

**Module Syllabus :**

Course Title: Set Theory  
Course Code: 250251  
Semester: First / 2014–2015  
Lecturer : Amin Witno  
Office Room: 820 (Ext. 2228)  
Office Hours: SUN/TUE/THU 10–11 & MON/WED 11–12  
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**Short Description:**

This course is an introduction to abstract mathematics, also known as Transition to Advanced Mathematics, wherein heavy emphases are placed upon proof structures in the setting of logic and set theory. Topics include propositional logic and quantification, methods of proof, set operations and identities, relations and functions, cardinal numbers and countability.

**Topics by the Week:**

Week	Topics
1	Review of the real number system, set notations, special functions and operations.
2	Logic and operators, truth tables, equivalence statements.
3	Set operators, Venn diagrams, subsets and power sets.
4	Direct proof, proof using contrapositive.
5	Proof by cases, proving equivalent statements.
6	Proof by contradiction, proving existential statements.
7	Proof by mathematical induction.
8	Relations, inverse and composition, equivalence relations.
9	Partial and total order relations, the well ordering principle.
10	Functions as relations, composition of functions.
11	One-to-one and onto functions, inverse functions.
12	Cardinality and cardinal arithmetic.
13	Properties of infinite countable sets.
14	Uncountable sets and the continuum hypothesis.
15	Review for Final Exam.
16	Final Exam will be held in this period.

**Required Textbook:**

Amin Witno, Discrete Structures in Five Chapters, CreateSpace 2010--we will need only Chapters 2 and 3. Students are required to download softcopies of the text for free from <http://www.witno.com/discrete>. Optional hardcopies are available for purchase online.

## Lecture Notes:

- Amin Witno, Infinite Countable Sets. These notes are a supplement to accompany Homework Set #10 and can be downloaded for free from Amin Witno Website.
- Amin Witno, Logic & Set Theory. These are the old revision notes which are no longer used, but they contain a collection of exercises that are still relevant for the course.

## Home work Assignments:

HW	Topics	Exercises as numbered in the textbook
1	Propositional Logic	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17, 2.18, 2.19
2	Introduction to Sets	2.22, 2.23, 2.24, 2.25, 2.26, 2.27, 2.28, 2.29, 2.30, 2.31, 2.32, 2.33, 2.34, 2.35, 2.36, 2.37
3	Direct Proof and Contrapositive	2.38, 2.39, 2.40, 2.41
4	Proof by Cases and Proving Equivalence Statements	2.42, 2.43, 2.44, 2.45
5	Proof by Contradiction and Proving Existence	2.47, 2.48, 2.51, 2.56, 2.57, 2.58
6	Mathematical Induction	2.60, 2.61, 2.62, 2.63
7	Binary Relations	3.1, 3.2, 3.3, 3.6, 3.7, 3.8
8	Equivalence Relations and Ordering	3.17, 3.20, 3.21, 3.23
9	Functions	3.26, 3.27, 3.28, 3.29, 3.30, 3.31, 3.32, 3.33, 3.34, 3.35
10	Cardinality	3.36, 3.37, 3.38, 3.39, 3.40, 3.41, 3.42

## Mark Distribution:

- Homework 10 Sets 10%
- Quizzes 2 Sets 10%
- Exam 1 Week 6 20%
- Exam 2 Week 11 20%
- Final Exam Week 16 40%

Exam dates, once determined, will be posted online at the Department's website.

## Supporting Websites:

- Basic Sciences Department – <http://www.philadelphia.edu.jo/math>
- Amin Witno Website – <http://phi.witno.com>