COURSE DESCRIPTIONS

Faculty	Science and Information Technology				
Department	Mathematics			**NQF level**	7
Course Title	Real Analysis I	**Code**	505307	**Prerequisite**	Set theory
Credit Hours	3	**Theory**	3	**Practical**	-
Course Leader	Dr Tariq Qawasmeh	**email**	ta.qawasmeh@jadara.edu.jo		
Lecturers	Dr Tariq Qawasmeh	**emails**	ta.qawasmeh@jadara.edu.jo		
Lecture time	10:00-11:30	**Classroom**	D403		
Semester	First Semester 2021\2022	**Production**	2008	**Updated**	2021
Awards	Real Analysis 2			**Attendance**	Fulltime

Short Description
This course covers the foundations of main topics in real analysis variables such as; Real Numbers, Metric spaces, Sequences, Continuity and compactness, Riemann Integration.
Course Objectives
1. Ability to utilize the Fundamental and basic Properties of Real line. 2. Metric spaces and Cauchy sequences and complete metric Spaces. 3. Solving Problems within Real Line by Using the basic tools of analysis and inequalities of real numbers.

Learning Outcomes
A. Knowledge - Theoretical Understanding
a1) Describe fundamentals and basic properties of the Real line. a2) Define the concept of metric spaces and other related concepts.
B. Knowledge - Practical Application
a3) Generalize the use the basic tools of analysis.
C. Skills - Generic Problem Solving and Analytical Skills
b1) Use several facts related to theory of functions of real variable.
D. Skills - Communication, ICT, and Numeracy
b2) Analyze the relation between different facts.
E. Competence: Autonomy, Responsibility, and Context
C1) Develop some inequalities of real numbers. C2) Develop the understanding of Calculus.
Teaching and Learning Methods
Lectures, discussions, and solving selected problems.

Assessment Methods
• Discussion and Interaction • Mid-Term Exam, Final exam, Class Assignment Quizzes,

Course Contents					
W	**Hours**	**CLOs**	**Topics**	**Teaching & Learning Methods**	**Assessment Methods**
1.	**3**	**a1, a3,c1**	Definition of bounded sets, Ordered set, Least upper bound and greatest lower bound.	Lecturing, examples, Discussion	Assignments, Exams, Quizzes, Discussion and Interaction
2.	**3**	**a1, b2, c2**	The Real field and its properties, ordered field. The extended real number system, Bounded sets	Lecturing, examples, Discussion	Discussion and Interaction and Quizzes,
3.	**3**	**a2, b1, c2**	Euclidean Spaces, Norm spaces, Inner product, Metric spaces.	Lecturing, Discussion	Assignments, Exams, Quizzes, Discussion and Interaction
4.	**3**	**a2, b1, c2**	Neighborhoods, Interior point, Exterior point, Limit point, Boundary point, Open set, Closed set, Closure, Compact spaces, Perfect sets, Connected sets.	Lecturing, examples, Discussion	Assignments, Discussion and Interaction
5.	**3**	**a1, b1, c1, c2**	Convergent sequences, Subsequences, Cauchy sequences,	Lecturing, oral Discussion	Assignments, Exams, Quizzes, Discussion and Interaction
6.	**3**	**a1, b1, c1, c2**	Complete metric spaces, compact metric spaces. Upper and lower limits, Some special sequences	Lecturing, oral Discussion	Exams, Quizzes, Discussion and Interaction
7.	**3**	**a1, b1, c1, c2**	Series, series of nonnegative terms, Convergent tests, Summation by parts.	Lecturing, examples, Discussion	Assignments, Exams, Discussion and Interaction
8.	**3**	**a1, b1, b2, c2**	Series, series of nonnegative terms, Convergent tests, Summation by parts.	Lecturing, examples, Discussion	Assignments, Exams, Quizzes, Discussion and Interaction
9.	**3**	**a1, b1, c1, c2**	Absolutely and conditional convergence.	Lecturing, examples, Discussion	Assignments, Exams, Quizzes, Discussion and Interaction

10.	**3**	**a1, a3, b2, c1,**	Limits of functions, Continuous functions.	Lecturing, oral Discussion	Assignments, Discussion and Interaction
11.	**3**	**a2, b2, c2**	Continuity and compactness Continuity and connectedness,	Lecturing, oral Discussion	Assignments, Exams, Quizzes, Discussion and Interaction
12.	**3**	**a1, a3, b1, c1**	Intermediate value theorem, Discontinuities, Monotonic functions	Lecturing, examples, Discussion	Assignments, Exams, Quizzes, Discussion and Interaction
13.	**3**	**a1, a3, b1, c1**	Intermediate value theorem, Discontinuities, Monotonic functions	Lecturing, examples, Discussion	Assignments, Exams, Quizzes, Discussion and Interaction
14.	**3**	**a2, a3, b1**	Historical overview, Riemann's integral, Criteria for Riemann integrability.	Lecturing, examples, Discussion	Exams, Quizzes, Discussion and Interaction
15.	**3**	**a2, a3, b1**	Historical overview, Riemann's integral, Criteria for Riemann integrability.	Lecturing, examples, Discussion	Exams, Quizzes, Discussion and Interaction
16.	Final Exam				

Infrastructure	
Textbook	1. Principle of Mathematical Analysis, by W. Rudin, 3rd edition, McGraw-Hill, New York 1976. 2. Mathematical Analysis, by Tom Apostol, 2nd edition, Addison-Wesley, Reading, MA, 1974.
References	• Theory of Functions of A Real Variable, by I. Natanson, 3rd edition, Volume I & II, Fredrick Ungar Publishing Company, New York, 1964. • Functions of A Real Variable, Vol. I & II, by N. Bourbaki,

	Translated, Springer-Verlag, Berlin, 2004. • Elementary Theory of Metric Spaces, by Robert B. Reisel, Springer-Verlag, New York, 1992. • Metric Spaces, by E.T. Copson, Cambridge University Press, 1968. • Real Analysis: An Introduction to the Theory of Real Functions and Integration, Jewgeni H. Dshalalow, Chapman & Hall/Crc, Florida, 2001. • A Garden of integrals, by Frank E. Burk, MAA, 2007. • Advanced Calculus, by Lynn H. Loomis & Shlomo Sternberg, Jones and Bartlett Pub., 1990. • The Riemann approach to integration, by Washek F. Pfeffer, Cambridge University Press 1993.
Required reading	
Electronic materials	**Any Internet Resources**
Other	**Any manuscript, Chapter and Book in Real Analysis**

Course Assessment Plan									
Assessment Method		**Grade**	**CLOs**						
			a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**
First (Midterm)		**30%**	**8%**	**6%**		**6%**		**6%**	**4%**
Second (if applicable)									
Final Exam		**50%**	**10%**		**9%**	**6%**	**9%**	**10%**	**6%**
Coursework		**20%**							
Coursework assessment methods	Assignments	**10%**			**5%**		**5%**		
	Case study	-							
	Discussion and interaction	-							
	Group work activities	-							
	Lab tests and assignments	-							
	Presentations	-							
	Quizzes	-				**5%**			**5%**
Total		**100**	**18**	**6**	**14**	**17**	**14**	**16**	**15**

Plagiarism

Plagiarism is claiming that someone else's work is your own. The department has a strict policy regarding plagiarism and, if plagiarism is indeed discovered, this policy will be applied. Note that punishments apply also to anyone assisting another to commit plagiarism (for example by knowingly allowing someone to copy your code).

Plagiarism is different from group work in which a number of individuals share ideas on how to carry out the coursework. You are strongly encouraged to work in small groups, and you will certainly not be penalized for doing so. This means that you may work together on the program. What is important is that you have a full understanding of all aspects of the completed program. In order to allow proper assessment that this is indeed the case, you must adhere strictly to the course work requirements as outlined above and detailed in the coursework problem description. These requirements are in place to encourage individual understanding, facilitate individual assessment, and deter plagiarism.

منسق المادة　　رئيس قسم الرياضيات

د. طارق قواسمة　　د. أيمن هزايمـــــــــــــــــــــــــــه