School of Engineering and Natural Sciences / Computer Engineering (English)

2023 - 2024 Academic Year

AN INTRODUCTION to FORMAL LANG. and AUTO. THEORY

Syllabus

Course Description					
Name	**Code**	**Semester**	**T+A Hour**	**Credit**	**ECTS**
AN INTRODUCTION to FORMAL LANG. and AUTO. THEORY	COE4167890	Fall Semester	3+0	3	6

Prerequisites Courses	AYRIK MATEMATİK; PROGRAMLAMAYA GİRİŞ
Recommended Elective Courses	Discrete mathematics
Language of Instruction	English
Course Level	First Cycle (Bachelor's Degree)
Course Type	Required
Course Coordinator	Assist.Prof. Cihan Bilge KAYASANDIK
Name of Lecturer(s)	Assist.Prof. Cihan Bilge KAYASANDIK
Assistant(s)	
Aim	This course aims to introduce concepts in Automata theory. Based on topics on identifying the different formal language classes, their relationship and diffrences. Students are supposed to design theoretic machines for specific purposes, and prove/disprove properties of these machines.
Course Content	This course contains; Course Info, Introduction to Finite State Automata ,Deterministic and Nondeterministic Finite State Automata ,Equivalence of deterministic and nondeterministic Automata ,Regular Expression and Equivalence with Non-deterministic Automata ,Algebraic Laws for Regular Expression,Pumping Lemma for Regular Languages and Minimization of finite state automata ,Context Free Grammars ,Context Free Languages ,Parse Trees and Ambiguity of grammar ,Pushdown Automata ,Chomsky Normal Form ,Pumping Lemma for Context Free languages ,Turing Machines ,Basic Calculation with Turing machines.

Course Learning Outcomes	**Teaching Methods**	**Assessment Methods**
Identify different classes of languages and design automaton to accept that language □□□□□	10, 11, 12, 14, 16, 3, 4, 6, 9	A, G
Prove or disprove if the given language is regular, proving equivalence of different automata □□□□□□	10, 11, 12, 14, 16, 3, 4, 6, 9	A, G
Represent a given language by a context-free grammar, removing ambiguity, and simplification of a given grammar. □□□□□□□□	10, 11, 12, 14, 16, 3, 4, 6, 9	A, G
Desing a Turing machine for a certain purpose. □□	10, 11, 12, 14, 16, 19, 3, 4, 6, 9	A, G

Teaching Methods	10: Discussion Method, 11: Demonstration Method, 12: Problem Solving Method, 14: Self Study Method, 16: Question - Answer Technique, 19: Brainstorming Technique, 3: Problem Baded Learning Model, 4: Inquiry-Based Learning, 6: Experiential Learning, 9: Lecture Method
Assessment Methods	A: Traditional Written Exam, G: Quiz

Lecture Schedule

Sequence	**Topics**	**Preliminary Preparation**
1	Course Info, Introduction to Finite State Automata □□□□	Textbook Chapter 1
2	Deterministic and Nondeterministic Finite State Automata □□□□□	Textbook Chapter 2.1-2.3
3	Equivalence of deterministic and nondeterministic Automata □□□□□	Textbook Chapter 2.3
4	Regular Expression and Equivalence with Non-deterministic Automata □□□□□□	Textbook Chapter 3
5	Algebraic Laws for Regular Expression	Textbook Chapter 4.2
6	Pumping Lemma for Regular Languages and Minimization of finite state automata □	Textbook Chapter 4.1
7	Context Free Grammars □	Textbook Chapter 5.1
8	Context Free Languages □□	Textbook Chapter 5.1, 5.4
9	Parse Trees and Ambiguity of grammar □□□□	Textbook Chapter 5.4
10	Pushdown Automata □□	Textbook Chapter 6
11	Chomsky Normal Form □□	Textbook Chapter 7.1
12	Pumping Lemma for Context Free languages □□□□	Textbook Chapter 7.2
13	Turing Machines □□	Textbook Chapter 8.1
14	Basic Calculation with Turing machines	Textbook Chapter 8.1,8.2

Evaluation Methods	**Weight(%)**
Midterm Exam	30
General Exam	70

Resources
Lecture notes will be supplied by instructor but following textbooks could be used as supplementary materials. 1. J. Hopcroft, R. Motwani, and J. Ullman. Introduction to Automata Theory, Languages, and Computation, 3rd edition, 2007, Pearson/Addison-Wesley, 2. Theory of Automata By C.J. Martin □□□□□□