Course specification

(1102 Discrete structure)

Faculty: HICIT

Programme(s) on which the course is given: Under graduate program in Computer Science

Major or minor element of programme: Compulsory

Department offering the programme: Department of Computer Science

Department offering the course: Department of Computer Science

Year / Class: 1st Year – 1st semester

Date of specification approval: 22/9/2015

A- Basic Information:

Title: Discrete Structure **Code:** 1102

Weekly Hours:

Lecture: 3 **Exercise: 2** **Practical:-** **Total: 5**

B- Professional Information

1- Course Objectives:

Upon successful completion of the course, students should be:

- understand the fundamental concepts of :-
- Set Theory, Relations, and Functions
- understand Vectors and Matrices.
- understand Graph Theory.
- Combinatorial Analysis
- Algebraic Systems, Formal Languages
- Propositional Calculus
- Boolean Algebra

2- Program ILOs Covered by Course

Program Intended Learning Outcomes			
Knowledge and understanding	**Intellectual Skills**	**Professional and practical skills**	**General and Transferable skills**
a1, a4	**b1, b7, b8**	**c16**	**d11**

3 - **Intended Learning Outcomes of course (ILOs)**

a. Knowledge and Under-Standing:

a1. Understand the sets, relations and functions.

a2. Understand graphical systems.

a3. Explain the principles, concepts and practical design of Boolean and logical systems.

b. Intellectual Skills:

b1. Analyze the problems including Sets, Relations, and Functions

b2. Identify appropriate methods of proof.

b3. Identify a range of solutions and critically evaluate and justify proposed design solutions.

c- Professional and practical skills

c1. Solve related problems in sets, sequences and series.

d- General and transferable skills

d1. Communicate effectively by oral, written and visual means.

d2. Work effectively as an individual and as a member of a team.

d3. Develop Creativity and imagination skills, Self-assessment ability and Critical thinking and analytic ability.

4- Contents and Course Outline

Topic	Hours	Lec.	Exc
1 SET THEROY • Sets and elements • Universal set, empty set, and Subsets. • Venn diagrams, Set operations, Algebra of sets, Duality. • Finite sets, counting principle, Classes of sets, power sets. • Arguments and Venn diagrams • Mathematical induction	**10**	**6**	**4**
2 Relations • Product sets. Relations. Pictorial representations of relations. • Inverse relations. Composition of relations. • Properties of relations. Partitions. Equivalence relations. • Partial ordering relations • n-ary relations. **3 Functions** • **Functions, Graph of function.** • **One-to-one, onto and invertible functions.** • **Indexed classes of sets.** • **Cardinality.**	**10**	**6**	**4**
4 Vectors and Matrices • **Vectors, Matrices. Matrix addition and scalar multiplication.** • **Summation symbol. Matrix multiplication.** • **Transpose, Square matrices.** • **Invertible matrices. Determinants.** **5 Graph Theory** • **Graphs and multigraphs. Degree, Connectivity.** • **The bridges of Konigsberg, traversable multigraphs.** • **Special graphs. Matrices and graphs.** • **Labeled graphs. Isomorphic graphs.** • **Directed graphs.**	**10** **10**	**6** **6**	**4** **4**
6 Combinatorial Analysis • **Fundamental principle of counting.** • **Binomial coefficients.** • **Permutations.** • **Combinations** • **Ordered Partitions. Tree diagram.**	**10**	**6**	**4**
	10	**6**	**4**

7 Proposition Calculus • **Statement and compound statements** • **Conjunction p AND q. Disjunction, p OR q Negation, NOT p.** • **Propositions and truth tables.** • **Tautologies and contradictions. Logical equivalence.** • **Algebra of propositions. Conditional and biconditional statements.** **8 Boolean Algebra** • **Basic definitions** • **Duality** • **Basic Theorems.** • **Boolean Algebra as lattices.** • **Representation Theorem. Disjunctive normal form for sets.** • **Minimal Boolean expressions.** • **Karnaugh maps.**	**5**	**3**	**2**

5- Teaching and learning methods

4.1 Lectures
4.2 Tutorial Exercises
4.3 Discussions.

6 -Student assessment methods

5.1 Midterm Exam: To assess the knowledge and understanding achieved by the student during the previous weeks.
5.2 Final Exam: To evaluate what the student gain at the end of the course, and to assess: the knowledge and understanding, general skills, and intellectual skills.
5.3 Course Work & Quizzes: To keep the student always in the course, and to evaluate knowledge, understanding, intellectual, and transferable skills.

Assessment Schedule

Assessment	**Week #**
Mid Term Exam	**8**
Final Exam	**16**
Course Work &Quizzes	**2-14**

Assessment Weight

Assessment	**Weight %**
Mid Term Exam	**10%**
Final Exam	**80%**
Course Work &Quizzes	**10%**
Total	**100**

Course Work &Quizzes: (Short Exams, Assignments, Researches, Reports, Presentations, Class/Project discussion)

7 -List of references

7.1 Text Books

Chaum's Outline DISCRETE MATHEMATICS BY SEYMOUR

LIPSCHUTZ 3rd edition
McGraw-HILL BOOK COMPANY 2007

7.2 Donald E. Knuth, The Art of Computer Programming

7.3 Kenneth H. Rosen, Handbook of Discrete and Combinatorial Mathematics CRC Press. ISBN 0-8493-0149-1.

- Kenneth H. Rosen, Discrete Mathematics and Its Applications 5th ed. McGraw Hill. ISBN 0-07-293033-0. Companion Web site: http://www.mhhe.com/math/advmath/rosen/
- Richard Johnsonbaugh, Discrete Mathematics 6th ed. Macmillan. ISBN 0-13-045803-1. Companion Web site: http://wps.prenhall.com/esm_johnsonbau_discrtmath_6/
- Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction 5th ed. Addison Wesley. ISBN 0-20-172634-3
- Norman L. Biggs, Discrete Mathematics 2nd ed. Oxford University Press. ISBN 0-19-850717-8. Companion Web site: http://www.oup.co.uk/isbn/0-19-850717-8 includes questions together with solutions..
- Neville Dean, Essence of Discrete Mathematics Prentice Hall. ISBN 0-13-345943-8. Not as in depth as above texts, but a gentle intro.
- Klette, R., and A. Rosenfeld (2004). Digital Geometry. Morgan Kaufmann. ISBN 1-55860-861-3. Also on (digital) topology, graph theory, combinatorics, axiomatic systems.
- Mathematics Archives, Discrete Mathematics links to syllabi, tutorials, programs, etc. http://archives.math.utk.edu/topics/discreteMath.html
- Ronald Graham, Donald E. Knuth, Oren Patashnik, Concrete Mathematics
- Discrete Mathematics AJ Sadler

7.4 Internet Location : http://en.wikipedia.org/wiki/Discrete_mathematics

8- Required Facilities

- Data show and PC computer.

9- Course Matrices

9-1 **Course Contents/ILOs Matrix**

Course Contents	a1	a2	a3	b1	b2	b3	c1	d1	d2	d3
1 SET THEROY	√		√	√	√					
2 Relations	√		√	√						

3 Functions	√		√	√						
4 Vectors and Matrices		√	√		√	√	√			
5 Graph Theory		√	√		√	√	√			
6 Combinatorial Analysis		√		√	√	√	√			
7 Proposition Calculus		√		√	√	√	√			
8 Boolean Algebra		√		√	√	√	√			

9-2 **Learning Methods /ILOs Matrix**

Learning Method /ILO Matrix

Learning Methods	**a1**	**a2**	**a3**	**b1**	**b2**	**b3**	**c1**	**d1**	**d2**	**d3**
Lectures	√	√	√	√	√	√	√			
Tutorial Exercises				√	√	√	√	√	√	√
Discussions.				√	√	√	√	√	√	√

9-3 **Assessment Methods /ILOs Matrix**

Assessment Methods /ILO Matrix

Assessment Methods	**a1**	**a2**	**b1**	**b2**	**b3**	**b4**	**c1**	**c2**	**c3**	**d1**	**d2**	**d3**
Mid Term Exam	√	√	√	√	√	√	√	√	√			
Final Exam	√	√	√	√	√	√	√	√	√			
Course Work &Quizzes	√	√	√	√	√	√	√	√	√	√	√	√

Course Coordinator: Dr. Farouk Shabaan **(** **)**
Head of Department: Dr. Farouk Shabaan **(** **)**
Date: 22/9/2015