Course Title: **Discrete Structures**
Course Code: 250104
Semester:
Lecturer :
Office Room:
Office Hours:
E-mail:

I. Course Description

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.

II. Week-by-Week Plan

Week	Topics of Study
1	Logic: logic operators AND, OR, IFF, XOR, truth table, tautology, equivalence.
2	Normal forms, predicates and quantifiers.
3	Sets: set operations, set identities, power set, cardinality, cross product, power set.
4	Modulo operation, divisibility, GCD and LCM, the Euclidean algorithm.
5	Combinatorics: the addition and multiplication principles, the Pigeonhole principle.
6	Inclusion-exclusion principles, permutations and combinations, permutations on multisets.
7	Revision for the first exam. **First Exam will be held in this week.**
8	Recurrence relation: solving first order homogeneous sequences.
9	Methods of proof: mathematical induction.
10	Relations: properties of relations, representation by digraphs, zero-one matrices, transitive closures.
11	Equivalence relations, partial order relations, total order, Hasse diagrams.
12	Revision for the second exam. **Second Exam will be held in this week.**
13	Graph Theory: complete graphs, complete bipartite, representations by adjacency matrix, incidence matrix, distance matrix.
14	Trees, minimal spanning trees, Euler circuit, the Chinese postman problem.
15	Coloring algorithms, planar graphs, maps and dual graphs.
16	Revision for the final exam. **Final Exam will be held in this week.**

III. Learning Outcomes

Knowledge and understanding:

Students will have knowledge and understanding of:

- Conversion between various base number systems, particularly the binary, octal, and hexadecimal number systems.
- Basic number theoretical functions such as the mod function, GCD, and LCM.
- Boolean logic and techniques of mathematical proofs.
- Sets and relations.
- Basic counting techniques and discrete probability.
- Some important algorithms of graph theory.

Cognitive skills (thinking and analysis):

Students are expected to develop abilities in:

- Understanding mathematical definitions and demonstrating it by writing them in their own words.
- Translating application word problems into mathematical arguments and algorithms.
- Reading and writing mathematical proofs.
- Finding examples and counter-examples to a given propositional theorems.

Communication skills (personal and academic):

Students will learn specific skills in:

- Expressing mathematical ideas in a logically correct manner.
- Good logical writing.
- Identifying ambiguities in mathematical statements and how to overcome them.
- Making good and acceptable presentation of their works.

Practical skills (transferable):

Students will also experience and gain awareness in:

- Planning and undertaking project assignments.
- The high value of meeting deadlines.
- Working independently and managing time wisely.
- Using word processor to write their reports legibly.

IV. Assessment Distribution

Students will be assessed out of 100 total marks, which will be distributed as follows.

• Homework	10 Sets	20 %
• Exam 1	Week 7	20 %
• Exam 2	Week 12	20 %
• Final Exam	Week 16	40 %

V. Supporting Materials

Required Textbook:

Amin Witno, Discrete Structures in Five Chapters, CreateSpace 2010---this text is required and can be downloaded for free from http://www.witno.com/discrete. Optional hardcopies are available for purchase from Amazon.com.

Following this text, ten sets of exercises will be assigned, detailed as follows.

Homework Assignments		Exercises as numbered in the textbook
Logic, Sets, Counting		
Part 1 4 Sets	HW 1: Logic Operators	2.1, 2.2, 2.3, 2.4, 2.6, 2.7, 2.8, 2.9, 2.12, 2.13, 2.14, 2.16, 2.20, 2.21
	HW 2: Set Operators	2.23, 2.24, 2.25, 2.26, 2.27, 2.28, 2.29, 2.30, 2.33, 2.34, 2.35, 2.37
	HW 3: MOD, GCD, LCM	1.20, 1.21, 1.22, 1.23, 1.31, 1.32, 1.33
	HW 4: Inclusion Exclusion	4.9, 4.10, 4.11, 4.14, 4.15, 4.17, 4.23, 4.27
Recurrence, Induction, Relations		
Part 2 4 Sets	HW 5: Recurrence Relations	4.50, 4.51, 4.52, 4.54, 4.57
	HW 6: Mathematical Induction	2.60, 2.61, 2.62, 2.63
	HW 7: Relations & Digraphs	3.1, 3.3, 3.6, 3.7, 3.8, 3.9, 3,10, 3.11, 3.13, 3.14
	HW 8: Partial & Total Orders	3.17, 3.18, 3.19, 3.20, 3.22, 3.23, 3.24
Graphs		
Part 3 2 Sets	HW 9: Degree, Matrices, MST	5.2, 5.4, 5.5, 5.20, 5.22, 5.23, 5.24, 5.25, 5.26, 5.31, 5.34
	HW 10: Distance, Walks, CPP	5.36, 5.37, 5.39, 5.40, 5.41, 5.44, 5.45, 5.46, 5.47, 5.48. 5.53

Lecture Notes:

The old notes Discrete Structures, which has a collection of revision problems, are still available for download from http://www.philadelphia.edu.jo/math/witno/notes.

Online Resources:

In addition to the online textbook site, there are other websites which contain relevant materials pertaining to the course, such as

- Basic Sciences Department – http://www.philadelphia.edu.jo/math
- Instructors' Webpages – http://www.philadelphia.edu.jo/academics

VI. Class Rules and Regulations

Class Attendance:

- Attendance is expected of every student.
- Being absent is not an excuse for not knowing about any important information that may have been given in class.
- Under the University's regulations, a student whose absence record exceeds 15% of total class hours will automatically fail the course.
- Students who in any way disrupt the class will be expelled from the classroom and will not be allowed to return until the problem has been resolved.

Project Assignments:

- Students are allowed to work together on a project assignment; however, the work that is turned in by each student must be his own. For instance, a mere copy of another student's work will not be graded.
- A written project must be properly presented to receive full credit.
- A late project is penalized one point per day after its due date.
- A project sent by email will not be accepted.

Late Exams:

- Late (make-up) exams will be given only to students who have a valid excuse and are able to provide a written document for its verification.
- The level of difficulty of a late exam is about 50% higher than that of the corresponding regular exam.
- All late exams will be conducted during the last week of the semester.
- Each student is allowed only one make-up in a semester, either for the first exam or the second, but not both.
- There is no make-up for a late exam.

Dishonesty:

- Any form of dishonest conduct will be strictly punished.
- A student who is caught cheating, or attempting to do so in an exam will be given a zero for the exam and a report will be written to the Dean for further action.
- A student who helps another student or is seen communicating with another student in an exam will be given the same penalty stated in the previous point.
- Students with different exam forms are not exempt from the above rules.
- Repeat offenders will be expelled permanently and banned from future courses.