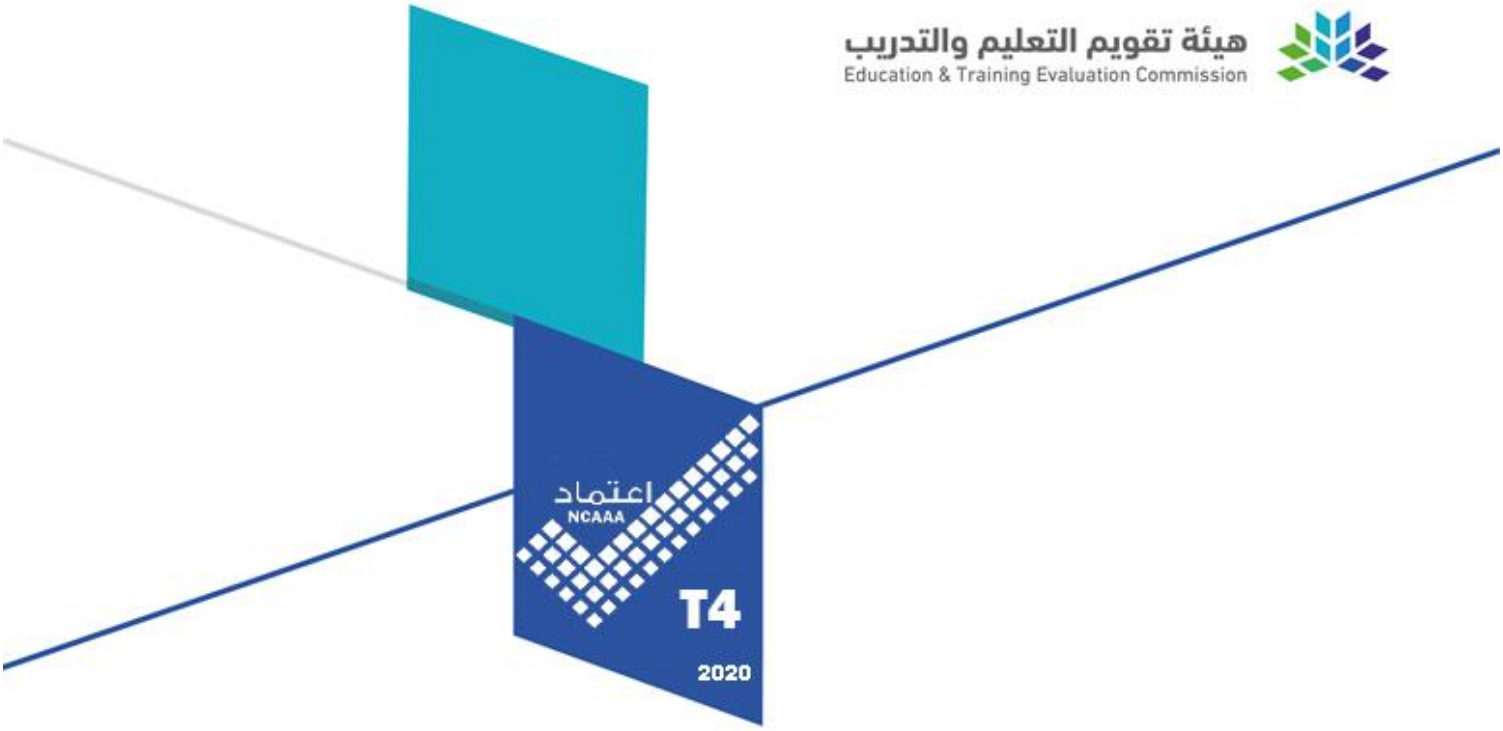
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Theory of Computation
Course Code:	**422CCS-3**
Program:	**BSc in Computer Science**
Department:	**Computer Science**
College:	**Computer Science and Information Systems**
Institution:	**Najran University**

Table of Contents

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department Ö Others ☐ **b.** Required Ö Elective ☐
3. Level/year at which this course is offered: Year 4/ Level 10
4. Pre-requisites for this course (if any)**:**
5. Co-requisites for this course (if any)**:** **None**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	40	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	0
3	**Tutorial**	10
4	**Others** (specify)	0
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Study of abstract models of computers and computation. Finite state automata and regular languages. Pushdown automata and context-free languages. Linear bounded automata and context-sensitive grammar. Turing machines. Un-decidability and intractable problems.

2. Course Main Objective

Introduce the main concepts of automata and formal languages and the relationships among and between them and apply these concepts to design various model of computations

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	

CLOs		Aligned PLOs
1.1	Describe the basic concepts of alphabets, strings, regular expressions, languages, derivation (leftmost and rightmost), finite state machines, pushdown automata, Turing machines, decidability, halting problems and time complexity	K1
1.2	Explain the relationships between regular expressions, different types of languages defined by grammars and abstract machines.	K1, K3
1.3		
1...		
2	**Skills :**	
2.1	Construct finite automata, pushdown automata, Turing machines and regular expressions that model different types of languages.	S1, S2, S4, S5
2.2	Design various models of computation.	S2
2.3	Assess the equivalence of DFA with NFA, PDA with context-free grammars, and regular expressions with automata	S1, S5
2...		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Automata: The Methods and the Madness	3
2	Finite Automata	6
3	Regular Expressions and Languages	3
4	Properties of Regular Languages	3
5	Context Free Grammars and Languages	7
6	Pushdown Automata	5
7	Introduction to Turing Machines	5
8	Leaner bounded automata	5
9	Un-decidability and intractable problems	3
Total		40

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Describe the basic concepts of alphabets, strings, regular expressions, languages, derivation (leftmost and rightmost), finite state machines, pushdown automata, Turing	TS: 1-Interactive Lectures using PowerPoint slides and explaining the essential points in more detail with the	Indirect: - Students CLO Survey Direct: - Quizzes. - Midterm exam (Exam consists

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	machines, decidability, halting problems and time complexity	help of whiteboard. TS: 2- Encouraging the students to use the online links to know the concepts in detail. TS: 3 – Recall the topics discussed in the last lecture by asking questions to the students. TS: 4 – Motivating students to be active during class by asking questions regularly during the lecture. TS: 5 – Associating the topics in with the course learning outcomes (CLO).	of multiple-choice questions, true/false, fill in the blanks, and theoretical questions.) - Final Exam
1.2	Explain the relationships between regular expressions, different types of languages defined by grammars and abstract machines.	TS: 1-Interactive Lectures using PowerPoint slides and using the whiteboard to explain the essential points in more detail. TS:2- Engaging the students in problembased learning through tutorials TS: 3- Encouraging the students to use the online links to know the concepts in detail. TS: 4 – Recall the topics discussed in the last lecture by asking questions to the students. TS: 5 – Motivating students to be active during class by asking questions regularly during the lecture. TS: 6 – Associating the topics in each chapter with the CLO.	**Indirect:** • Students CLO Survey **Direct:** • Quizzes. • Assignment. • Midterm exam (The exam consists of multiple-choice questions, true/false, fill in the blanks, and theoretical questions.) • Final Exam
…			
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Construct finite automata, pushdown automata, Turing machines and regular expressions that model different types of languages.	TS: 1-Interactive Lectures using PowerPoint slides and using the whiteboard to explain the essential points in more detail. TS: 2- Giving students a tutorial related to automata construction. TS: 3- Motivating students to work in the home, to search from the internet, to read related reference books by giving them assignments related to automata. TS: 4 – Let students solve automata problems and giving correction on their solution during class. TS: 5 – Motivating students to be active during class by asking questions regularly during the lecture. TS: 6 – Associating the topics in each chapter with the CLO.	**Indirect:** • Students CLO Survey **Direct:** • Quizzes. • Assignment. • Midterm exam (Exam consists of multiple-choice questions, true/false, fill in the blanks, and theoretical questions.) • Final Exam
2.2	Design various models of computation	TS: 1-Interactive Lectures using PowerPoint slides and using the whiteboard to explain the essential points in more detail. TS: 2- Giving students tutorial related to designing the models of computation. TS: 3- Group discussion. TS: 4 – Let students solve automata problems and giving correction on their solution during class.	**Indirect:** • Students CLO Survey **Direct:** • Quizzes. • Assignment. • Midterm exam (Exam consists of multiple-choice questions, true/false, fill in the blanks, and theoretical questions.) • Final Exam
…			
3.0	**Values**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.1	Assess the equivalence of DFA with NFA, PDA with context-free grammars, and regular expressions with automata	TS: 1-Interactive Lectures using PowerPoint slides and using the whiteboard to explain the essential points in more detail. TS: 2- Giving students tutorial related to deterministic automata, non-deterministic automata, automata conversion etc. TS: 3- Asking questions during the lectures to spark the student's curiosity. TS: 4- Group discussion. TS: 5- Let students solve automata problems and giving correction on their solution during class.	**Indirect:** • Students CLO Survey **Direct:** • Quizzes. • Assignment. • Midterm exam (Exam consists of multiple-choice questions, true/false, fill in the blanks, and theoretical questions.) • Final Exam
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	First Assignment	4th week	10%
2	Second Assignment or mini project (presentation)	5th week	10%
3	First quiz	3rd week	5%
4	Second quiz	9th week	5%
5	Midterm Exam	6th	20%
7	Final Exam	12th or 13th week	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

The following arrangements for student consultations and academic advisors are available:

• Office hours: 10 weekly hours.

• Academic advising: 4 weekly hours

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• J.E. Hopcroft, R. Motwani, J.D: Ullman, Introduction to Automata Theory, Languages, and Computation (3rd Edition), Addison Wesley, 2014.
Essential References Materials	• John Martin, Introduction to Languages and the Theory of Computation (4th Edition), 2010 • Michael Sipser, Introduction to the Theory of Computation (Third Edition), Thomas Course Technology, October 2014.
Electronic Materials	NA
Other Learning Materials	NA

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture Rooms with 30 seats with a multimedia projector • white board, personal computer, one table
Technology Resources (AV, data show, Smart Board, software, etc.)	• Desktop/ Laptop computer • Projector system
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NA

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Collecting students' suggestions to facilitate more during the class.	Students	Verbal discussion
Student's questioner once during the semester about course learning outcomes	Students	Indirect Survey
Achievement percentage of course learning outcomes, direct evaluation using CLO assessment sheet	Course Instructor	Direct evaluation using CLO achievement calculation
Teaching strategies	Quality unit	Indirect
Assessment methods	Quality unit	Indirect
Instructor performance	Quality unit	Indirect
Course content	Quality unit	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Computer Science Departmental Council
Reference No.	14440203-0185-00002
Date	1st Sep, 2022