

Formal Languages and Automata Theory (COT 4420)

Catalog description: An introduction to the formal languages and automata, with emphasis on context-free and regular languages. Topics will include regular grammars, deterministic and nondeterministic finite state machines, parsing algorithms, linear-bounded automata and the use of Turing machines to introduce the P=NP problem.

This course is an introduction to the theory of computation. We will cover different abstract models of computation and their associated computing power. We will examine different classifications and properties of languages recognized by different abstract machines. We will explore the power of different types of computation and the theoretical limits of computers.

Prerequisites: *MAD 2104 Discrete Mathematics*
COP 3530 Data Structures and Algorithms Analysis

Textbook : Peter Linz "*An Introduction to Formal Languages and Automata*" Fourth Edition, Jones and Bartlett, 2006

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Objectives:

- To understand fundamental concepts of Computer Theory and the use of Mathematical thinking as it is applied to Computer Science.
- To understand DFA's and NFA's as Mathematical models of computation.
- To understand NPDA's as Mathematical models of computation
- To understand Turing Machines and LBA's as Mathematical models of computation.
- To improve the understanding of formal languages as Mathematical objects.
- To improve the ability to accurately solve difficult problems in Computer Science by representing them in mathematical forms.
- To improve the ability to communicate concepts in Computer Theory and Mathematics.

Topics:

- The use of Mathematics to communicate about Computer Science
- Combinatorial and Sequential Machines
- Finite Automata, Acceptors and Transducers
- Deterministic and Non-deterministic Finite Automata and their equivalence
- Reduction of the number of states in Finite Automata
- Languages and Grammars
- Regular Languages, Regular Expressions, and Regular Grammars
- Context-free Languages and Context-free Grammars
- Pushdown Automata, Properties of Regular and Context Free Languages
- Pumping Lemmas for Regular and Context Free Languages
- Turing Machines
- The Hierarchy of Formal Languages
- Introduction to Computability, Decidability, the Halting Problem and Complexity Theory.
- P, NP and NP-completeness.
- Philosophical Implications of the limits of Computation.

Grading: Homework and participation (20%)
 Midterm exam (35%)
 Final exam (45%)

Accommodations for students with disabilities:

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodations due to a disability to properly execute coursework must register with the Office for Students with Disabilities (OSD) located in Boca Raton - SU 133 (561-297-3880), in Davie - MOD I (954-236-1222), in Jupiter - SR 117 (561-799-8585), or at the Treasure Coast - CO 128 (772-873-3305), and follow all OSD procedures.

FAU Honor Code:

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see http://www.fau.edu/regulations/chapter4/4.001_Honor_Code.pdf.