Dept Number	CS 553	Course Title	Formal Languages and Automata
Semester Hours	3	Course Coordinator	Shahram Rahimi
Catalog Description	The Chomsky hierarchy of formal grammars and the corresponding classes of automata. Turing machines and basic concepts of computability. Recursive and recursively enumerable languages. Closure properties. Undecidable problems about Turing machines and context-free languages. Deterministic context-free languages and the construction of LR parsers.		

Textbooks

References

Course Learning Outcomes

- To reinforce and extend the student's knowledge of the main results of language and automata theory
- To appreciate how the theory serves as a unifying framework for other areas of computer science
- To study one or more particular applications to other areas, such as the construction of parsers for programming languages

Assessment of the Contribution to Program Outcomes

Outcome →	1	2	3	4	5	6	7	8	9	10
Assessed →	X	X			X					

Prerequisites by Topic

CS 451.

Major Topics Covered in the Course

1. Basic language and automata theory

   Review of finite automata, regular sets, context-free grammars and languages {6 classes}
2. Turing Machines

   Recursive languages, Turing acceptors, techniques for Turing machine construction, Church's hypothesis, Turing machines as generators, variations and equivalence of Turing machines {9 classes}
3. Undecidability

   Universal Turing machines, undecidability of the halting problem, recursiveness and recursive enumerability, Post's correspondence problem, and undecidable problems about context-free languages {9 classes}
4. The Chomsky hierarchy

   Grammars and their relation to automata, relations between classes of languages, LR(0) and LR(1) grammars, parser construction {8 classes}
5. Closure properties of families of languages

   Abstract families of languages, language operations, closure and decidability properties {8 classes}