Instructor: Ebru Aydin Gol

Catalogue description: Modeling systems, linear time properties, linear temporal logic, computational tree logic, model checking, abstraction techniques, state-space explosion problem, model-checking tools, recent topics in formal methods.

Background requirements: Familiarity with propositional logic and automata theory. Basic programming skills. Fundamentals of discrete structures.

Course objectives: By the end of this course the students will be able to
- Explain fundamental concepts in computer-aided formal verification.
- Create mathematical models for sequential and concurrent systems.
- Write and analyze formal properties of the developed models.
- Prove formal specifications of the model to validate system’s correctness.
- Use automated verification tools.

Course conduct: In class. Participation is important. There will be discussions and in-class exercises.

Course outline

1- Introduction to formal methods
2- Modeling sequential and concurrent systems
3- Formal specifications (~2 weeks)
4- Linear Temporal Logic (LTL), LTL model checking, and SPIN (~ 3 weeks)
5- Computation tree logic (CTL), CTL model checking, CTL* (~1-2 weeks)
6- Model checking of distributed systems with TLA+ (~2 weeks)
7- Advanced topics in formal methods

Textbooks: None

Reference material

Books:

Grading (tentative)

Homeworks (written + tools) + Project: %50
Midterm: %20
Final: %30