جامعة الإسراء
ISRA UNIVERSITY

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Computation Theory

Course Number: 06052153

General Course Information:

Course title	**Computation Theory**
Course number	**06052053**
Credit hours	**3 hrs**
Education type	**[Face-to-Face]**
Prerequisites/corequisites	**06051200**
Academic Program	**Computer Science**
Program code	**605**
Faculty	**Information Technology**
Department	**Computer Science**
Level of course	**2**
Academic year /semester	**2,1**
Awarded qualification	**Bachelor**
Other department(s) involved in teaching the course	**CIS,CS,SE,CMS**
Language of instruction	**English**
Date of production/revision	**March 12, 2022**

Course Coordinator:

Coordinator's name	**Dr. Ahmad alshanty**
Office No	**4225**
Office Phone extension number	**2504**
Office Hours	**TBA**
Email	**ahmad.alshanty@iu.edu.jo**

Other Instructors:

Coordinator's name	**Dr. Ahmad alshanty**
Office No	**4225**
Office Phone extension number	**2504**
Office Hours	**TBA**
Email	**ahmad.alshanty@iu.edu.jo**

Course Description *(English/Arabic)*:

English	Regular languages and Regular expressions, Deterministic and Nondeterministic Finite Automata, Converting NFA to DFA, minimization methods of DFA, Context-free languages, pushdown automata, Turing Machine and their languages, Unsolvable problems and computable functions.
Arabic	اللغات النظامية والتعبيرات النظامية والآلية المتناهية المحددة وغير المحددة والتحويل فيما بينها وطرق الإختصار والإختزال، سياقات غير مقترنة، مكائن حركية ولغاتها، مسائل غير قابلة للحل والدوال الحسابية.

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

HERTZ, John; KROGH, Anders; PALMER, Richard G. *Introduction to the theory of neural computation*. CRC Press, 2018.

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

1. An Introduction to Formal Languages and Automata, Peter Linz, Jones & Bartlett Learning, 6thEdition, 2016
2. Michael Sipser, Introduction To The Theory Of Computation, 3rd Ed., Thomson Course Technology, 2012

Course Educational Objectives (CEOs):

1.	**Demonstrate set theory and types of computation that is captured by each model, the limits of each model and the limits of computation**
2.	**Illustrate Grammar types (regular Grammars, context-free grammars, context sensitive grammars), and normal forms (Chomsky and Greinbach Forms)**
3.	**Explain formal languages (regular languages, and context-free languages, and recursively enumerable languages)**
4.	**Illustrate machines associated with each language (Finite Automata, Machines with output, push down automata)**
5.	**Explain the concept of Turing Machine**

Intended Learning Outcomes (ILO's):

	Subject Intended learning outcomes (ILOs) describe what students are expected to know and be able to do at the end of the course. These outcomes are related to the knowledge, skill and competence that students acquire:	Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	Descriptors**
A	**Knowledge and Understanding:**				
A1	**Define set theory and types of computation that is captured by each model, the limits of each model and the limits of computation.**	**1**	**a**	**1**	**K**
A2	**Outline grammars and languages (regular Grammars, context-free grammars-CFG, context sensitive grammars-CSG, Turing machine)**	**2,3**	**b**	**2**	**S**
A3					
B	**Intellectual skills:**				
B1	**Discover problems solutions concerning Regular expression and language; CFG and CFL (context free languages)**	**3**	**a,f**	**3**	**K,S**
B2	**Construct machines (Finite Automata, Machines with output, push down automata, Turing Machine)**	**2**	**b**	**3**	**S**
B3					
C	**Subject specific skills:**				
C1	**Formulate the Conversion of CFG grammars to Normal forms (Chomsky Normal Form Greinbach Normal Form)**	**4.5**	**b,f**	**4**	**K,S**

C2					
C3					
D	**Transferable skills:**				
D1					

***Bloom Taxonomy Levels**

Level #	1	2	3	4	5	6
Level Name	Knowledge	Comprehension	Application	Analysis	Evaluation	Synthesis

** Descriptor (National Qualification Framework Descriptors): K : Knowledge, S: Skill, C: Competency.

Program Learning Outcome (PLOs):

Program Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviours that students acquire as they progress through the program. A graduate of the (_____) program will demonstrate:		Descriptors**		
		K	S	C
a.	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.	√		
b.	Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.		√	
c.	Communicate effectively in a variety of professional contexts.			√
d.	Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.			√
e.	Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.			√
f.	Apply computer science theory and software development fundamentals to produce computing-based solutions. [CS]		√	
g.				
h.				
i.				
j.	.			
k.				

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

■ **Face to Face**

□ **Hybrid** *(**2 Lectures** Face – To - Face **+1 Lecture** Asynchronous)*

□ **Hybrid (***1 **Lectures** Face – To - Face **+1 Lecture** Asynchronous)*

□ **Online** *(**2 Lectures** Synchronous **+1 lecture Asynchronous**)*

Week	First Hour (*Face – To - Face*)	Second Hour (*Face – To - Face*)	Third Hour (*Face – To - Face*)	Ach. ILOs	Ach. PLOs	DS**
1	Course Plan	**Introduction**	– Sets and n-tuples, – Functions, – Alphabets & Strings, – Predicates, – Quantifiers, – Proof by Contradiction, – Mathematical Induction Computation models	A1	a	K
2	**Regular expression** Definition,	Operands in a regular expression	Operators used in regular expressions	B1	a,f	K,S
3	Languages Associated with RE	Finite Languages are Regular	Finite Languages are Regular	B1	a,f	K, S
4	**Formal Languages language types,**	**Formal Languages language types,**	**Formal Languages language types,**	A2	b	S
5	**Machines of regular expressions**	Finite automata,	transition graph	B2	b	S
6	**Nondeterministic finite automata**	**Nondeterministic finite automata**	**Nondeterministic finite automata**	B2	b	S
7	**Kleene's Theorem**	**Kleene's Theorem**	**Kleene's Theorem**	A2,B1, B2	a,b,f	K, S
8	Midterm Review	Midterm Exam	(Discuss Exam Results)	-	-	-
9	**Decidability DFA,**	**Minimization of DFA**	**Minimization of DFA**	B2	b	S
10	**Nonregular Language**	**Nonregular Language**	**Nonregular Language**	A2	b	S
11	**Finite automata with output**	– Moore Machines	Mealy Machines	B2	b	S
12	**Context-Free Grammars (CFG)**	**Simplifications of CFG**	**Simplifications of CFG**	A2	b	S
13	**Chomsky Normal Form**	**Greinbach Normal Form**	**Greinbach Normal Form**	C1	b,f	S
14	**Push Down Automata**	**Turing Machine**	**Turing Machine**	B2	b	S
15	Project	Review for Final Exam		-	-	-

* K: Knowledge, S: Skills, C: Competency

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- **Interactive videos**
- **Practice Labs**
- **Discussion Forums**
- **Quizzes**
- **Other Interactive online activities**
- **Reports**

Course Policies:

A- Attendance policies:

The maximum allowed absences is 15% of the lectures.

B- Absences from exams and handing in assignments on time:

Midterm exam can be retaken based on approval of excuse by the instructor's discretion.

Not handing assignment on time will incur penalties.

C- Academic Health and safety procedures

D- Honesty policy regarding cheating, plagiarism, and misbehaviour:

Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.

E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **___%**
- Midterm **___%**
- Final Exam **___%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required equipment:

- **PC / Laptop with webcam and mic**
- **Internet Connection**
- **Access to the IU E-Learning Platform at: https://elearn.iu.edu.jo/**
- **E-learning plan**
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools implemented in the course:

- ☑ Final Exam
- ☑ Midterm Exam
- ☑ Quizzes
- ☑ Homework
- Practice Labs
- Discussion Forums

- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching
- Others:…….

Responsible Persons and their Signatures:

Course Coordinator	**Dr. Ahmad Alshanty**	**Completed Date**	**20/ 6 / 2022**
		Signature	Dr.Ahmad Alshanty

Received by (Department Head)	**Dr. Fisal Alzyoud**	**Received Date**	/ /
		Signature	