

COURSE DESCRIPTION

Department and Course Number	CS 386	Course Coordinator	Valentino Crespi
Course Title	Introduction to Automata Theory	Total Credits	4

Current Catalog Description:

Formal approach to automata theory; finite state machines, regular expressions, regular languages. Develops mathematical foundation for computer science.

Textbook:

J. Hopcroft, R. Motwani, J. Ullman. *Introduction Automata Theory, Languages and Computation*. Addison-Wesley.

References:

- Arto Salomaa. *Computation and Automata*. Cambridge University Press.
- Peter Linz. *An Introduction to Formal Languages and Automata*. Jones and Barlett Publishers.
- Hartley Rogers, Jr. *Theory of Recursive Functions and Effective Computability*. The MIT Press.
- Michael Sipser. *Introduction to the Theory of Computation*. Thomson.
- Christos H. Papadimitriou. *Computational Complexity*. Addison-Wesley.

Course Goals:

At the end of the course, students are able to

- Understand and manipulate formal descriptions of languages, automata and grammars with focus on Regular and Context Free Languages, Finite State Automata and Regular Expressions.
- Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.

These course goals contribute to the success of **Student Learning Outcomes 1.c, 5, and 6**.

Prerequisites by Topic:

- Computer Programming.
- Discrete Mathematics.

Major Topics Covered in the Course:

- Mathematical Preliminaries and Proof Techniques: sets, alphabets, strings, languages, proofs by contradiction and structural induction.
- Grammars and Automata: language generation and language recognition.
- DFSA and NDFSA. The Subset construction.
- Regular Languages and Regular Expressions.
- Minimization of DFSA.
- Linear Grammars.
- Pumping Lemma for Regular Languages.
- Context Free Languages.
- Parse Trees. Leftmost and rightmost derivations. Ambiguity.
- PDA and DPDA.
- Pumping Lemma for Context Free Languages.

Laboratory Projects (specify number of weeks on each):

At the discretion of the instructor. Projects range from weekly assignments to a couple of class projects over the course of the term.

Estimate Curriculum Category Content (Quarter Hours)

Area	Core	Advanced	Area	Core	Advanced
Algorithms			Data Structures		
Software Design			Prog. Languages		
Comp. Arch.			Other*	4	

(*) Automata, Theory of Computation and Structural Complexity Theory.

Oral and Written Communications:

No significant component.

Social and Ethical Issues:

No significant component.

Theoretical Content:

- Grammars and Automata.
- Theory and Analysis of Formal Languages.

Problem Analysis:

Students identify the issues involved with representing and study formal languages. In particular they focus on grammars and automata.

Solution Design:

Solution design involve the implementation of algorithms for the manipulation of Automata and Formal Languages.