Course Definition File

Mathematical Analysis I

Information

Technology

Engineering

Syrian Arab Republic		الجمهورية العربية السورية
Ministry of Higher Education		وزارة التعليم العالـــي
Syrian Virtual University		الجامعة الافتراضية السورية

1. Basic Information:

Course Name	Mathematical Analysis I
Course ID	BMA401
No. of Recorded Sessions*	10-16
No. of Synchronized Sessions*	12
No. of Quizzes (hrs.)	6
Exam (hrs.)	2
Registered Sessions Work Load (hrs.)	36
Synchronized Sessions Work Load (hrs.)	36
Credit Hours	5

* The duration of each session 1.5 hr

2. Pre-Requisites:

Course	ID
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3. Course Objectives:

"Mathematical Analysis I" aims to provide the student with the basic concepts of real analysis, to meet the students' expected needs in their study in the ITE program. In particular the student will be able to:

Understand the real numbers field and its properties, the complex numbers, their properties and applications, the exponential function with a complex variable, solving some algebraic equations, the sequences and limits, their types and properties, the series, the convergent and semi-convergent series, functions definition, injective, surjective and bijective functions, functions algebra, functions limits properties, functions continuity concepts, intermediate

value theorem, bounded and monotone functions, derivatives, higher order derivatives, theorem of bounded variations, functions variations, exponential functions, logarithmic functions, hyperbolic functions, trigonometric functions, antiderivative, limited integrals, and their calculations rules.

Practice on real analysis concepts applications.

4. Learning Outcomes (LO):

By the end of this course the learner is expected to:

- Understand, analyze and master the use of real numbers, real numbers and the upper bound property, real field properties, extended real numbers set, neighborhoods and intervals.

- Understand, analyze and master the use of complex numbers, complex number conjugate, magnitude of a complex number, argument of non-zero complex number, trigonometric form of a complex number, the complex exponential function, complex numbers' applications, solving some algebraic equations in the complex numbers set $\mathbb{C}$

- Understand, analyze and master the use of sequences, sequence convergence and sequence limit definition, sequence limit calculations and properties, convergent sequences properties, infinite limit of a sequence, monotone sequences, partial sequences, Cauchy sequences.

- Understand, analyze and master the use of series and convergence, positive terms sequences, absolutely convergent series, conditional convergent series.

- Understand, analyze and master the use of injective surjective and bijective functions, functions algebra, limit of a function, limits properties.

- Understand, analyze and master the use of continuity, mean value theorem, continuity and closed bounded intervals, continuity with monotonic functions.

- Understand, analyze and master the use of derivatives, higher order derivatives, Rolle's Theorem, bounded variations theorem and functions variations.

- Understand, analyze and master the use of exponential function, logarithmic function, hyperbolic functions, inverse hyperbolic functions, trigonometric functions and inverse trigonometric functions.

- Understand, analyze and master the use of antiderivatives, limited integrals and their calculations methods.

5. Assessment Results:

Chapter No.	Chapter Title	Intended Objectives	Assessment Type				
			Developed content/ Recorded Sessions	Practical Activities (Synchronized Sessions)	Quizzes and Exams	Presentations And Interviews	Reports
CH1	Real Numbers	Comprehension –Analytical Thinking	X	X	X		
CH2	Complex Numbers Field	Comprehension –Analytical Thinking –Tools And Application Hands– On	X	X	X		X

CH3	Sequences	Comprehension –Analytical Thinking –Tools And Application Hands– On	X	X	X		X
CH4	Series	Comprehension –Analytical Thinking –Tools And Application Hands– On	X	X	X		X
CH5	Functions Limits	Comprehension –Analytical Thinking –Tools And Application Hands– On	X	X	X		X
CH6	Functions Continuity	Comprehension –Analytical Thinking –Tools And Application Hands– On	X	X	X		X
CH7	Functions Derivatives	Comprehension –Analytical Thinking	X	X			X
CH8	Common Functions	Comprehension –Analytical Thinking	X	X			X

CH9	Functions Antiderivatives and Integrals	Comprehension –Analytical Thinking	X	X			X

6. Course Syllabus

Chapter No.	Chapter Title	Chapter Content (Syllabus)	No. of Theoretical Learning Units	No. of Practical Learning Units)
CH1	Real Numbers	1. Why do we need Real Numbers 2. Real numbers and upper bound property 3. Real numbers Field properties 4. Extended Real numbers Set 5. Neighborhoods 6. Exercises	2	2
CH2	Complex Numbers Field	1. Definition of complex numbers 2. Conjugate of a complex number 3. Magnitude of a complex number 4. Argument of a non-zero complex number, Trigonometric form of a complex number 5. Complex Exponential Function 6. Application of complex numbers in trigonometric functions 7. Solving some algebraic equations in $\mathbb{C}$. 8. Exercises 9.	2	2

CH3	Sequences	1. Definition of a Sequence 2. How to define a sequence 3. Sequence's Limit and Convergence 4. Limits calculation and convergent sequences properties 5. Infinite sequence 6. Monotonic sequences 7. Partial sequences 8. Cauchy sequences 9. Exercises	2	2
CH4	Series	1. Series and convergence 2. Positive terms series 3. Absolutely convergent series and Conditional convergent series 4. Exercises	2	2
CH5	Functions Limits	1. Injective, Surjective and bijective function 2. Functions Algebra 3. Function limit 4. Limits properties 5. Exercises	1	1
CH6	Functions Continuity	1. Continuity 2. Intermediate value theorem 3. Continuity and bounded closed intervals 4. Continuity and monotonic functions	1	1

		5. Exercises		
CH7	Functions Derivatives	6. Derivative number 7. Derivative function 8. Higher order derivatives 9. Roll's Theorem and bounded variations theorem 10. Functions variations 11. Exercises	2	2
CH8	Common Functions	1. Exponential and Logarithmic function 2. Hyperbolic functions 3. Inverse Hyperbolic functions 4. Trigonometric functions 5. Inverse trigonometric functions 6. Exercises	2	2
CH9	Functions Antiderivatives and Integrals	1. Antiderivative 2. Limited integrals 3. Integrals calculations 4. Exercises	2	2

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7. Practical Activity:

- Tools and Labs:

Tool Name	Description
Word, Excel, PowerPoint,	Software
Microsoft Mathematics	Software
Math Type	Software
Google	Search Engine

- Practical Activities per Chapters:

Chapter	Practical Activity	Remarks
CH1	☒ Exercises ☒ Homework ☐	
CH2	☒ Exercises ☒ Homework ☐	
CH3	☒ Exercises ☒ Homework ☐	
CH4	☒ Exercises ☒ Homework ☐	

CH5	☒ Exercises ☒ Homework ☐	
CH6	☒ Exercises ☒ Homework ☐	
CH7	☐ Exercises ☐ Homework ☐	
CH8	☐ Exercises ☐ Homework ☐	
CH9	☐ Exercises ☐ Homework ☐	

8. References:

1. Course de Mathématiques Spéciales, III, IV.", E. RAMIS & C. DESCHAMPS & J. ODOUX, Masson, 1979.

2. "Course de Mathématiques du Premier Cycle", J. DIXMIER, Gautier-villars, 1977.

3. "Course de Mathématiques", J.M. ARNAUDIES, H. FRAYSSE, Dunod Université, 1986.

4. "A First Course in Real Analysis", S.K. BERBERIAN, Spinger-Verlag, 1994.

5. "Problems in Calculus of One Variable", I.A. MARON, Mir Publishers, Moscow 1973.

6. "263 Exercices Corrigées de Mathématiques en Spéciales", O. KOUBA. Editions Marketing, Paris 1995.

7. "A Deeper View of Calculus", Bagby, Richard J. Introductory Analysis. Academic Press, 2000.

8. "Elementary analysis", Ross, Kenneth A. New York: Springer-Verlag, 1980.

9. "Analysis 1", Omran Kuba, Damascus University Press, Third Edition 2003 (in Arabic).

10. "Advanced calculus", Wrede, Robert C., and Murray R. Spiegel. McGraw-Hill, 2010