

Concurrent Computing Course

Prof. Andrzej Bargiela, an Erskine visitor to UC, is teaching a short course on concepts of concurrent programming that students are invited to attend. This short course will provide some important theoretical background for anyone interested in parallel algorithms and programming:

Lectures on Concurrent Computing
Department of Computer Science & Software Engineering
Lecturer: Prof. Andrzej Bargiela, University of Nottingham, UK
Visiting Erskine Fellow (Feb.-May 2014)

The general objective of this short course on Concurrent Computing will be to link the mathematical specification of algorithms, that may benefit from concurrent execution, with the necessary consideration of the correctness of the implementation of such algorithms. First four lectures will be given within COSC413 but additional participants are welcome.

Lecture 1: 1.00pm-2pm, Wednesday, 26 March 2014, room Erskine 315

Concurrent computing abstraction:

introduction of a formalism that enables reasoning about correctness of concurrent programs; atomic instructions, interleaving and proofs by mathematical induction

Lecture 2: 2.00pm-3pm, Wednesday, 26 March 2014, room Erskine 315

Mutual exclusion problem:

discussion of the interdependence of concurrent programs and the various attempts to ensure correct execution of such programs using the most basic computer functionality that of memory interlock

Lecture 3: 1.00pm-2pm, Wednesday, 2 April 2014, room Erskine 315

Fine-grained atomic operations - semaphore synchronization:

refinement of synchronization of concurrent processes by building complex instructions

Lecture 4: 2.00pm-3pm, Wednesday, 2 April 2014, room Erskine 315

Coarse-grained atomic operations - monitor synchronization:

refinement of synchronization of concurrent processes by building abstract data types

Optional tutorials/practicals

Students will be offered an opportunity to undertake a project using an emulator of the ADA language. This provides an environment for empirical validation of the correctness of implementation of concurrent programs as well as facilitating an easy introduction to ADA programming.

Additional Lectures at the beginning of May, the date(s) and room: TBA

The objective will be to expand on the formal proof of correctness in the context of distributed computing environments.

Lecture 5:

ADA rendezvous for distributed synchronization:

synchronization of concurrent processes executing on distributed hardware; a-symmetrical communication-based synchronization with a privileged process

Lecture 6:

Distributed mutual exclusion:

synchronization of concurrent processes executing on distributed hardware; symmetrical communication-based synchronization with all processes being equal

Lecturer profile:

Andrzej Bargiela (www.bargiela.com) is Professor of Computer Science working at the University of Nottingham, UK. His external appointments included Visiting Professorships at the University of Alberta, Canada, Helsinki University of Technology, Finland, Tokyo Institute of Technology, Japan, University of Bari, Italy and Krakow Technical University, Poland.

His research falls under the general heading of Computational Intelligence and involves study of representation of information and uncertainty, mathematical foundations of Granular Computing, information abstraction, human-centred information processing, fuzzy logic, parallel, distributed and neural computation and modeling and optimization of systems with structural and information uncertainty.

He is Associate Editor of the IEEE Transactions on Systems, Man and Cybernetics, (Systems) and Associated Editor of Information Sciences. He served as President of the European Council for Modelling and Simulation and serves/served as reviewer for research funding bodies in UK, Germany, Italy and Poland.