

I. Languages

- A.** Alphabets and strings
- B.** Definition of languages: a subset of the set of all strings.
- C.** Operations on languages:
 - 1. complement, union and intersection
 - 2. concatenation
 - 3. Kleene star
- D.** Related concepts
 - 1. proving two languages are the same
 - 2. inductive definitions

II. Computation Models for Regular Languages

- A.** The models:
 - 1. DFAs
 - 2. NFAs
 - 3. Regular expressions
- B.** Key concepts
 - 1. Acceptance conditions
 - 2. Be able to design a DFA, NFA or regular expression to recognize (or generate) a simple regular language from an English description of the language.
 - 3. Non-determinism
 - 4. Special constructions
 - a.** Product machines
 - b.** Power set

III. Closure properties

- A.** Boolean operations: complement, union, intersection
- B.** Concatenation
- C.** Intersection
- D.** Reversal

IV. Non-regular languages

- A.** The pumping lemma
 - 1. What it states
 - 2. How to use it to prove that a language is not regular
- B.** Some “typical” example of non-regular languages:
 - 1. $a^n b^n$

2. Balanced parentheses
 3. Length is a prime, perfect square, integer power of two.
- C. Using closure properties to prove that a language is not context free.