ELECTRICAL ENGINEERING
COLORADO SCHOOL OF MINES

Spring 2017 Colloquium Series

Tuesday, March 14, 2017
1:30-2:00 pm – Meet and Greet –BB340
2:00-3:00 – Seminar Talk – GC Metals Hall

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Robust Design and Optimization of Low Frequency Electromagnetic Devices

Abstract:
Electromagnetic devices are an indispensable component of modern life. Generators are the basic devices for mechanical to electrical energy conversion providing for the effective, reliable and flexible transmission of energy; motors and actuators convert that energy back into mechanical form. Over the last 50 years the increasing power of computers has allowed the complete simulation of these devices – the creation of a virtual laboratory. However, being able to analyse (or test) the performance of a potential machine only addresses part of the needs of a designer of an actual device. The question is how can a computer system be used to actually help in the design process of a motor or generator? Generally, designing a device means simultaneously achieving several performance objectives such as the force or torque output, a minimum efficiency, a rated speed, a maximum temperature, a minimum cost, etc. In addition, when a device is constructed, it is unlikely that every input parameter has a value which exactly matches that used in the simulation. In this case, the performance of the device may differ from the prediction. The question is how much will that variation be and is it acceptable? Ideally, a computer based design system should include the impact of parameter variations on the performance of a device, generate designs which are robust.

The seminar is intended to provide some background on the current state of the art in simulation and then discuss both multi-objective optimization and the inclusion of robustness as part of the optimization process. It will also look to the future and propose possible scenarios for design tools given advances in computing and manufacturing technologies.

Bio: David Lowther received a B.Sc.(Hons) degree in Electrical Engineering from King's College, London in 1970 and a Ph.D. in 1973 from Brighton Polytechnic, UK. He spent 6 years as a post-doctoral researcher at Imperial College, London before taking up a position as an Associate Professor in the Department of Electrical Engineering at McGill University in 1979. He was promoted to Full Professor in 1986. He was one of the founding members of the International Compumag Society and is currently its Vice-President for the Americas.

His research work involves in the use of computer systems in the design process of low frequency electromagnetic devices. In particular, he has applied numerical optimization techniques and artificial intelligence methods to assist the designer in finding a solution to satisfy a particular set of requirements while minimizing the time needed to do it.

David Lowther is a Fellow of the IEEE, the Institution of Engineering and Technology and the Canadian Academy of Engineering.