

Detailed Course Description - Course Plan Development and Updating Procedures/ Mathematics Department	QF01/0408-3.0E
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Faculty	Faculty of Science and Information Technology	Department	Mathematics
Course number	0101251	Course title	Real Analysis (1)
Number of credit hours	3	Pre-requisite/co-requisite	Calculus (2) + Set Theory (0101102) + (0101211)

Brief course description

A first course in real analysis. Topics include real numbers, sequences, limits and continuity of real-valued functions, topology of the field of real numbers.

Course goals and learning outcomes

Goal 1	Prove basic set theoretic statements and emphasize the proofs' development.
Learning outcomes	1.1 Students will be able to prove a basic set theoretic statement. 1.2 Students will be able to write formal proofs relating to the various topics. 1.3 Students will be able to apply theorems in a correct mathematical way.
Goal 2	Have the knowledge of basic properties of the field of real numbers.
Learning outcomes	2.1 Students will know and work with the basic properties of the field real numbers including the completeness axiom and its consequences. 2.2 Know the basic topology of the real line, including open and closed sets, cluster points and compactness.
Goal 3	Have the knowledge of the limit of a sequence and a function and the Cauchy criterion.
Learning outcomes	3.1 Being able to define the limit of a sequence and the limit of a function at a point. 3.2 Students will have knowledge about theorems concerning limits .
Goal 4	Have the knowledge of continuity of a real-valued function.
Learning outcomes	4.1 Students will be able to define continuity of a function and uniform continuity . 4.2 Students will be able to prove theorems about continuous functions.

Textbook	Elementary Linear Algebra, by Howard Anton, 8 th Edition
Supplementary references	1. "Linear Algebra and its Applications", by David C. Lay and Steven R. Lay and Judi J. McDonald, 5 th Ed., (2015), Addison-Wesley. 2. "Elementary Linear Algebra", B. Kolman and D. Hill, 9 th Ed., (2008), Pearson. 3. "Linear Algebra with Applications", Steven J. Leon, 9 th Ed., (2015), Pearson. 4. "Linear Algebra; An introduction", by R. Larson, 8 th Ed., (2017), Cengage.

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Course timeline			
Week	Number of hours	Course topics	Pages (textbook)
01	1 1 1	The Algebraic and the Order Properties of \mathbb{R} ; Some Inequalities.	22-30
02	1 1 1	Absolute Value and the Real Line; The Completeness Property of \mathbb{R} ; Suprema and Infima.	31-38
03	1 1 1	Applications of the Supremum Property; The Archimedean Property.	38-41
04	1 1 1	The Existence of \sqrt{p} ; Density of \mathbb{Q} in \mathbb{R} ; Sequences of Real Numbers.	41-44 52-54
05	1 1 1	Some topology of \mathbb{R} : Neighborhoods; Closed Sets and Open Sets; Cluster Points; Compact Sets.	
06	1 1 1	The Limit of a Sequence: The $\varepsilon - K$ Definition; Examples; Main Theorems.	54-60
07	1 1 1	More Limit Theorems; Squeeze Theorem for Sequences.	60-65
08	1 1 1	The Ratio Test for Convergence; Monotone Sequences; Monotone Convergence Theorem; Euler's Number as a Limit of a Sequence.	66-74
09	1 1 1	Subsequences; Divergence Criteria; Monotone Subsequence Theorem; Bolzano-Weierstrass Theorem.	75-80
10	1 1 1	The Cauchy Criterion; Limits of Functions: Definition of the Limit of a Function; Theorems.	80-86 96-101
11	1 1 1	Sequential Criteria for Limits; Divergence Criteria; Theorems on Limits; Computing Limits.	101-111
12	1 1 1	Squeeze Theorem for functions; Some Extensions of the Limit Concept; Infinite Limits.	111-118
13	1 1 1	Continuous Functions; Combinations of Continuous Functions.	119-129
14	1 1 1	Continuous Functions on Intervals; Location of Roots Theorem; Bolzano's Theorem; Uniform Continuity.	129-138

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15	1 1 1	More on the topology of R; the closure and the interior of a set.	312-316
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	Amal H. Al-Saket	Office Number	9114
Phone number (extension)	430	Email	Amal_saket@zu.jo
Office hours			