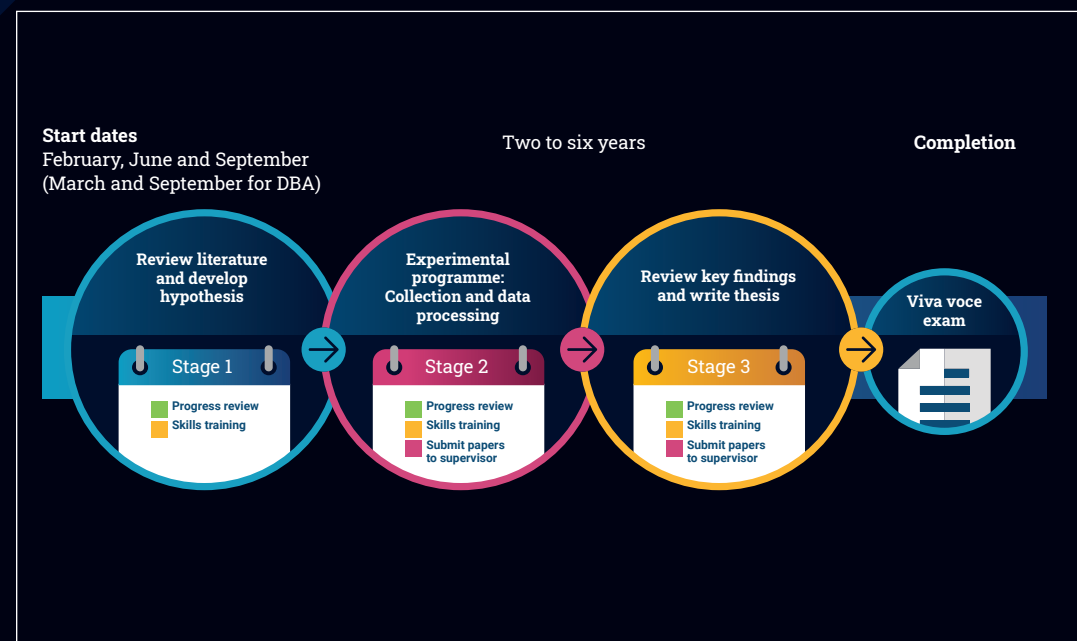
Our research degrees are also available to study part-time. As a part-time research student you will be in good company, over a third of all our students study part-time.

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 Sean Tyrrell,
Professor of Bioaerosol Science
and Interim Pro-Vice Chancellor -
Education



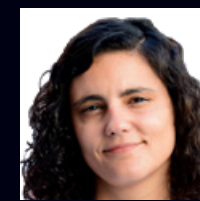
Dr Jitka Macadam,
Lecturer in Water Science Education



Dr Robert Grabowski,
Senior Lecturer in Catchment
Science



Dr Yadira Bajon Fernandez,
Lecturer in Anaerobic Processes



Dr Dolores Rey Vicario,
Lecturer in Water Policy and
Economics



Dr Andrea Momblanch,
Academic Fellow in Water
Systems Modelling

Past attendees

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

- ABB Limited,
- Amey Group Services Limited,
- Anglian Water,
- The Environment Agency,
- GlaxoSmithKline,
- The Institute of Environmental Science and Research,
- Jacobs Engineering,
- Saudi Aramco,
- Severn Trent Water,
- South West Water Limited,
- Thames Water Utilities Limited,
- United Utilities,
- WWF,
- Yorkshire Water.

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 Bedford and Milton Keynes railways stations are approximately 20 minutes away by taxi. London Luton, Stansted and Heathrow airports are 30, 90 and 90 minutes away respectively by car, offering superb connections.



Cranfield University
Cranfield, MK43 0AL, UK

E: shortcourse@cranfield.ac.uk
T: +44 (0)1234 754189
www.cranfield.ac.uk/cpd

 @CranfieldUni
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