Syrian Arab Republic

Higher Institute for Applied Sciences and Technology

HIAST

Course Specification Document

Title	Automata & Formal Languages

Credits	5 ECTS

Aims	This course aims to provide the student with the knowledge and skills related to the generation and recognition of programming languages.

Intended learning outcomes

On successful completion of this course, the student will be able to:

- Identify types of formal languages.
- Recognize the models describing these types.
- Utilize algorithms for transforming automata into formal rules.
- Apply theoretical concepts to propose a classification for simple languages.
- Understanding the general framework and fundamental issues of compilers.
- Design and construct automaton models.
- Employ standard patterns such as Chomsky or Turing machines.

Syllabus

- **Fundamental concepts:** Automata and formal languages, language membership definition (vocabulary identification and rule setting, Turing machine).
- **Finite automaton model:** Deterministic Finite Automaton (DFA), Non-deterministic Finite Automaton (NFA), Non-deterministic Automaton with epsilon move (NFA-e), regular expressions.
- **Properties of regular languages:** Pumping lemma, closure properties, finding the smallest DFA.
- **Context-Free grammar model:** Rule simplification, Chomsky's form, Greibach's form.
- **Properties of context-free grammars.**
- **Stack-based automaton model:** Non-deterministic Pushdown Automaton, Deterministic Pushdown Automaton.
- **Introduction to compilers:** General framework and key issues: Compiler structure, stages of work (lexical analysis, syntactic analysis, semantic analysis, code generation).