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الجمهورية العربية السورية

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الجامعة الافتراضية السورية

Mathematical Analysis GMA102 Course Description

## **1-Basic information**

Course Name	Mathematical Analysis
Course ID	GMA102
Contact Hours (Registered Sessions)	36
Contact Hours (Synchronized Sessions)	18
Mid Term Exam Hours	0
Exam Hours	1.5
Registered Sessions Work Load	36
Synchronized Session Work Load	18
Credit Hours	6
Level	1
Home Work numbers	1

Syrian Arab Republic		الجمهورية العربية السورية
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### 2- Pre-Requisites

Course	ID
Mathematical Algebra	GMA101

### **3– Course General Objectives**

Mathematical Analysis aims to study real numbers, functions, continuity, limits,

sequences, series, derivatives, integrals and differential equations.

### 4- Intended Learning Outcomes (ILO)

Code	Intended Learning Outcomes				
ILO1	Understanding Real numbers field				
ILO2	Knowing Functions, Limits and Continuity concepts and properties				
ILO3	Understanding real sequences and knowing evaluation of sequences convergence or divergence and limits				
ILO4	Understanding infinite series, and knowing evaluation of series limits, convergence or divergence				
ILO5	Understanding Derivatives, knowing how to make differentiation of simple, combined and implicit functions.				
ILO6	Knowing definite Integrals and indefinite integrals, knowing how to evaluate integrals using analytical and numerical methods				

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ILO7	Understanding and knowing how to resolve First- and second- order Linear
	Differential Equations with constant coefficients

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# 5- Course Syllabus (18 hours of total synchronized sessions SS, 36

## hours of Recorded Sessions RS )

Number	Title	Description	RS [h]	SS [h]
		Numbers sets, Mathematical		
1	Real Numbers	Induction, Field properties,	3	3
1	Field	ordered field, bounds, absolute	5	
		values, intervals		
	Functions,	Functions, Bounded functions,		
2	Limits and	Monotonic functions, Function	6	3
2	Continuity	limits, Maxima and minima,	0	3
	Continuity	Continuity		
		Definition of a Sequence,		
		Arithmetic and Geometric		
3	Real	Sequences,	6	3
5	Sequences	Limit of Sequences,	0	
		Bounded and Monotonic		
		Sequences,		
		Notation of sums, Properties of		
		sums, Definition of Series,		
		Convergence of Series,		
4	Series	Tests for Convergence,		3
	Series	Absolute and conditional	6	3
		convergence,		
		Power series,		
		Expansion of functions in Power		

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	series,	
	Taylor's Theorems	

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5DerivativesRight and Left derivation, Differentiability in an interval, The differentiation of composite functions, Implicit differentiation, Derivatives of Elementary functions, Higher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's Method636IntegralsProperties of Definite Integrals, Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			The Concept and definition of a		
5DerivativesDifferentiability in an interval, The differentiation of composite functions, Implicit differentiation, Rules for differentiation, Derivatives of Elementary functions, Higher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's Method636IntegralsProperties of Definite Integrals, Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			derivative,		
5DerivativesThe differentiation of composite functions, Implicit differentiation, Rules for differentiation, Derivatives of Elementary functions, Higher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's Method636IntegralsProperties of Definite Integrals, Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, Integrals of elementary functions, Lange of variable of integration, Integration, Integration by Parts,93			Right and Left derivation,		
5Derivativesfunctions, Implicit differentiation, Rules for differentiation, Derivatives of Elementary functions, Higher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's Method636IntegralsProperties of Definite Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			Differentiability in an interval,		
5DerivativesImplicit differentiation, Rules for differentiation, Derivatives of Elementary functions, Higher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's Method636IntegralsProperties of Definite Integrals, Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			The differentiation of composite		
5 Derivatives Rules for differentiation, Derivatives of Elementary functions, Higher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's Method 6 3   6 Integrals Properties of Definite Integrals, Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts, 9 3			functions,		
6 Integrals Rules for differentiation, Derivatives of Elementary functions, Higher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's Method 1   7 Properties of Definite Integrals, Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts, 9 3	F	Derivetives	Implicit differentiation,	C	2
6Integralsfunctions, Higher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's MethodImage: Comparison of the	3	Derivatives	Rules for differentiation,	0	3
6IntegralsHigher order Derivatives, Applications: Relative Extrema and points of inflection, Velocity, Newton's MethodImage: Constraint of the second			Derivatives of Elementary		
6Applications: Relative Extrema and points of inflection, Velocity, Newton's MethodImage: Constraint of the sector			functions,		
6IntegralsProperties of Definite Integrals, Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			Higher order Derivatives,		
Newton's MethodImage: Constraint of the synthesis			Applications: Relative Extrema		
6Properties of Definite Integrals, Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			and points of inflection, Velocity,		
6Mean Value Theorem for Integrals, Primitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			Newton's Method		
6Integrals, Primitive, antiderivative or indefinite integrals,936IntegralsThe fundamental theorem of the Calculus,931Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			Properties of Definite Integrals,		
6IntegralsPrimitive, antiderivative or indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			Mean Value Theorem for		3
6 Integrals indefinite integrals, The fundamental theorem of the Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,			Integrals,		
6IntegralsThe fundamental theorem of the Calculus,936Integrals of elementary functions, Change of variable of integration, Integration by Parts,93			Primitive, antiderivative or		
6 Integrals Calculus, 9 3   6 Integrals of elementary functions, Integrals of elementary functions, 1   6 Integrals of elementary functions, Change of variable of 1   6 Integration, 1 1   6 Integration by Parts, 1 1			indefinite integrals,		
Calculus, Integrals of elementary functions, Change of variable of integration, Integration by Parts,	C C		The fundamental theorem of the	0	
Change of variable of integration, Integration by Parts,	0	integrais	Calculus,	9	
integration, Integration by Parts,			Integrals of elementary functions,		
Integration by Parts,			Change of variable of		
			integration,		
Rational functions integration			Integration by Parts,		
			Rational functions integration,		

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	Numerical methods for	
	evaluating definite integrals,	
	First and Second order linear	
	differential equations.	

### 6- Assessment Criteria

Code	Intended Learning Outcomes	Home Work	Interaction during Synchronized	Exam
Code	Intended Learning Outcomes	WORK	Sessions	
ILO1	Understanding Real numbers field	V	$\checkmark$	V
ILO2	Knowing Functions, Limits and Continuity concepts and properties	J	J	J
ILO3	Understanding real sequences and knowing evaluation of sequences convergence or divergence and limits	J	J	J
ILO4	Understanding infinite series, and knowing evaluation of series limits, convergence or divergence		J	J
ILO5	Understanding Derivatives, knowing how to make differentiation of simple, combined and implicit functions.		J	J



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	Knowing definite Integrals and indefinite	V	V
ILO6	integrals, knowing how to evaluate		
	integrals using analytical and numerical		
	methods		
	Understanding and knowing how to	$\checkmark$	$\checkmark$
ILO7	resolve First- and second- order Linear		
	Differential Equations with constant		
	coefficients		

### References

[1] Bagby, Richard J. Introductory Analysis: A Deeper View of Calculus. Academic Press, 2000.

[2] Ross, Kenneth A. Elementary analysis. New York: Springer–Verlag, 1980.

[3] Omran Kuba, Analysis 1, Damascus University Press, Third Edition 2003 (in Arabic).

[4] Wrede, Robert C., and Murray R. Spiegel. Advanced calculus. McGraw-Hill, 2010