

MPhil in Advanced Computer Science

Advanced Topics in Concurrency

Leaders: Glynn Winskel and Jonathan Hayman
Timing: Easter
Prerequisites: Category theory
Structure: 8 lectures

AIMS

This module gives a rapid introduction to the major models for concurrent computation, especially “causal” or “independence” models such as Petri nets and event structures which are becoming increasingly important in today’s semantics and verification, and how they are related and used in the semantics and verification of concurrent/distributed computation from the verification of security protocols, to game semantics and systems biology.

SYLLABUS

- Models for concurrency: transition systems, Petri nets, Mazurkiewicz trace languages, interleaving vs. independence models [2 lectures]
- Bisimulation and open maps [2 lectures]
- Event structures and stable families [2 lectures]
- Graph rewriting and rule-based systems biology [2 lectures]

OBJECTIVES

On completion of this module, students should:

- know about transition systems, Petri nets, Mazurkiewicz trace languages, event structures and how they are related;
- be able to apply such models to semantics and basic reasoning;
- have insight into their use over a variety of areas, especially in rule-based systems biology.

ASSESSMENT

By take-home test.

RECOMMENDED READING

Notes and articles will be provided. They will probably include:

Winskel, G., & Nielsen, M., (1993). *Models for Concurrency*. A Chapter in the Handbook of Logic in Computer Science. OUP.

Joyal, A., Nielsen, M. & Winskel, G. (1996). *Bisimulation from open maps*. An article in Inf.& Comp.