**CHAPTER 0-0**

**introduction to theory of computation**

* We are going to study the science of computing. However, what does it mean to study the science of computing given the rapid change in computing technology within the last 70 years?
* The answer is that there are mathematical properties of problems and algorithms, which do not depend on the computing technology.
* To study the science of computing, we construct mathematical models of computers and computation.
* To model the hardware of a computer, we use an automaton.
  + An automaton is an abstract model of a digital computer.
  + It accepts inputs, produces outputs, may have some temporary storage, and can make decisions in transforming the input to the output.
* To model the software of a computer, we use a formal language.
  + A formal language is a language for which we can produce a formal specification.
  + A formal language consists of a set of symbols and rules by which these symbols can be combined into sentences following the rules.
* The theory of computation includes several topics:
  + automata theory
  + languages/grammars
  + computability
  + complexity.
* We can think of automata, languages/grammars, and computability as the study of what can be done and what cannot be done by computer in principle regardless of processor speed or memory size, while we can think of complexity as the study of what can be done and what cannot be done by computer in practice.