

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics and Statistics**

**SYLLABUS Math 232**  
Semester I, 2012-2013(121)

Instructor: Dr. Othman Echi

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| <b>Course:</b>               | Math 232   |
| <b>Title:</b>                | Introduction to Sets and Structures  |
| <b>Textbook:</b>             | Introduction to Mathematical Structures and Proofs by Larry J. Gerstein;<br>and Contemporary Abstract Algebra (6e) by Joseph A. Gallian.   |
| <b>Objectives:</b>           | This course is intended to introduce students to some fundamental concepts in mathematics and to familiarize them with mathematical proofs and rigor. The aim is to provide students with the appropriate background for more advanced courses in mathematics.   |
| <b>Catalogue Description</b> | Elementary logic. Methods of proof. Set theory. Relations and functions. Finite and infinite sets. Equivalence relations and congruence. Divisibility and the fundamental theorem of arithmetic. Well-ordering and axiom of choice. Groups, subgroups, symmetric groups, cyclic groups and order of an element, isomorphisms, cosets and Lagrange's Theorem. |

**Lectures: Saturday/Monday/Wednesday 8.00-8.50 ; Building 7, Room 100**

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| <b>Grading Policy:</b> Four Tests 40%; HW +Attend 30%; Final Exam 30%. |
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**EXAMS:**

- 1. Tests:** Date, time and location TBA
- 2. Final exam (comprehensive):** Wednesday, January 2, 2013, 7:00 PM

| Lectures   | Sections | Material  |
|------------|----------|---|
| 1, 2, 3    | 1.1      | Statements, propositions and theorems                               |
|            | 1.2      | Logical connectives and truth tables                                |
|            | 1.3      | Conditional statements  |
| 4, 5, 6    | 1.4      | Proofs: structures and strategies                                   |
|            | 1.5      | Logical equivalence   |
| 7, 8, 9    | 2.1      | Sets: fundamentals  |
|            | 2.2      | Russell's paradox   |
|            | 2.3      | Quantifiers   |
| 10, 11, 12 | 2.4      | Set inclusion   |
|            | 2.5      | Union, intersection and complement                                  |
|            | 2.6      | Indexed sets  |
| 13, 14, 15 | 2.7      | The power set   |
|            | 2.8      | Ordered pairs and Cartesian products                                |
| 16, 17, 18 | 2.9      | Partitions and relations  |
|            | 2.10     | Mathematical induction and recursion                                |
| 19, 20, 21 | 3.1      | Functions: definitions and examples                                 |
|            | 3.2      | Surjections, injections, bijections and sequences                   |
|            | 3.3      | Composition of functions  |
| 22, 23, 24 | 4.1      | Cardinality   |
|            | 4.2      | Comparing sets, finite or infinite                                  |
|            | 4.3      | Countable and uncountable sets                                      |
|            | 4.4      | More on infinity  |
| 25, 26, 27 | 6.1      | Operations  |
|            | 6.2      | The integers  |
|            | 6.3      | The fundamental theorem of arithmetic                               |
| 28, 29, 30 | 6.4      | Congruence  |
|            | 6.5      | Euler's function  |
|            | 6.6      | The inclusion-exclusion principle                                   |
| 31, 32, 33 | Ch.2     | Groups: definitions and examples<br>Elementary properties of groups |
|            | Ch.3     | Finite groups and subgroups   |
| 34, 35, 36 | Ch.4     | Cyclic groups   |
|            | Ch.5     | Permutations<br>Permutation groups                                  |
| 37, 38, 39 | Ch.6     | Isomorphisms and Cayley's theorem                                   |
| 40, 41, 42 | Ch.7     | Cosets and Lagrange's theorem                                       |
| 43, 44, 45 |          |   |

[Chapter references in the above table are to Gallian's Abstract Algebra]