



# MARMARA UNIVERSITY - FACULTY OF ENGINEERING

2021-2022 Spring

CSE3064 – Formal Languages and Automata Theory

## COURSE DESCRIPTION FORM

Offering Department		Department of Computer Engineering		Undergraduate must course (6th semester)						
Course Code		CSE3064								
Course Name		Formal Languages and Automata Theory								
Language of Instruction		English								
ECTS		6								
Contact Hours		Theoretical (T): 3			Practice (U): 0			Laboratory (L): 0		
Pre-requisites		CSE2023 – Discrete Computational Structures								
Instructor		Name	Assoc. Prof. Ali Haydar Özer							
		E-mail	haydar.ozer@marmara.edu.tr							
Course Materials		Mandatory	Introduction to the Theory of Computation, 3 <sup>rd</sup> Edition, Michael Sipser, Cengage Learning.							
		Recommended	Introduction to Automata Theory, Languages, and Computation, 3rd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson.							
Course Objectives		The aim of the course is to provide students an overview of the theoretical foundations of computer science, and to teach them the basic concepts and models of formal languages and automata theory. The students are expected to gain the ability of abstract thinking and mathematical proving.								
Course Content		Deterministic finite state automata. Non-deterministic finite state automata. Regular expressions and regular languages. Properties of regular languages. Context-free grammars and properties of context-free languages. Push-down automata. Turing machines. Undecidability.								
Learning Outcomes		LO1	To be able to identify regular languages, to understand their properties, and to design deterministic finite state automata.							
		LO2	To be able to design nondeterministic finite state automata and define regular expressions.							
		LO3	To be able to identify context-independent languages and define grammar or push-down automata for these languages.							
		LO4	To be able to understand how Turing machines work, to design Turing machines, and to identify undecidable languages.							
		LO5	To be able to make formal proofs within the scope of automata theory.							
Program Outcomes				LO1	LO2	LO3	LO4	LO5		
PO1		Adequate knowledge in mathematics, science (a) and computer engineering subjects (b) pertaining to the relevant discipline (1); ability to use theoretical and applied information in these areas to model and solve engineering problems (2).		1b	1b	1b	1b	1b		
PO14		Knowledge of data structures and algorithm analysis (a), database management systems (b), operating systems (c), software engineering (d), computer architecture (e) and automata theory (f) in computer engineering.		f	f	f	f	f		
Subjects (Knowledge, Skills and behaviors), Contributions of Subjects to Learning Outcomes, Assessment Methods	No	Week	Subjects	LO1	LO2	LO3	LO4	LO5		
	S1	1	Introduction to Automata Theory and Concept of Languages.	MF,H						
	S2	2-3	Deterministic Finite State Automata and Regular Languages.	MF,H						
	S3	4	Nondeterministic Finite State Automata.		MF,H					
	S4	5	Properties of Regular Languages.	MF,H				MF,H		
	S5	6	Regular Expressions		MF,H					
	S6	7	Pumping Lemma for Regular Expressions.					MF,H		
	S7	8	Context-Free Grammars.			MF,H				
	S8	9	Grammar Normal Forms.			MF,H				
	S9	10-11	Push-Down Automata, Context-Free Languages and Pumping Lemma for Context-Free Languages.			MF,H		MF,H		
	S10	12-13	Turing Machines and Variations of Turing Machines.				MF,H			
S11	13-14	Decidability. Decidable and Undecidable Languages.				MF,H				

Determining Letter Grades	<ul style="list-style-type: none"><li>• The letter grades will be determined based on the midterm and final exams, and assignments.</li><li>• In order to determine the letter grade, a curve or catalog-based method will be followed based on the total average scores of the students.</li><li>• The final exam score and the total average score of the student must be at least 35 to pass the course.</li><li>• According to Marmara University Undergraduate regulations, the weight of the final exam must be at least 40 out of 100.</li></ul>					
	Assessment	Midterm	Quizzes	In Class - Attendance	Final	TOTAL
	Weight	28	25	7	40	100
Teaching Method, Student Work Load	Time Applied by the Instructor					
	No	Method	Explanation			Hours
	1	Lectures	Lectures are given in class using the board or via presentations. Example questions are solved to enhance the concepts.			14x3=42
	2	Problem Session/ Practice	Problems related to the course topics are solved on the board.			
	3	Laboratory	Experiments are done in the laboratory or theoretical concepts covered during the lectures are practiced using computer exercises.			
	4	Interactive Courses	Questions are asked to students during lectures and they are encouraged to guess the answers (peer learning is also in this category)			
	5	Field Work	Students attend activities outside the campus.			
	6	Midterm	Midterm exam is given during the midterm week.			2
	7	Final	Final exam is given during the final exam week.			2
	Estimated Time to be Allocated by a Student					
	8	Projects	The students carry out research about the problem given in the project, design and implement their solution and prepare a report.			
	9	Homework	The students solve the problems given as homework.			2x27=54
	10	Pre-class learning of Course Material	The students study and learn the new subjects from course materials.			0.5x42=21
	11	Review of Course Material	Students review the course subjects from course materials to prepare for the exams and homework.			0.5x42=21
	12	Office Hour	Students ask questions to the instructor or the assistant during office hours.			8
Total					150	
Academic Honesty	Violations of scholastic honesty include, but are not limited to cheating, plagiarizing, fabricating information or citations, facilitating acts of dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students.					
	In case academic dishonesty is observed, the first authority is the instructor of the course. The instructor may decide to give the student zero for the homework(s)/lab(s)/exam(s), give the letter grade FF, or may take disciplinary action.					