

Course Number & Name: 235CSS-3 Theory of Computation

Credits and Contact Hours: 3 crs; 3 hrs for Theory +1 hr for Tutorial

Course Coordinator's Name: Dr. Anwar Esmail

Textbook Title, Author, and Year: Introduction to Automata Theory, Languages, and Computation , *J. E. Hopcroft, R. Motwani, J.D. Ullman, (3rd edition), Addison Wesley, 2007.*

a. Supplemental Material: None

Specific Course Information

a. Catalog Description: Study of abstract models of computers and computation. Finite state automata and regular languages. Pushdown automata and context-free languages. Pumping lemmas. Applications to parsing. Turing machines. Un-decidability and decidability.

b. Prerequisites: 111CSS-4

c. Required, Elective, or Selected Elective: Required

Specific Goals for the Course

a. Specific Outcomes of Instruction:

- Describe the basic concepts of alphabets, strings, regular expressions, languages, derivation (leftmost and rightmost), finite state machines, pushdown automata, Turing machines, decidability, halting problems and time complexity.
- Explain the relationships between regular expressions, different types of languages defined by grammars and abstract machines.
- Construct finite automata, push down automata, Turing machines and regular expressions that models different types of languages.
- Design various models of computation.
- Assess the equivalence of DFA with NFA, PDA with context free grammars, and regular expressions with automata.

b. Student outcomes addressed by the course: a, b, c, f, h, i, j, k

Brief List of Topics to Be Covered

- Automata: The Methods and the Madness
- Finite Automata
- Regular Expressions and Languages

- Minimization of DFA's
- Context Free Grammars and Languages
- Pushdown Automata
- Properties of Context Free Languages
- Introduction to Turing Machines
- Equivalence of One Tape and Multi-tape TMs
- Un-decidability
- The Halting problems
- Intractable Problems