Minimization of maximum completion time, \( \min(C_{\text{max}}) \), and minimization of total completion time, \( \min(\sum C_j) \), are two fundamental objectives of scheduling in serial systems, where a serial system consists of a number of stages or machines, and operations must be done sequentially from the first operation to the last. An \( m \)-machine flow line for production scheduling in manufacturing systems and a 3-stage perioperative (periop) process for operating room (OR) scheduling in healthcare systems are typical examples of serial systems. The scheduling objectives of \( \min(C_{\text{max}}) \) and \( \min(\sum C_j) \) drive critical performance measures of operations management (OM) in serial systems, which, in general, can be summarized as production cost and holding cost, and specifically as, due date, utilization of production lines, work-in-process (WIP) inventories, OR cost to a hospital, length of stay across the periop process, etc. Although maximum completion time is included in total completion time, minimization of one completion time does not necessarily mean minimization of the other. Garey et al. (1976) proved NP-completeness of \( \min(C_{\text{max}}) \), and Hoogeveen and Kawaguchi (1999) proved NP-completeness of \( \min(\sum C_j) \). \( NP \) stand for non-deterministic polynomial, and \( NP \)-completeness means, in layman words, it is impossible to generate an optimal solution to a general problem in a given period of time. Moreover, Li et al. (2014) proved the inconsistency between \( \min(C_{\text{max}}) \) and \( \min(\sum C_j) \), which presents additional theoretical challenges for OM to balance trade-offs between production cost and holding cost in manufacturing systems, and between OR cost to the hospital and patient flow across the periop process. We model the inconsistency between two completion times, first, as two coupled deviations from lower and upper bounds of completion times, second, as current and future deviations (CFD), and third, as variations in performance evaluation. Based on Taillard’s benchmarks for flow shop scheduling, 5400 randomly generated small-scale instances, and historical OR data from UK HealthCare, our CFD heuristic outperforms the NEH heuristic on \( \min(C_{\text{max}}) \) and the LR heuristic on \( \min(\sum C_j) \), which are the best heuristics in world respectively for each of the two scheduling problems, and generates stable performance in balancing trade-offs of scheduling in serial systems.

When: 11:00AM, Friday, November 10, 2017
Where: 414A CRMS Building

Wei Li has been an assistant professor in ISM at UK since 2013. He was a post-doctoral fellow in Haskayne School of Business from 2011 to 2013, got his PhD and MSc degrees, respectively in 2011 and in 2006 from Department of Mechanical and Manufacturing Engineering at University of Calgary, and got his BEng from Tsinghua University in 1997. He has a 3-year working experience in IT and another 3-year working experience in manufacturing in China and Canada. His research interests are adaptive scheduling and control in serial systems, optimization, simulation and data analysis.