Course name:

Games, Logic and Automata

Course Syllabus

Lecturer: Alex Rabinovich

Credit: 3pt

Prerequisites: Logic for CS, Computational Models.

Course Objectives:
In this course we will study topics related to games, logic and automata and a rich interplay between them. These provide the mathematical foundations to formal verification.

Automata on infinite words and trees serve as a computational model for reactive systems; Logics are the basis of specification formalisms and games are a conceptual framework for understanding the interaction between a system and its environment.

Course Syllabus:
Infinite behavior of finite automata: closure properties, succinctness, deteminization algorithms.

Specification formalisms and their expressive power and succinctness properties: Monadic second order logic, temporal logics, algebraic formalisms.

Decidability of monadic second-order logics over the naturals and over the full binary tree. Reduction to finite automata, EF games, Shelah's compositional method.

Church Synthesis problem*: Infinite two-persons perfect information games. Determinacy, computational and descriptive complexity of*

winning strategies.

Model Checking Problem. Algorithms for model-checking and their complexity.

Recommended reading:

D. Perrin and J. E. Pin. Infinite Words Automata, Semigroups, Logic and Games. Pure and Applied Mathematics Vol 141 Elsevier, 2004.

W. Thomas Automata and Reactive systems. (draft of a book).

Grade: 80% home exam + 20% HW