

Planning and Quality Assurance Affairs

Form (A)

Course Specifications

General Information

Course name	Automata Theory
Course number	ITCS3314
Faculty	
Department	
Course type	College Needs
Course level	3
Credit hours (theoretical)	3
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

- 1 - specify the relationship between the four classes of languages, grammars, and automata, and explain why they are so related
- 2 - convert expressions from grammar form to automata and from automata to grammar
- 3 - show competence in the application of the major proof forms (the pumping lemmas) common to the study of theory of computer science
- 4 - understand the limits of computing and have an introductory knowledge of complexity theory.
- 5 - Learning some important applications in fields of digital design, programming languages and compiler.
- 6 - Problem solving in games.

Intended Learning Outcomes

Knowledge and Understanding	<ul style="list-style-type: none"> * a1. Describe precise mathematical claims using a range of fundamental definitions from discrete math and formal languages. * a2. Discuss formal language and their applications * a3. Explain detailed knowledge of foundational results for regular languages and finite automata. * a4. Identify foundational results for context-free languages and pushdown automata.
Intellectual Skills	<ul style="list-style-type: none"> * b1. Systematically apply knowledge of the formal language and methods of related systems in the identification and solution of the problems * b2. Display sound judgment in the evaluation and selection of methods and tools appropriate for a given problem. * b3. Analyzes and evaluate a range of options in producing a solution to an identified problem. * b4. Evaluate problems solution results from a variety of sources * b5. Critically assess the assumptions and values of proposed approaches and the relationship between theory and practice.
Professional Skills	<ul style="list-style-type: none"> * c1. Systematically apply appropriate methods to develop an algorithm to appropriate application * c2. Apply new techniques in the planning and implementation of the algorithms. * c3. Knowledge of automata with output and applications * c4. Ability to apply the Pumping Lemma for context-free languages to show that a language is not context-free.
General Skill	<ul style="list-style-type: none"> * d1. Manage tasks effectively. * d2. Ability to share ideas and communicate with others * d3. Communicate effectively by oral, written and visual means. * d4. Work effectively as an individual and as a member of a team. * d5. The ability to interact with the automaton theorem.

Course Contents

1	- Deterministic Finite automata, Nondeterministic finite automata, NFA's with lambda-transitions, Converting NFA to DFA.
2	- Minimizing in DFA's, Finite automata with output.
3	- Regular expressions and regular sets. Equivalence of regular sets and finite automata, Generalized transition graph, pumping lemma,
4	- Context Free Grammar, Derivation, derivation tree, ambiguous.
5	- Simplification of CFG, lambda-productions, unit-productions, Useless-productions, chomsky normal form, CYK-algorithm, Regular grammar and regular languages

Teaching and Learning Methods

1	- Lectures
2	- Exercises
3	- Projects

Students Assessment

<u>Assessment Method</u>	<u>TIME</u>	<u>MARKS</u>
Mid-Term Exam	6th week	30
projects and/or Assignments	12th week	20
Final Exam	16th week	50

Books and References

Essential books	Linz, Peter. An Introduction to Formal Languages and Automata, 4th Ed. Sudbury, MA: Jones and Bartlett Publishers, 2006
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Knowledge and Skills Matrix

Main Course Contents	Study Week	Knowledge and Understanding	Intellectual Skills	Professional Skills	General Skill
Deterministic Finite automata, Nondeterministic finite automata, NFA's with lambda-transitions, Converting NFA to DFA.	1-3	a1, a2	b1, b2	c1	d1, d2, d3, d5
Minimizing in DFA's, Finite automata with output.	4-6	a1,a2,a3	b1,b2	c1,c2	d1,d2,d3,d5
Regular expressions and regular sets. Equivalence of regular sets and finite automata, Generalized transition graph, pumping lemma,	7-9	a1, a3	b1-b3	c1	d1-d5
Context Free Grammar, Derivation, derivation tree, ambiguous.	10-12	a1, a4	b4	c1,c2,c4	d2,d5
Simplification of CFG, lambda-productions, unit-productions, Useless-productions, chomsky normal form, CYK-algorithm, Regular grammar and regular languages	13-15	4a5	b5	c4	d2, d5