

UQ Winter Research Project Description

Project title:	Open channel hydraulics and modelling coherent structures and turbulence in hydraulic engineering
Project duration:	5 weeks
Description:	<p>Theoretical and numerical studies of turbulent flows in hydraulic structures are complicated by the large number of relevant equations: i.e., three basic equations (continuity, momentum, energy), plus a mass transfer equation. Most studies rely upon some physical experiments with sophisticated instrumentations. Model studies are performed under controlled flow conditions with geometrically similar models.</p> <p>Open channel hydraulic investigations will be conducted to predict the turbulence and mixing induced by large-scale coherent structures in hydraulics flows.</p>
Expected outcomes and deliverables:	<p>The work will be conducted in the AEB hydraulic research laboratory. The student(s) will conduct some research experiments under academic supervision in a world-known research laboratory. They/he/she will gain skills in modelling and data processing, together with some critical analysis of the results. Student(s) may also be asked to produce a report or oral presentation at the end of the project.</p>
Suitable for:	<p>Suitable for Civil and Environmental Engineering students who successfully completed course in Fluid Mechanics (UQ equivalent: CIVL2131), and preferably Open Channel Hydraulics (UQ equivalent: CIVL3140), and are likely undertake a CIVL4583/4584 Research thesis or CIVL4560 Project in 2021, semester 2, or 2022, semester 1.</p> <p>Preference will be given to highly motivated students.</p> <p>The research project will place typically in June/July 2021. UQ enrolled students only. Pre-requisite: Successful completion of Fluid Mechanics courses equivalent to CIVL2131 Fluid mechanics.</p>
Primary Supervisor:	Professor Hubert Chanson
Further info:	<p>For further information, contact Professor Hubert CHANSON: Room 49-553 h.chanson@uq.edu.au</p>

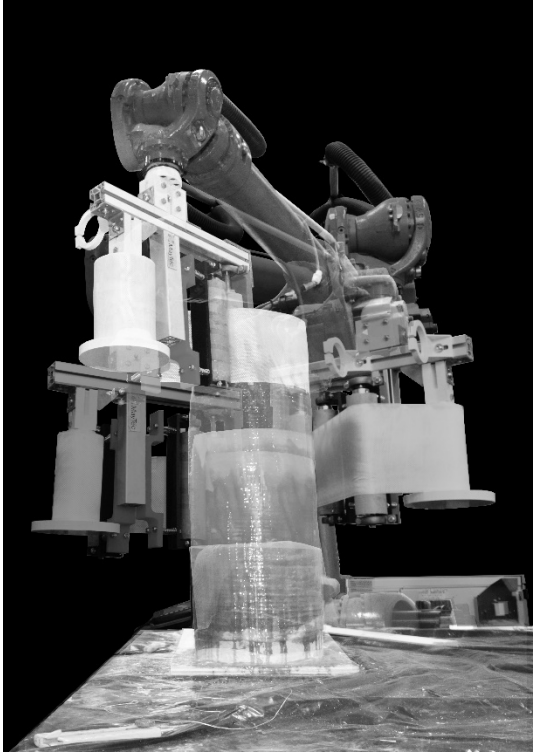
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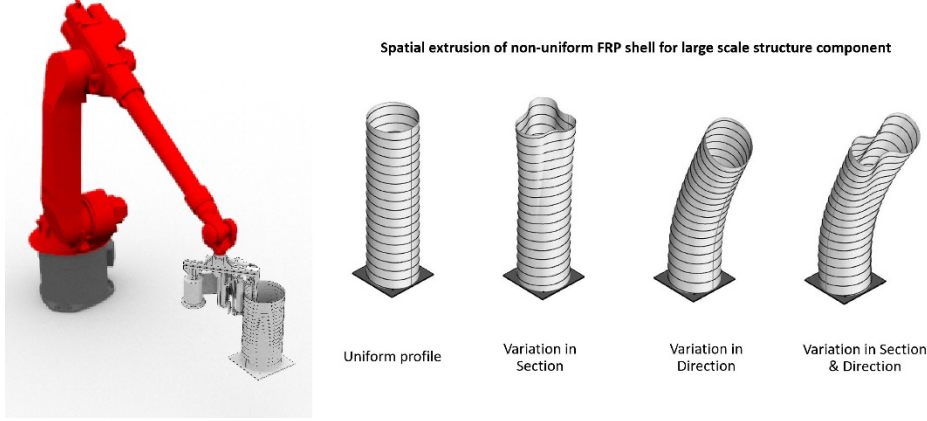
Project title:	Physical modelling of hydraulic structures
Project duration:	5 weeks
Description:	<p>Theoretical and numerical studies of turbulent flows in hydraulic structures are complicated by the large number of relevant equations: i.e., three basic equations (continuity, momentum, energy), plus a mass transfer equation. Most studies rely upon some physical experiments with sophisticated instrumentations. Laboratory model studies are performed under controlled flow conditions with geometrically similar models.</p> <p>Hydraulic investigations will be conducted in the AEB hydraulics laboratory to predict the hydrodynamic performances of man-made structures. The project will aim to characterise the turbulence and the effects of flow turbulence on the optimum flow conditions.</p>
Expected outcomes and deliverables:	<p>The work will be conducted in the AEB hydraulic research laboratory. The student(s) will conduct some research experiments under academic supervision in a world-known research laboratory. They/he/she will gain skills in modelling and data processing, together with some critical analysis of the results. Student(s) may also be asked to produce a report or oral presentation at the end of the project.</p>
Suitable for:	<p>Suitable for Civil and Environmental Engineering students who successfully completed course in Fluid Mechanics (UQ equivalent: CIVL2131), and preferably Open Channel Hydraulics (UQ equivalent: CIVL3140), and are likely undertake a CIVL4583/4584 Research thesis or CIVL4560 Project in 2021, semester 2, or 2022, semester 1.</p> <p>Preference will be given to highly motivated students.</p> <p>The research project will place typically in June/July 2021. UQ enrolled students only. Pre-requisite: Successful completion of Fluid Mechanics courses equivalent to CIVL2131 Fluid mechanics.</p>
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UQ Winter Research Project Description

Project title:	Investigation of key focus areas for a circular infrastructure industry
Project duration & delivery	The project will run for 5 weeks with meetings and work undertaken at the St Lucia campus. Remote working arrangements are also acceptable if required.
Description:	The project is part of a collaborative initiative between UQ and industry which supports Australia's infrastructure industry to transition to circular economy principles. The winter research project investigates key opportunities for circular economy in the infrastructure industry via a review of literature and analysis of data from industry partners.
Expected outcomes and deliverables:	Applicants will gain skills in systematic literature reviews, data collection and analysis and contributing to an academic paper for publication.
Suitable for:	This position is open to students of the EAIT Faculty at either Bachelor or Masters level. Knowledge of civil engineering or the infrastructure industry will be well regarded.
Primary Supervisor:	Dr Jurij Karlovšek and Dr Cristyn Meath
Will you be collaborating with an external organisation on this project?	<i>The project is part of a collaborative initiative between UQ, the Infrastructure Sustainability Council of Australia (ISCA) and Business Models Inc. (BMI). The initiative also involves representatives from the Queensland Government and numerous relevant industry associations and leading companies.</i>
Further info:	For further information please contact Dr Jurij Karlovsek at j.karlovsek@uq.edu.au

UQ Winter Research Project Description

Project title:	Robotic FRP fabrication with a customized non-standard geometry
Project duration:	4 weeks
Description:	<p>Recent studies on topology optimization have found that material efficiency can be significantly improved by using irregular sections to replace the conventional sections in some structural members. The optimized structures are also tended to be with changing cross-sections along the member span or height, such as the tree-like structure used at the Qatar National Convention Centre and the Art Nouveau Apartment by Flying Concrete in San Miguel De Allende Mexico. FRP is found to be a promising material for the irregular profiles because of its high flexibility. However, as above mentioned, conventional manufacturing techniques have their limitations on irregular shapes</p> <p>The fabrication method proposed to investigate is developed inspired by the novel hybrid double-skin tubular arch bridge system developed in UQ, in which prefabricated FRP tubes are used both as formworks for concrete casting and as reinforcement to construct a hybrid bridge structure.</p>  <p>Based on this system of construction, our research is introduced to explore the potential to use robotic technology for robotic fabrication of structural members with greater formwork flexibility to reduce the cost of transportation and to increase the material and structural efficiency of the building structure.</p>

	<p style="text-align: center;">Spatial extrusion of non-uniform FRP shell for large scale structure component</p> 
Expected outcomes and deliverables:	<p>Scholars may gain skills in basic industrial robot control, non-standard geometry design optimization, robotic fabrication path planning, prototype fabrication experience.</p> <p>The scholars are expected to deliver an adaptive path planning for robotic fabrication with non-standard FRP tube geometry. Design and fabrication of a jointing system between robotic fabricated subassemblies will also be required. A final customized concrete-filled FRP tube prototype will be fabricated if applicable.</p> <p>There will also be an opportunity to generate publication based on the prototype geometry design pattern and the robotic fabrication method.</p>
Suitable for:	<p>This project is open to senior undergraduate and master students with a background of civil engineering or architecture. One for civil engineering and one for architecture are preferred.</p> <p>Students owning previous experience with FRP/concrete or rhino/grasshopper will be in higher priority. The students must gain access to the structure lab and industrial robotic arm by completing all relevant inductions before the research program.</p>
Primary Supervisor:	<p>Dr. Dan Luo</p>
Further info:	<p>Dan Luo d.luo@uq.edu.au Please contact the supervisor prior to submission</p>

UQ Winter Research Project Description

Project title:	Development of novel treatments to enhance timber durability
Project duration:	5 weeks
Description:	<p>In timber elements, the main concern with moisture is its ability to create conditions conducive to biological attack. Nevertheless, water intrusion has much more immediate effects on the mechanical properties of timber, which are associated with swelling (water uptake) and shrinking (drying) of the wood. Thermal modification of wood is a way to achieve water repellence. It is a process where the wood is heated to high temperatures. Drying oils with a high content of polyunsaturated fatty acids, such as linseed oil have effectively restricted water penetration into wood samples.</p> <p><u>Research objectives</u></p> <ol style="list-style-type: none"> 1. Prepare TMW specimens. The timber samples used will from three Australian hardwood Eucalyptus species (1 week) 2. Assess the changes in the chemical characteristics of the wood (2 weeks) 3. Evaluate the treatment quality in terms of the durability of the coating, and the wettability and hydrophobicity of the treated timber (2 weeks)
Expected outcomes and deliverables:	Scholars would gain skills in data collection, experimental design and manipulation. In addition, one journal paper is expected to be published from the result of this project. This will boost the student's opportunities for later RHD studies at the School.
Suitable for:	<p>This project is open to applications from students with some kind of background in timber, preferably from EAIT.</p> <p>On-campus work essential.</p>
Primary Supervisor:	Luis Yerman
Further info:	Please contact Dr Luis Yerman at l.yerman@uq.edu.au before applying