Course Description Form

Description of the location

This course description provides a concise summary of the main features of the course and the learning outcomes expected of the student, demonstrating whether the student has made the most of the available learning opportunities. It must be linked to the course .description .The program

Shatt al-Arab University	1 Educational institution .
Computer Science	2 Scientific Department / Center .
/ Computational Theory**CS205**	3 Name/Code of the . headquarters
My presence	4 forms of Available . attendance
Second semester/ 2024-2025	5 semester/year .
125	6 Number of study hours (total) .
August 5, 2025	7 Date this description was . prepared

8 Course objectives .

aims to introduce students to the core field of computer science, enabling them course to focus on the study of abstract computational models. These abstract models allow students to evaluate, through logical reasoning, what computation can achieve when used to solve science and engineering problems. This course aims to enable them to answer fundamental questions about problems, such as whether they are computable. The course introduces basic computational models and their properties. Students will be able to express computer science problems as mathematical statements and .formulate proofs

Course outcomes, teaching, learning and assessment methods .9

A- Knowledge and understanding:

- Clarifying the basic concepts in computing theory through a set of tools.
- Acquire problem-solving skills.
- Acquire basic skills as an introduction to language building.
- ,Acquire theoretical concepts for dealing with machine learning mechanisms functional expression mechanisms(DFA) non-functional functional expression , mechanisms(NFA) stack mechanisms ,, Turing machines, and rules.
- B- Subject-specific skills:

The ability to design (functional expression mechanisms, non-functional functional -1 expression mechanisms, grammar, language modeling, and the basics of small (compilers.

.The ability to think about solving the problem according to specific rules -2

Writing scientific reports -3.

.Knowing the comparison between (natural and formal languages) -4

A- Cognitive objectives

computational theory is defined as the branch of study that studies whether and how , problems can be efficiently solved using a computational model and algorithm. This field is divided into three main branches: automata theory, computability theory, and computational complexity theory.

theory is to develop a formal mathematical model of computing that reflects reality.

Computers.

The student can review these basic topics to guide him in the field of computational theory. These topics are: (computational theory, language concepts, grammar concepts, finite state machines, deterministic finite automata, non-deterministic finite state machines, regular languages, regular expressions, pumping theorem, free ,grammarsFSM summary .(free languages, ambiguity ,

B-Skill objectives of the course

- Readings, self-learning, discussion groups.
- Classroom exercises and activities.
- Directing students to some websites to benefit from them in developing their skills.
- Holding research seminars to explain and analyze some problems and the mechanism for finding solutions.

Write something like: The main strategy used in teaching this unit is to encourage students to participate in exercises, while honing and expanding their critical thinking skills. This will be achieved through classroom instruction, interactive lessons, and the study of simple experiments that include some sample activities that interest the .students

Teaching and learning methods

Evaluation methods

C- Emotional and value goals

Teaching and learning methods

Learning and Teaching Resources

sources learning and teaching

	Text	Available in the Library?
Required Texts	(Michael (Sipser), Introduction to the Theory of computation (Third Edition).	Yes
Recommended Texts	Theory of Computation Simplified , (Varsha H. Patil , Vaishali S. Pawar Swati A. Bhavsar) , 2022 .	No
Websites	https://elc.uobasrah.edu.iq/enrol/index.php?id=72	

Evaluation methods

Module Evaluation

evaluation The material Academic

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative	**Midterm Exam**	2 hours	10% (10)	7	LO # 1- 7

assessment	**Final Exam**	2 hours	50% (50)	16	All
Total assessment			100% (100 Marks)		

D - General and transferable skills (other skills related to employability and . (personal development

-1

-2

-3

-4

Course structure .10

	Learning method	Unit name/topic	Required learning outcomes	watches	week
	In-person lecture Reports project Quick test	-- General information about computing. - Information representation. - Arithmetic problems. - Properties of arithmetic problems Computational theory -		8	the first
	In-person lecture Reports project Quick test	Language concepts - Grammar concepts - Chomsky's classification of grammar Finite state machine How does the machine - ?work		8	the second
	In-person lecture Reports project	A machine's view of - the finite state machine		8	the third

	Quick test	How to define a finite - state machine Finite state machine diagrams Properties of a state - machine Deterministic finite state) machineDFA (Examples of finite state - .machine			
	In-person lecture Reports project Quick test	Nondeterministic finite) state machineNFA (Running a finite state -) machineNFA (Examples of non-deterministic finite state machines Finite State Machine - 8 vs. Non-Deterministic Finite State Machine		8	Fourth
	In-person lecture Reports project Quick test	Machine equivalence Example of equivalent machines Proof by construction		8	Fifth
	In-person lecture Reports project Quick test	Properties of regular - languages Definition of regular languages The union process and - examples of it The sequencing - process and examples of it Star process and - examples		8	Sixth
	In-person lecture Reports	Properties of regular - languages		8	Seventh

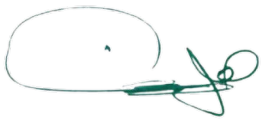
	project Quick test	Definition of regular languages The union process and - examples of it The sequencing - process and examples of it Star process and - examples			
	In-person lecture Reports project Quick test	-DFA minimization Equivalence theory - Equivalent -DFA plot Minimize the way to fill - out theDFA table		8	The eighth
	In-person lecture Reports project Quick test	Myhill-Nerod theory - Regular languages and examples Regular expressions and examples		8	Ninth
	In-person lecture Reports project Quick test	Automata theory - ,(basics, inferences ,priority of operators ,examples, identities facts) -RE parity .and automata		8	tenth
	In-person lecture Reports project Quick test	Convert -RE toε-NFA Constructing the -ε-NFA formula Convert -RE toε-NFA : ,union, concatenation) (closure, examples Convert -DFA toRE Algebraic laws of -RE		8	eleventh
	In-person lecture Reports project	Converting automata to regular expressions using case deletion		8	twelfth

	Quick test	Pumping the theorem Converting the theory - into a regular proof language Converting the theory - into an irregular proof language Pigeonhole Principle and FSA			
	In-person lecture Reports project Quick test	Theory - Long chains - Line of reasoning - Examples of pumping the theorem		8	thirteenth
	In-person lecture Reports project Quick test	Free Grammar FSM Summary Free languages - Chomsky's sequence		8	fourteenth
	In-person lecture Reports project Quick test	Derivation of free - languages ,Derivation trees - examples Ambiguity, examples -		8	fifteenth
	In-person lecture	Preparatory week before the final exam		5	sixteenth

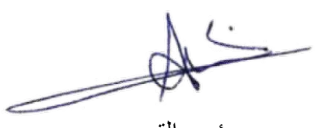
Infrastructure .11	
nothing	Required textbooks -1
Computational Theory - Dr. Abdul-Hussein Mohsen, University of Basra	Main references (sources) -2

(Michael Sipser), Introduction to the Theory of computation (Third Edition). Theory of Computation Simplified, (Varsha H. Patil , Vaishali S. Pawar ,Swati A. Bhavsar), 2022.	a) Recommended books and ,references (scientific journals (.reports, etc
	, b) Electronic references .websites, etc

Curriculum development plan .12



عميد الكلية



رئيس القسم

مدرس المادة