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**The Faculty of Computing, Engineering and the Built Environment (CEBE) is making major investments in growing the quality and volume of research across its two constituent Schools (Schools of Engineering and the Built Environment, and Computing and Digital Technology) through investments in academic staff and researchers, doctoral students and new labs, workshops and equipment.**

The [Water, Environment and Communities Research Centre](https://www.bcu.ac.uk/computing-engineering-and-the-built-environment/research/water-environment-and-communities) is located in the Faculty of Computing, Engineering and the Built Environment (CEBE) and based at our City Centre Campus. The Centre undertakes applied research on a range of contemporary themes relating to water and the environment reflecting the diversity and interdisciplinary nature of issues concerning the development of resilient communities. The Centre undertakes a portfolio of applied interdisciplinary research, knowledge exchange, education, community engagement and advice for decision makers and policy makers at all levels. The Centre’s work embraces and integrates local, national and international perspectives on water, focusing on environmental challenges towards sustaining resilient communities.

We have a range of PhD studentships now available across the range of disciplines represented in the centre. There are a limited number of funding opportunities available with some studentships including full scholarships while others having partial or self-funding options. Funding will be determined based on the strength of the candidate and quality of the proposal. Some of these projects also include support from our collaborating organisations.

**NUMERICAL MODELIZATION OF THE PHYSICS OF WETLANDS**

**How to apply**

**The closing date for applications is 23.59 on Sunday 1 December 2019.**

To apply, please complete the [project proposal form](http://www.bcu.ac.uk/Download/Asset/1c822112-124b-e911-818d-005056831842) , **ensuring that you quote the project reference,** and then complete the [online application](https://www.bcu.ac.uk/courses/bsbe-research-degrees-phd-2018-19)  where you will be required to upload your proposal in place of a personal statement.

You will also be required to upload two references, at least one being an academic reference, and your qualification/s of entry (Bachelor/Masters certificate/s and transcript/s)

For international applicants, a valid English language qualification, such as International English Language Test System (Academic IELTS) or equivalent with an overall score of 6.5 with no band below 6.0, must be submitted with your application.

These studentships come with full fee waivers for both UK and international candidates. There will also be the opportunity for some paid teaching work of up to 180hrs per academic year. Exceptionally strong candidates may also be offered a bursary. Final funding arrangements will be determined based on the strength of the candidate and quality of the proposal. Some of these projects also include support from our collaborating organisations.

You can find further details on studying for a PhD and details of how to apply [here](https://www.bcu.ac.uk/courses/bsbe-research-degrees-phd-2018-19)

**Project title: NUMERICAL MODELIZATION OF THE PHYSICS OF WETLANDS**

**REF: CEBE-NUMMOD**

**Contact:**

The successful candidate will be supported by an interdisciplinary research team, consisting, in particular, of Dr Vasiliki Ioannidou ([vasiliki.ioannidou@bcu.ac.uk](mailto:vasiliki.ioannidou@bcu.ac.uk)) and Dr Florimond Gueniat ([florimond.gueniat@bcu.ac.uk](mailto:florimond.gueniat@bcu.ac.uk)). For further information please contact the Director of Studies, Prof Wenyan Wu, [Wenyan.wu@bcu.ac.uk](mailto:Wenyan.wu@bcu.ac.uk).

**Overview:**

Wetlands (i.e., marshes, bogs, and swamps) “are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water” [8].

There is hence a whole spectrum of diverse types of wetlands, and it explains why modelizing a wetland is such a challenge. But they are known to be key in protecting the biodiversity: they provide shelters for plants and species, where breeding, and feeding occur [8]. Wetlands also have an immense value in flood protection and pollution control [4,6]. There is, consequently, a crucial need for understanding better the wetlands.

The project

The project will consist of creating a numerical model of a wetland. It will be solved using standard FEA techniques and software (ansys/fluent, openfoam, etc.). In particular, it will allow to quantify the hydraulic performance of the wetland, and possibly to derive an ad hoc model. It will be fitted and compared to the available experimental data. Validation of the model will be carried out.

In addition to this, the porosity of the plants as a medium will be investigated. The influence of various parameters will be quantified, including for example the inclination of plants with respect to the time of the year, the variation in the water velocity due to different flow regimes, and the wind interference. It will be carried out using uncertainty quantification techniques, such as chaos expansion or Sobol analysis, or by fitting the model on the data, using Bayesian techniques.

In order to validate the model, on site experimental field work may be arranged to obtain new datasets if required. The work is of high interest and importance to the Environmentalists, Water Authorities & Councils, Regulators, Modellers, Wetland Designers, and other relevant stakeholders

**Person specification:**

MSc or equivalent professional or research experience in remote sensing, fluid mechanics, civil engineering, Computing and computational computing or closely related fields and have knowledge of environmental science and data processing.

**References:**

[1] Ioannidou, V.G. & Pearson, J.M. (2018). ‘Hydraulic & Design Parameters in Full-Scale Constructed Wetland & Treatment Units: Six Case Studies’. *Environmental Processes*.

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[8] Cowardin, L.M., Carter, V., Golet, F.C. and LaRoe, E.T., 1979. Classification of wetlands and deepwater habitats of the United States. *US Department of the Interior, US Fish and Wildlife Service*.