Department of …… Computer Science ….

College of …… Science …….

University of …… Salahaddin …….

Subject: … Discrete Structures……

Course Book – (Year 1)

Lecturer's name: Dalya Abdullah Anwaer MSc

Academic Year: 2015/2016

Course Book

1. Course name	**Discrete Structure**
2. Lecturer in charge	**Dalya Abdullah anwer**
3. Department/ College	**Computer science/science**
4. Contact	**e-mail: Dalya.Anwar@su.edu.krd**
5. Time (in hours) per week	**Theory: 2**
6. Office hours	**Sunday 9-10:30 am**
7. Course code	
8. Teacher's academic profile	**- Acquired a BSc from College Computer Science and Mathematics- Department of Mathematic in Mosul University in 2004** **- Graduated with a MSc in Applied Mathematics From the University of Mosul in 2006.** **- I have been working in the Department of Computer Science as an assistant lecturer since 2007.**
9. Keywords	**Logic,Set,Matrix,Mathematical Induction,Graph Theory**

10. Course overview:

Discrete mathematics, the study of finite systems, has become increasingly important as the computer age has advanced. The digital computer is basically a finite structure, and many of its properties can be understood and interpreted within the framework of finite mathematical systems. This course is an introduction to Discrete Mathematics for students from the IT majors, covering main topics in number theory, propositional logic, proof techniques, sets and relations, counting techniques, and graph theory, together with selected applications in computer algorithms.

Course Goals: The course will develop numerical methods aided by technology to solve algebraic, transcendental, and differential equations, and to calculate derivatives and integrals. The course will also develop an understanding of the elements of error analysis for numerical methods and certain proofs. The course will further develop problem solving skills.

11. Course objective:

Discrete mathematics deals with objects that come in discrete bundles, e.g., 1 or 2 babies. In contrast, continuous mathematics deals with objects that vary continuously, e.g., 3.42 inches from a wall. Think of digital watches versus analog watches (ones where the second hand loops around continuously without stopping).

Why study discrete mathematics in computer science? Here are a few examples:

- **Designing high-speed networks and message routing paths.**
- **Finding good algorithms for sorting.**
- **Performing web searches.**
- **Analysing algorithms for correctness and efficiency.**
- **Formalizing security requirements.**

This course is designed to provide an introduction to some fundamental concepts in discrete structure and mathematics for students in computer science. The students are taught how to deal with Mathematical logic, sets, functions, Matrices and relations.

12. Student's obligation

- **Students must attend weekly theoretical lectures.**
- **Solve Homework .**
- **Students must also attend two exams during the course**
- **In small groups, student will investigate discrete mathematics topics not covered in class. Student group will give an in-class presentation and write a report.**

13. Forms of teaching

- **Weekly handouts will be uploaded online for theoretical lectures.**
- **A projector will be used in the class, as well as a whiteboard, to convey the necessary Information to students.**

14. Assessment scheme

Students are demanded for two main theoretical exams during the academic year. From the two theoretical exams, the degree can be calculated of 30 marks and during the studying period there will be daily exams to be calculated at the end of the year and take 5 marks. .So that the final grade will be based upon the following criteria:

30 + 5 = 35 %

35 +5(project) = 40%

And final exam degree will be for 60 %

15. Student learning outcome:

By the end of this course, students will be able to:

- **Understanding of the fundamental notions of propositional and first order predicate logic and apply them in order to formalize simple logical statements; and the first principle of induction.**
- **Understanding of the fundamental notions of set theory and apply them in order to describe collections of objects.**
- **Understanding of the fundamental notions of mathematical relations ,matrix, and graph theory.**

16. Course Reading List and References:

- **SEYMOUR LIPSCHUTZ, MARC LARS LIPSON. Theory and Problems of DISCRETE MATHEMATICS. 3th ed. New York: McGraw-Hill, 2007.**
- **Clifford Stein, Robert L. Drysdale, Kenneth Bogart. DISCRETE MATHEMATICS FOR COMPUTER SCIENTISTS. Boston: Addison-Wesley,2011.**
- **http://www.philadelphia.edu.jo/math/witno/notes.**

17. The Topics:	**Lecturer's name** **Dalya A.Anwer** **(2 hrs) for each lecture**
• **Week 1: References, Mathematical Logic, Logic Operators and Truth Tables example on logic operators.** • **Week 2: An Application in Logical Arguments, Logical Equivalence, Common Equivalence Rules,Set & elements, Universal set, empty set, subset.** • **Week 3: Set of numbers, set operations,Algebra of sets.** • **Week 4: power set ,classes of set, the cardinality of the power set, examples .** • **Week 5: finite sets, counting principle, example.** • **Week 6: mathematical induction, example.** • **Week 7:exam.** • **Week 8: relations, product sets, domain, range, examples, representation of relations, types of relations,examples, composition of relations.** • **Week 9:n-Ary relations, examples,function, definition ,example.** • **Week 10:graph of function, composition of function,sequences of sets.** • **Week 11: matrix, definition, type of matrix,basic matrix arithmetic, addition, subtraction,product of matrix scalar.** • **Week 12: properties of matrix multiplication, determinate of matrix,matrix inverse with examples.** • **Week 13: matrix power, boolian operations.** • **Week 14: graph theory, definition of graph, direct & indirect graph, vertex degree loop & multiple edge, simple graph, connected graph.** • **Week 15:Exam.** • **Week 16: subgraph, degree, regular graph, isomorphic, walk, trial, path, complete graph.** • **Week 17: null graph, cycle graph, path graph, bipartite graph.** • **Week 18: tree, spanning tree, interval graph, digraph.** • **Week 19: Report Discussion.**	
18. Practical Topics (If there is any)	
This subject is only theory.	
19. Examinations: **1. for the following relations on the set A = {1, 2, 3}:** **R = {(1, 1), (1, 2), (1, 3), (3, 3)}, & Q = A× A = the universal relation** **Determine if R & Q is:** **reflexive; (b) symmetric; (c) transitive; (d) antisymmetric.** **Answer:**	

R: a) not reflexive **b) not symmetric** **c) transitive** **d) antisymmetric** **2. A graph in which all nodes are of equal degrees is known as:** **(A) Multigraph (B) Regular graph** **(C) Complete lattice (D) non regular graph** **Answer: B**
20. Extra notes: **الملاحظة التي اود ان اشير اليها انة هذه المادة تشمل الكثير من المواضيع في الرياضيات والتي يستفاد منها في الحاسبات ولكن بسبب تاخر نظام قبول الطلاب في الجامعة وهذه المادة تدرس في المرحلة الاولى لذلك يصعب تدريس كل المواضيع بطريقة وافية .**
21. Peer review