هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Theory of Computation**
Course Code:	**CS1507**
Program:	**Computer Science**
Department:	**Computer Science and Engineering**
College:	**Computer Science and Information Technology**
Institution:	**Albaha University**
Version:	**1**
Last Revision Date:	6/4/2023

Table of Contents:

A. General information about the course:

Course Identification	
1. Credit hours:	
2. Course type	
a. University ☐ College ☐ Department☒ Track☐ Others☐	
b. Required ☒ Elective☐	
3. Level/year at which this course is offered: Level 8 / 3rd Year	
4. Course general Description This Course introduces the theory of computation through a set of abstract machines that serve as models for computation - finite automata, pushdown automata, and Turing machines - and examines the relationship between these automata and formal languages. Additional topics beyond the automata classes themselves include deterministic and nondeterministic machines, regular expressions, context free grammar, undecidability, and the P = NP question.	
5. Pre-requirements for this course (if any): **Introduction to Computing and Algorithms (CS1002)**	
6. Co- requirements for this course (if any):	
7. Course Main Objective(s) The main purpose for this course is to teach students how to: • Use different computational models to recognize or generate languages. • Understand language classification according to computational modulization. • Prove a language is decidable/undecidable. • Prove a language is recognizable/unrecognizable. • Prove a language is P, NP or NP-complete	

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	50%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning	33	50%
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	33
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
	Total	

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Discuss key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving.	**K1**	• Lecture • Assignments	• Assignments (rubric) • Midterm exams • Quizzes • Final Exam
1.2	Explain the models of computation, including formal languages, grammars and automata, and their connections.	**K2**	• Lectures • Assignments	• Assignments (rubric) • Midterm exams • Quizzes • Final Exam
1.3	State and explain the Church-Turing thesis and its significance.	**K2**	• Lectures • Assignments	• Assignments (rubric) • Midterm exams • Quizzes • Final Exam
2.0	Skills			
2.1	Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.	**S1**	• Lectures • Assignments • Case study • Lab Exercises	• Quizzes • Midterm exams • Project (rubric) • Final Exam
2.2	Solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation.	**S2**	• Lectures • Assignments • Case study • Lab Exercises	• Quizzes • Midterm exams • Final Exam • Project (rubric)

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	Initiate groups collaboratively	**V1**	Small groups	Project (rubric)

C. Course Content

No	List of Topics	Contact Hours
1.	Formation of Preliminary Concepts.	3
2.	Regular Languages	3
3	Context-Free Languages	6
4	The Church-Turing Thesis	3
5	Decidability	3
6	Reducibility	3
7	Advanced Topics in Computability	3
8	Time Complexity	3
9	NP-completeness	3
10	NP-complete problems	3
Total		33

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Weekly assignments exercises/ programming assignments**	**Every Two Weeks**	**10%**
2.	**Quizzes**	**Week 8**	**10%**
3.	**Mid Term 1**	**Week 6**	**20%**
4.	**Project**	**Week 10**	**10%**
5.	**Final Exam**	**Week 12**	**50%**

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	- Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning, 2012.
Supportive References	- Computer Science Curriculum 2013 – http://cs2013.org - ACM (Association for Computer Machinery) Curricula Recommendations - http://www.acm.org/education/curricula-recommendations
Electronic Materials	• ACM (Association for Computer Machinery) web site - http://www.acm.org/ • IEEE Computer Society web site - http://www.computer.org/portal/web/guest/home • Access to the Saudi Digital Library (SDL). Using the learning management system of the university – Rafid System (https://lms.bu.edu.sa/).
Other Learning Materials	None

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• A classroom or lecture hall with whiteboard for 25 students.
Technology equipment (projector, smart board, software)	• All students shall have: • High speed Internet connection. • Power outlets for student's laptop plug-in.
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Exams Evaluation committee Students	Direct: Exam Review Indirect: Survey
Effectiveness of students assessment	Faculty	Direct: Exams
Quality of learning resources	Program Leaders Students	Indirect: Survey Indirect: Survey
The extent to which CLOs have been achieved	Exams Evaluation Committee Students	Direct: Exam Review Indirect: Survey
Other	None	None

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	