UNIVERSITY OF NEVADA LAS VEGAS
Department of Computer Science

CS456/656: Automata and Formal Languages

Course Description

This course is about the fundamentals of theoretical computer science (TCS). The objective of TCS is the study of mathematical models of computing and the design of efficient algorithms.

Student Learning Outcomes

- The student should be able to write regular expressions, construct non deterministic and deterministic (minimal) finite automata, and able to prove that certain languages are regular, or not regular.
- The student should be able to design context free grammars construct pushdown automata, and prove that certain languages are context-free, or not context free.
- The student should understand the definition, and the importance, of Church- Turing Thesis.
- The student should acquire the skill needed to design Turing Machines and enumerators for given problems.
- The student should be able to distinguish between decidable and undecidable languages, in certain classic cases.
- The student should have learned the importance of the Halting problem and universal Turing Machines.
- The student should be familiar with the concepts of intractability and NP- completeness.

Student outcomes addressed by this course

SLO 6: Apply computer science theory and mathematical models to comprehend the tradeoffs involved in various design choices.

Course Material

Textbook: An Introduction to Formal Languages and Automata (6th Ed.) by Peter Linz. If you have 4th or 5th edition it should be helpful for 90% of material.

Course Schedule

	Topics	Chapter
Week 1	Language Notation and preliminaries	1
	Introduction to DFA	2
Week 2	Regular languages and DFA problems	2

	Introduction to NFA	2
Week 3	Converting NFA to DFA	2
	DFA minimization	2
Week 4	Regular language notation.	3
	Properties of regular languages	4
Week 5	Pumping lemma for regular languages	4
	Application of pumping lemma	4
Week 6	More applications of pumping lemma	4
	Introduction to context free grammar	5
Week 7	Context free languages	5
	Examination 1	1,2,3,4,5
Week 8	Simplification of context free grammars	6
	Problems on context free languages	5 and 6
Week 9	Pumping lemma for context free languages	8
	Applications of pumping lemma	8
Week 10	Transformations: CNF and GNF	6
	CYK algorithm for membership problem	6
Week 11	Push down automata	7
	Push down automata and CFG	7
Week 12	Turing Machine	9
	Construction of Turing Machines	9
Week 13	Decidable and undecidable problems	12
	Halting problem, and other undecidable problems	12
Week 14	The complexity of classes P and NP	14
	Approximation algorithms for NP-Complete problems	--
Week 15	Review	
	Final Examination (2 hours)	Comprehensive

Grading

The grades will be approximately distributed as follows: (i) Home Works /Quizzes 20% (ii) Exam 1 30% and(iv) Final Exam 50%.

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