Junior Researcher Mentoring Programme 2023

Code:	JRMP2023_06
School / Department:	Department of Civil and Environmental Engineering
Name of Research Team Member(s):	Dr Alireza Keramat, Research Assistant Professor
Research Topic:	Exploring the Analogy between Pipe Networks and Electric Circuits
Short Description of the Research Project:	The water supply infrastructure is a fundamental sector of developed countries. To monitor these systems, the physical properties of flow in the pipe network need to be understood and formulated. More specifically, the mathematical formulations to govern these systems must be derived in terms of the velocity of the fluid in each pipe and the pressure at each junction. The principle to develop the forgoing formulations is the energy and the mass balance that allows for connecting the pressures and flow rates in terms of algebraic equations. Likewise, the electric circuits have two main unknowns being the electric current (analogous to the flow rate or velocity) that is associated with each resistive element and the voltage (analogous to the pressure) that provides a force to move the electrons by the potential difference. While the analogy between the unknowns of the pipe and circuit networks is obvious, the inference about this analogy in terms of their governing equations needs further investigation. Specifically, we will scrutinise and compare the constitutive equations of the pipe and circuit networks. As an essential motive for this study, one can refer to the costly construction of the pipe network pilot systems and the cheap construction of electric circuits. This, in fact, suggests making

	an equivalent electric circuit corresponding to each pipe network to predict the possible behavior of the pipe network.
No. of Places Offered:	2
Frequency of Meetings:	Weekly
Special Requirement(s):	The participating students should have a good background in Mathematics (especially calculus), Physics and Computer programming.

** The information presented above is subject to change.*