Discrete Mathematics
Course Definition

Information

Technology

Engineering

Syrian Arab Republic		الجمهورية العربية السورية
Ministry of Higher Education		وزارة التعليم العالـــي
Syrian Virtual University		الجامعة الافتراضية السورية

1. Basic Information:

Course Name	Discrete Mathematics
Course Code	BDM501
Number of Presentational Sessions*	10 – 12
Number of Synchronous Sessions**	10 – 12
Number of Shorter Tests***	No Tests
Number of Exams***	1
Theoretical Sessions Work Load (hrs.)	36
Practical Sessions Work Load (hrs.)	36
Credit Hours	5

*Each presentational session comprises both recorded lecture (1.5 hrs.) and interactive learning content (1.5 hrs.).

**Each synchronous session comprises the interactive lecture carried out in real time in a virtual class (1.5 hrs.).

***Each shorter test is 0.5 hr. long. The final exam is 2 hrs. long.

N.B.

Generally, each chapter requires two presentational sessions: one for the recorded content and one for the interactive content (unless the chapter is too long, in which case it may require more sessions (. This note applies to synchronous sessions as well, where each chapter requires one synchronous session generally.

2. Prerequisites courses:

Course	Code
Logic Circuits	BLC401

3. Course Objectives:

This course covers the topic of mathematics and logic that a programmers, designers, or analysts need in their work. It also helps the students in developing their abstraction and explains its direct application in the field of programming or analysis by dealing with topics such as mathematical induction, propositions, quantified expressions, the principles of Automata and the foundations of programming languages.

4. Learning Outcomes (LO):

By the end of this course, the learner is expected to be capable of:

- Promoting the use of mathematical logic and proofs in various fields of computer science.

- Designing electronic and logical circuits with mathematical verification of the mechanism and results

- Developing of some algorithms based on the concepts of discrete structures

- Understanding the mechanism of compilers, text editors, language design and Automata

- Developing in the field of advanced data structures

- Moving from propositional logic to predicate logic and being qualified to study fuzzy logic and artificial intelligence

- Employing the statement theory in designs and solutions

- Bridging the gap between the theoretical study of structures and practical application in general

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5. Assessment Results:

Chapter Number	Chapter Title	General Objectives	Assessment Type				
			Interactive Content & Recorded Sessions	Applied Activities (Synch. Sessions)	Final Exam*/ Shorter Tests**	Presentations and Interviews***	Reports****
CH1	Logic and Proofs	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH2	Boolean Logic	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH3	Introduction to predicate logic	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√

CH4	Induction and Recursion	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH5	Introduction to Algorithms	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH6	Graphs	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√
CH7	Trees	Comprehension –Analytical Thinking – Tools and	√	√	√	√	√

		Application Hands– On					
CH8	Introduction to Automata & FL	Comprehension –Analytical Thinking – Tools and Application Hands– On	√	√	√	√	√

*The final exam is two hours long and is given at the end of the course.

**Shorter tests are about 30 minutes long and are given after three or four lectures throughout the semester during synchronous sessions.

***Presentations, interviews, and reports are submitted once after each three or four lectures throughout the semester during synchronous sessions.

6. Course Syllabus:

Chapter	Subject	Content	Number of Theoretical Learning Units	Number of Practical Learning Units (synchronous)
CH1	Logic & Proofs	1. Introduction to logic 2. Propositional logic 3. Logic connectives 4. Logic equivalence 5. Substitution rule for tautologies 6. Arguments	1	1
CH2	Boolean algebra	1. Structure of Boolean Algebra 2. Calculus of Boolean Algebra 3. Rules of Boolean equalities 4. Partial order relations in Boolean algebra 5. Partial Boolean algebra 6. Free sets in Boolean algebra 7. Spanning sets in Boolean algebra 8. Basis in Boolean algebra 9. Multivariable Boolean functions 10. Design of logic circuits	2	2
CH3	Introduction to Predicate Logic	1. Introduction and definition 2. From Propositional logic to Predicate logic	2	2

		3. Concepts and rules of predicate logic 4. Translating English into Predicates 5. Universal and Existential Specification and Generalization 6. Robot Control Example		
CH4	Recursive & induction	1. Proof 2. Format of the Theorem or Proposition 3. Induction Proofs 4. Induction Proof on Recursive Procedure 5. Recursion 6. Substitution method 7. Recursion Trees 8. Master method	2	2
CH5	Algorithms	1. Basic concepts of algorithms 2. Recursive Algorithms 3. Performance Analysis 4. Time Complexity 5. Algorithms Design	2	2
CH6	Graphs	1. Introduction and definitions 2. Use of graphs 3. Graph types 4. Operations on graphs	1	1

		5. Representing Graphs in a Computer 6. Graph searching algorithms		
CH7	Trees	1. Relationship between Graphs to Trees 2. Tree types 3. Binary Trees 4. Searching Trees 5. Tree Representation	**1**	**1**
CH8	Introduction to Automata and Formal Languages	1. Deterministic Finite Automaton 2. Non−Deterministic Finite Automaton 3. Non−Deterministic finite automata with λ−transitions 4. Regular Expressions 5. Regular Languages Applications	**1**	**1**

7. Practical Activity:

- **Tools and Labs:**

Tool Name	Description
graphviz	Free open source
Word, power point, excel	Microsoft office

- **Practical Activities per Chapters:**

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Chapter	Activities Type	Remarks
CH1	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	
CH2	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	
CH3	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	
CH4	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	
CH5	☑ Exercises	

	☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	
CH6	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	
CH7	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	
CH8	☑ Exercises ☑ Homework ☐ Webinars ☐ Project ☐ Experiment ☐ Other	graphviz

8. References:

- Discrete Mathematics and its Applications (6thEdition) by Kenneth H. Rosen (McGraw-Hill, Inc., New York, 2007)
- Discrete Mathematics with Applications (3rd edition) by Susanna S. Epp (December22, 2003)
- Discrete Mathematics Wiki – Wikipedia Reference for Discrete Mathematics.