QFO-AP-FI-02	اسم النوذج: وصف المادة	جامعة فيلادلفيا Philadelphia University
رقم الإصدار: (Revision) 1	الجهة المصدرة: كلية تكنولوجيا المعلومات	
التاريخ: 2017/11/05	الجهة المدققة: عمادة التطوير والجودة	
عدد صفحات النموذج:		

Course Title: Discrete Mathematics	**Course code:** 750120
Course Level: 1	**Course prerequisite (s) and/or corequisite(s):**
Lecture Time:	**Credit hours: 3**

Academic Staff Specifics				
Name	**Rank**	**Office No. and Location**	**Office Hours**	**E-mail Address**

Course/Module Description:
This course studies the mathematical elements of computer science. Topics include propositional logic; predicate logic; mathematical reasoning; techniques of proof; mathematical induction; set theory; number theory; matrices; sequences and summations; functions, relations and their properties, elementary graph theory, and tree.

Course/Module Objectives:
- Simplify and evaluate basic logic statements including compound statements, implications, inverses, converses, and contrapositives using truth tables and the properties of logic.
- Express a logic sentence in terms of predicates, quantifiers, and logical connectives
- Apply the operations of sets and use Venn diagrams to solve applied problems.
- Determine the domain and range of a discrete or non-discrete function, identify functions types, perform the composition of functions,
- List the terms in a sequence, write a sequence in closed form, compute the sum of a finite sequence,
- Use elementary number theory including the divisibility properties of numbers to determine prime numbers and composites, the greatest common divisor, and the least common multiple; perform modulo arithmetic
- Perform basic matrix operations including sums, products, and transpose and perform 0-1 matrix operations.
- Apply rules of inference, and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction and write proofs using symbolic logic and Boolean Algebra.

- Describe binary relations between two sets; determine if a binary relation is reflexive, symmetric, or transitive or is an equivalence relation; combine relations using set operations and composition.
- Determine if a given graph is simple or a multigraph, directed or undirected, cyclic or acyclic, and determines the connectivity of a graph.
- Represent a graph using an adjacency list and an adjacency matrix and apply graph theory to application problems such as computer networks.
- Determine if a graph is a tree or not; use the properties of trees to classify trees, identify ancestors, descendants, parents, children, and siblings; determine the level of a node, the height of a tree or subtree.
- Perform tree traversals using preorder, in order, and post order traversals and apply these traversals to application problems.

Course/ module components

- **Textbook:**
  Discrete Mathematics and Its Applications, Kenneth H. Rosen, McGraw Hill, 7th edition, 2013.

Supporting material(s): Lectures handouts

Teaching methods:
Duration: 16 weeks, 48 hours in total
Lectures: 32 hours (2 hours per week),
Tutorials: 13 hours,
Tutorials: 7 hours.

Learning outcomes

A-Knowledge and understanding: with the ability to …
A1) Recognize and define the concepts of logic and proofs.
A2) Recall and explain the concepts of sets and its operations.
A3) Explain the concepts of functions.
A4) Define and select the concepts of sequences and summations.
A5) Define the concepts of integers and the other counting systems.
A6) Describe the concepts of matrices.
A7) Identify the concepts of relations.
A8) Define and classify the concepts of graphs.
A9) Define and classify the concepts of trees.

B- Intellectual skills: with the ability to …
B1) Use propositional and predicate calculus in reasoning.
B2) Prove equivalences and properties.
B3) Interpret set identities
B4) Distinguish between geometric and arithmetic progression
B5) Calculate a result of a summation
B6) Identify operations and properties of sets, functions, relations, matrices, graphs, and trees
B7) Calculate prime numbers, and calculate GCD and LCM

C- Subject specific skills – with ability to …
C1) Synthesis and explain proper proof method for a given problem.
C2) Develop mathematical structures to represent real situations and find their properties.
C3) Write computer program for a given problem.

D- Transferable skills – with ability to
D1) Work in a group in order to represent mathematically specific subject.
D2) Communicate effectively by oral and written means.

Learning outcomes achievement

- Development: A, B, C and D are developed through the lectures, Tutorials, Homework's, and lab work

- Assessment : A, B, C and D are assessed through Assignments, Quizzes, Homework, and written Exams.

Assessment instruments

Allocation of Marks	
Assessment Instruments	**Mark**
First examination	**20%**
Second examination	**20%**
Final examination	**40%**
Quizzes, and tutorial contributions	**20%**
Total	**100%**

Course/Module Academic Calendar

Week	Basic and support material to be covered	Homework/reports and their due dates	Lab works and tutorials
(1)	**Propositional Logic**	Assignments: selective questions from Q:11,13,14,16,17,18,19,31-39 in Pages 13-15. Or Quiz on Truth table, translation	**1st Tutorial**
(2)	**- Applications of Propositional Logic** **- Propositional Equivalences**	Assignments: selective questions from Q:2,3,5-10 in Pages 22-23, Or Assignments: selective questions from Q:1-6,9-33 in Pages 34-35, Or Quiz on Translation, Program Specification, proposition equivalences.	- **1st Lab work**: using proposition logic in computer programs. - **2nd Tutorial**: Propositional Equivalences
(3)	**Predicates and quantifiers Nested quantifiers**	Assignments: selective questions from Q:9-16,22-29,35,36,43, in Pages 53-56, Or Assignments: selective questions from Q:1,2,8-17,24-28 in Pages 64-67, Or Quiz on Quantifications	**3rd Tutorial**

(4)	**Rules of Inference**	Assignments: selective questions from Q:6,9,10,15,17,23-29 in Pages 78-80 Or Quiz on Inference rules	**4th Tutorial**
(5)	**Introduction to proofs**	Assignments: selective questions from Q:1,2,6,17,18,26,27 in Page 91 Or Quiz on Proofs	**5th Tutorial**
(6)	**Sets and Set operations**	Assignments: selective questions from Q:1,2,5-24,27,32, in Pages 125-126, Or selective questions from Q:3,4,25,29,47 in Pages 136-137, Or Quiz on Set operations	- **6th Tutorial** - **2nd Lab work**: Using sets and set operations in computer programs.
(7) First examination	**Revision**	Written exam on materials in Sections 1.1-1.8 and Sections 2.1, 2.2	-
(8)	**Functions, Sequences, and summations**	Assignments: selective questions from Q:8-15,22,23 in Pages 152-153, Or selective questions from Q:1-4,29-34 in Pages 167-169, Or Quiz on Function Operators, Function properties, find a sequence formula. or summation.	- **7th Tutorial** - **3rd Lab work**: Using Functions, sequences, and summations in computer programs.
(9)	**Matrices**	Assignments: selective questions from Q:1-5,10,26-29 in Pages 183-185, Or Quiz on Matrix Operators.	- **8th Tutorial** - **4th Lab work**: Using one and two dimensional arrays in computer programs
(10)	**Divisibility and modular arithmetic Primes and greatest common divisors**	selective questions from Q:1-4,14-17,24,25, in Pages 272-273, Or Quiz on Finding mod, prime factorization, GCD, LCM	- **9th Tutorial** - **5th Lab work**: Using Prim numbers, greatest common divisors in computer programs
(11)	**Mathematical Induction**	Assignments: selective questions from Q:5, 14-16 in Pages 329-330, Or Quiz on proving by induction	**10th Tutorial**
(12) Second examination		Assignments: selective questions from Q:3,6,7,26-28,30,32. in Pages 581-	

	Relations and their properties Representing relations Closures of relations Equivalence relations	583, Or selective questions from Q:1-4,13-15,22-28, in Pages 296-297, Or selective questions from Q:2,3,25,26, in Pages 606-607, Or selective questions from Q1,21,23,24 in Pages 615,616 Or Quiz on relation operator or representation.	**11th Tutorial**
(13)	**Graphs and graph models, Graph terminology and special types of graphs, Representing graphs Connectivity**	Assignments: selective questions from Q:1-3,20,35,. in Pages 665-667, Or selective questions from Q:1-15 in Page 675, Or selective questions from Q:1-5, in Page 689 Or Quiz on graph terminology or representation.	- **12th Tutorial** - **6th Lab work**: Representing graphs in computer programs.
(14)	**Introduction to trees Tree Traversal**	Assignments: selective questions from Q:1-9 in Page 755, Or selective questions from Q:7-16,23,24 in Pages 783-784 Or Quiz on Tree terminology or tree traversal.	- **13th tutorial** - - **7th Lab work:** Representing tree with tree traversal in computer programs.
(15)	**Revision**		-
(16) Final Examination	**Final Exam**		-

Expected workload:
On average students need to spend 3 hours of study and preparation for each 50-minute lecture/tutorial.

Attendance policy:
Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

Module references
Students will be expected to give the same attention to these references as given to the Module textbook(s)

A- Required book (s), assigned reading and audio-visuals:
Discrete Mathematics and Its Applications, Kenneth H. Rosen, McGraw Hill, 7th edition, 2012.

B- Recommended books, materials, and media:
- Discrete Mathematics with Applications, Susanna S. Epp, Brooks Cole, 4th Edition, 2010.

- Logic and Discrete Mathematics A Computer Science Perspective, Winfried K. Grassman and Jean Paul Tremblay, Prentice Hall, 1995.
- Discrete and Combinatorial Mathematics: An Applied Introduction, Ralph P. Grimaldi, 5th edition, Addison Wesley, 2003.

Website(s):
Useful site:
www.mhhe.com/rosen