

Detailed Course Description - Course Plan Development and Updating Procedures/ Department	QF01/0408-3.0E
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Faculty	Science & Information Technology	Department	Mathematics
Course number	0101211	Course title	Set Theorey
Number of credit hours	3	Pre-requisite/co-requisite	None

Brief course description

Logic, (Introduction to logical symbols, The common sentential connectives), Sets, Sets Operations, Family of Sets, Cartesian Product on Sets, Relations, Equivalence Relations, Order Relations, Functions, Operations on Functions, Inverse Functions, Binary Operations on Sets, Finite And Infinite Sets, Countable Sets.

	Course goals and learning outcomes
Goal 1	being able to think logically
Learning outcomes	1.1 Students will be able to write truth tables of connectives 1.2 Students will be able to prove theorems about tautologies and contradictions.
Goal 2	being able to construct a valid proof using different methods.
Learning outcomes	2.1 Students will be able to apply direct proof 2.2 Students will be able to apply contrapositive proof 2.3 Students will be able to apply contradiction proof 2.4 Students will be able to apply proof by induction
Goal 3	being able to define a binary relation between sets and to show that a relation is or is not an equivalence relation.
Learning outcomes	3.1 Students will be able to apply operations on sets 3.2 Students will be able to define equivalence relations
Goal 4	being able to define a function between sets
Learning outcomes	4.1 Students will be able to define a function between sets, composition of functions, injective, surjective, or bijective functions 4.2 Students will be able to define image and inverse image of subsets of the domain and codomain 4.3 Students will be able to prove statements combining these concepts.

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Textbook	P. Fletcher and C.W. Patty, Foundations of Higher Mathematics, PWS-KENT, Boston, 1988
Supplementary references	1.- Set Theory, C. Pinter, Addison-Wesley, London, 1971 2.- A Transition to Advanced Mathematics, D. Smith, M. Eggen, and R. Andre, Wadsworth, California, 1986. 3.- The Elements of Set Theory, Deepak, 2008

Course timeline				
Week	Number of hours	Course topics	Pages (textbook)	Notes
01	1	I. Logic and Language of Proof Propositions(Statements); truth value, sentential connectives, negation, disjunction, conjunction, conditional and biconditional statements, tautologies and contradictions, equivalent statements.	1-11	
	1			
	1			
02	1	The converse and the contrapositive of a conditional, the universal and the existential quantifiers, negation of quantified statements	12-17	
	1			
	1			
03	1	Techniques of proof : the direct method, the contrapositive method, the contradiction method, proof by cases, counterexamples	18-29	
	1			
	1			
04	1	II. Sets Definition, set-builder notation, subset, equal sets, proper subset, the empty set , the power set.	31-34	
	1			
	1			
05	1	Union and intersection of sets, disjoint sets, universal set, complements, properties of unions, intersections and complements	34-41	
	1			
	1			
06	1	Indexed families of sets, proving or giving counterexamples to various statements involving sets. First Exam 20%	41-46	
	1			
	1			
07	1	III. Mathematical Induction The well-ordering property of \mathbb{N} , the principle of mathematical induction (PMI), equivalent forms of PMI.	51-65	
	1			
	1			
08	1	IV. Relations and Order Ordered pairs, Cartesian product, relation, the domain and the range of a relation, the inverse of a relation.	80-90	
	1			
	1			
09	1	Reflexive, symmetric and transitive relations, equivalence relations, composition of relations,	92-97 107-109	
	1			
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10	1 1 1	Equivalence classes, partitions, congruence relations, congruence classes, orders, partial order, well order.	97-106	
11	1 1 1	V. Functions Functions as relations, composition of functions, injective (one-to one) functions, the inverse function.	115-120	
12	1 1 1	Surjective (onto) functions, bijections, composition of functions. Second Exam 20%	120-125	
13	1 1 1	Real-valued functions, images and inverse images of sets, proving more theorems involving the previous concepts concerning functions.	131-143	
14	1 1 1	VI. Countability and Cardinality of Sets Euqinumerous sets, finite and infinite sets, denumerable sets.	175-194	
15	1 1 1	Countable and uncountable sets, cardinal numbers.	175-194	
16	1 1 1	Final Exam 50%		

Theoretical course evaluation methods and weight	Participation = 10% First exam 20% Second exam 20% Final exam 50%	Practical (clinical) course evaluation methods	Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50%
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Approved by head of department		Date of approval	
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Extra information (to be updated every semester by corresponding faculty member)

Name of teacher	Waseem Al-Masha'leh	Office Number	126
Phone number (extension)	368	Email	w.almasha'leh@zuj.edu.jo
Office hours			