# Jordan University of Science and Technology

## Faculty of Science & Arts

## Mathematics Department

MATH245 Set Theory And Logic - JNQF Level: 7

First Semester 2024-2025

| Course Catalog |
|---|
| 3 Credit Hours. Cartesian products and Relations (domain, range, inverse, composition), Equivalence relations and Partitions, Ordering Relations (POSETS and Totally Ordered Sets). Functions (domain, codomain, range equality of functions, many examples), Injective, surjective, and bijective functions, Inverses and inverse functions, Images and inverse images of sets in a function, functions and inverses on unions and intersections and complements, Restriction functions on a subset (and restricting the codomain to the range), Composition of functions (composing a function with its inverse), Equipotent sets, Finite and infinite sets, Countable and Denumerable Sets, Proof of countability of Q, Examples and properties of denumerable sets, Nondenumerable sets and properties, Proof of uncountability of R, The concept of cardinal numbers, Cardinal number of a power set, Cantor's theorem, addition and multiplication of cardinal numbers. |
| **Teaching Method:** On Campus |

| Text Book | |
|---|---|
| **Title** | A Transition To Advanced Mathematics |
| **Author(s)** | Douglas Smith, Maurrice Eggen, and Richard St. Andre |
| **Edition** | 7th Edition |
| **Short Name** | TextBook |
| **Other Information** | Brooks I Cole |

**Course References**

| Short name | Book name | Author(s) | Edition | Other Information |
|---|---|---|---|---|
| Ref 1 | Introduction To Advanced Mathematics | William Barnier and Norman Feldman | 2nd Edition | Prentice Hall |
| Ref 2 | Introduction to Set Theory | M.J. Donald. | 1st Edition | |
| Ref 3 | Set Theory and Logic | F. Abraham | 1st Edition | |

| Instructor | |
|---|---|
| Name | **Prof. Saleh Abdullah** |
| Office Location | - |
| Office Hours | |
| Email | sabdulah@just.edu.jo |

| Class Schedule & Room |
|---|
| Section 1:<br>Lecture Time: Mon, Wed : 10:00 - 11:30<br>Room: NG56 |

| Prerequisites | | |
|---|---|---|
| **Line Number** | **Course Name** | **Prerequisite Type** |
| 901450 | MATH145 Fundamentals Of Mathematics | Prerequisite / Pass |

| Tentative List of Topics Covered | | |
|---|---|---|
| **Weeks** | **Topic** | **References** |
| Week 1 | Chapter 1: Statements and their connectives, Three more connectives | **.** From **TextBook** |
| Week 2 | Chapter (continued): Tautology, Implication, Equivalence, Contradiction, Deductive reasoning | **.** From **TextBook** |
| Week 3 | Chapter 1 (Continued) : Quantification rules, Proof of validity, Mathematical induction | **.** From **TextBook** |
| Week 4 | Chapter 2: Sets and subsets, Specification of sets | **.** From **TextBook** |
| Week 5 | Chapter 2 (continued): Unions and intersections, Complements, Venn diagrams | **.** From **TextBook** |
| Week 6 | Chapter 2 (continued) and Chapter 3: Indexed families of sets, Cartesian product of two sets | **.** From **TextBook** |
| Week 7 | Chapter 3: Relations, Partitions and equivalence relations | **.** From **TextBook** |
| Week 8 | Chapter 3 (Continued) : Functions, Images and inverse images of sets | **.** From **TextBook** |
| Week 9 | Chapter 3 (Continued): Injective, surjective, and bijective functions, Composition of functions | **.** From **TextBook** |
| Week 10 | Chapter 4: Finite and infinite sets | **.** From **TextBook** |

| | | |
|---|---|---|
| Week 11 | Chapter 4 ( Continued): Equipotence of sets, Examples and properties of denumerable sets | **.** From **TextBook** |
| Week 12 | Chapter 4 ( Continued) and Chapter 5: Nondenumerable sets, The concept of cardinal numbers | **.** From **TextBook** |
| Week 13 | Chapter 5 (Continued): Cardinal number of a power set-Cantor's theorem, addition of cardinal numbers | **.** From **TextBook** |
| Week 14 | Chapter 5 (Continued): Multiplication of cardinal numbers | **.** From **TextBook** |
| Week 15 | Review | |

| Mapping of Course Outcomes to Program Outcomes and NQF Outcomes | Course Outcome Weight (Out of 100%) | Assessment method |
|---|---|---|
| An able to write and understand the proofs that require to deal with the concepts of set operations, equivalence relations, partitions, and properties of injective as well as surjective functions. [1SLO1(K1S1)] [1L7K1] | 50% | |
| An able to deal with the concepts of cardinality: finite and infinite sets, denumerable sets, countable and uncountable sets. [1SLO1(K1S1)] [1L7S1] | 50% | |

| Relationship to Program Student Outcomes (Out of 100%) | | | | | |
|---|---|---|---|---|---|
| SLO1(K1S1) | SLO2(S23C1) | SLO3(C24) | SLO4(C3) | SLO5(C4) | SLO6(S2C3) |
| 100 | | | | | |

| Relationship to NQF Outcomes (Out of 100%) | |
|---|---|
| L7K1 | L7S1 |
| 50 | 50 |

| Evaluation | |
|---|---|
| **Assessment Tool** | **Weight** |
| First | 30% |
| Second | 30% |
| Final | 40% |

Date Printed: 2024-10-12