UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Formal Methods

2122-3-E3101Q121

Aims

At the end of the course, the student will be able to model, at several levels of abstraction, concurrent systems done by interacting components and to specify their requirements by means of a logic; the student will know the main techniques to prove the system's behavioral properties, and will be able to use some software tools for the design and analysis of concurrent systems.

Contents

A logic language will be introduced to specify behavioral properties of concurrent systems. Petri nets will be presented as useful formal tools to model concurrent systems and to analyze their properties. Algorithms and software tools for the design and analysis of such systems will be also introduced.

Detailed program

1. Survey of formal methods in the design and analysis of concurrent systems.

2. A logic language to specify behavioral properties of concurrent systems: Propositional Linear Temporal Logic (PLTL), syntax and semantics, equivalence of formulas, examples of unsatisfiable formulas in PLTL, properties of liveness, safety and fairness in PLTL. Transition systems and model checking.

3. Languages and software tools to specify and analyse concurrent systems and programs.

4. Petri nets: conceptual foundation, applications, and analysis techniques: elementary net systems,

transition rule, case graph. Place Transition nets: incidence matrix, Parikh vector, state equation. Behavioral properties and their verification on the reachability graph. Structural analysis: S- and T-invariants; siphons and traps; rank theorems. Net subclasses: state machines, marked graphs, Free-choice nets and analysis of behavioral properties on such subclasses. Other classes of nets.

Prerequisites

Basic notions of propositional logic. Basic notions of mathematical analysis and of discrete mathematics (as presented in the course of Fundamentals of Computer Science).

Teaching form

Lectures, practical exercises, laboratory activity. Language: Italian.

Textbook and teaching resource

Handouts, research and survey papers.

Semester

Second semester

Assessment method

Written and oral exam. The written exam consists in the execution of some exercises. In the oral exam the solution of such exercises will be discussed and some questions on the developed arguments will be done. Moreover, the solution of some exercises on modeling and verification developed during the lab could be also discussed.

No score is given to the written exam, the score is defined at the interview.

Office hours

On appointment