UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Concurrent Models

2425-1-F1801Q132-F1801Q132M

Aims

Acquire the ability to formally specify, model, and analyze concurrent systems; acquire the ability to state properties of concurrent systems by means of temporal logics.

Contents

Theoretical tools useful to understand and manipulate basic notions of computer science, related to the behaviour and the specification of distributed and concurrent processes. Fundamental notions about verifying properties of programs ans models of systems. Use of formal logics to specify properties of systems.

Detailed program

- Formal models for specifying and verifying the correctness of programs. Axiomatic semantics of sequential programs, Hoare logic; proofs of correctness of sequential programs.
- Models of concurrency: models of reactive systems, process calculi (CCS, Calculus of Communicating Systems), Petri nets. Fundamental notions about concurrent systems: causal dependence and independence, conflict, confusion, synchronization.
- Interleaving semantics (transition systems) of concurrent systems; partial order semantics (Petri nets). Semantics based on observation, equivalence notions for processes, bisimulation.
- Specification and verification of properties (modal and temporal logics, algorithms for model-checking). Linear Temporal Logic (LTL), Computation Tree Logic (CTL), basic notions of the mu-calculus.

Prerequisites

Basic notions of imperative programming; basic notions of propositional logic.

Teaching form

Instructional teaching: Lectures (3 CFU, 24 hours), practice sessions (2 CFU, 20 hours)
Interactive teaching: Practice sessions (1 CFU, 10 hours).
Language of the course: Italian

Textbook and teaching resource

Notes and papers available on the course site. Reference texts suggested on the course site.

Semester

First semester.

Assessment method

The evaluation for this module includes a written exam with assignments on all sections of the programme, and an oral exam, with discussion of the written part, and questions on the subjects of the module. The score is defined after the discussion.
There are no in-progress tests.

Office hours

Luca Bernardinello: on appointment.

Lucia Pomello: on appointment.

Sustainable Development Goals