Peruvian Computing Society (SPC)
School of Computer Science
Sillabus 2021-I

1. COURSE

MA100. Mathematics I (Mandatory)

2. GENERAL INFORMATION

2.1 Credits	:	5
2.2 Theory Hours	:	2 (Weekly)
2.3 Practice Hours	:	-
2.4 Duration of the period	:	16 weeks
2.5 Type of course	:	Mandatory
2.6 Modality	:	Face to face
2.7 Prerrequisites	:	None

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

The course aims to develop in students the skills to deal with models in science and engineering related to single variable differential calculus skills. In the course it is studied and applied concepts related to calculation limits, derivatives and integrals of real and vector functions of single real variables to be used as base and support for the study of new contents and subjects. Also seeks to achieve reasoning capabilities and applicability to interact with real-world problems by providing a mathematical basis for further professional development activities.

5. GOALS

- Apply knowledge of mathematics.
- Apply engineering knowledge.

6. COMPETENCES

a) An ability to apply knowledge of mathematics, science. (**Assessment**)

j) Apply the mathematical basis, principles of algorithms and the theory of Computer Science in the modeling and design of computational systems in such a way as to demonstrate understanding of the equilibrium points involved in the chosen option. (**Assessment**)

7. SPECIFIC COMPETENCES

a17) Define functions by recognizing dependent and independent variables by recognizing functions as parameters

a18) Build and model functions from a given context.

a19) Recognize the behavior of functions through rates of variation.

a20) Analyze the extreme values of a function.

a21) Recognize the use of integrals defined as differential accumulation.

j4) Solve contextualized problems in the area of computing by applying differential and integral calculus techniques.

j5) Propose basic models based on a science context using differential equations.

8. TOPICS

Unit 1: Vectors and complex numbers (20)	
Competences Expected: C1	
Topics	**Learning Outcomes**
• Operations with complex numbers • Theorem Moivre	• Define and operate with complex numbers, calculating their polar and exponential shape. • Use Moivre theorem to simplify complex calculations. • Operate with vectors by characterizing them by their direction and magnitude. Represent a function from the relation of sets, given verbally, graphically and algebraically, in a Venn diagram and/or in the Cartesian plane providing, if possible, its correspondence rule and its main characteristics.
Readings : [Ste12], [Lar18]	

Unit 2: Functions of a variable (10)	
Competences Expected: C20	
Topics	**Learning Outcomes**
• Definition, characteristics and graphic representation. • Function algebra. • Linear, polynomial, sinusoidal, exponential and logarithmic functions. • Modeling of situations close to reality using functions.	• Model real situations of the near environment using constant, linear, quadratic and polynomial functions, and others resulting from operations (f+-*/g, fog , af(bx -c)+d) between elementary functions, with emphasis on calculation, graphing and interpretation of slope and concavity in an applied context • Model real-life situations in the immediate environment using sine wave functions. • Use the exponential, logarithmic and logistic functions to model real situations of the near environment that adjust to their behavior, recognizing their characteristics (growth, decrease, asymptotic behavior). • Recognizes and builds trigonometric functions. • Aplicar reglas para transformar funciones.
Readings : [Ste12], [Lar18]	

Unit 3: Derivatives of functions (20)	
Competences Expected: C1	
Topics	**Learning Outcomes**
• Definition of derivative as rate of change and as slope of the tangent to the curve at a point. • Referral rules. • Applications of derivadees in related speed problems. • Applications of derivatives in function optimization problems.	• Solve problems using the derivative of a function as a ratio of change between its two variables or as the slope of the tangent line at a point, applying the derivation rules to simple functions. • Approximate functions using the differentials. $df = f'(x)dx$, applying the derivation rules to calculate derivatives of compound and implicit functions with Leibniz notation. • To solve real context problems of the near environment that involve the calculation of related speeds by deriving simple, compound functions and implicitly taking into account the use of differentials. • Solve optimization problems by analyzing the behavior of a function through its first and second derivatives (growth, decrease, concavity, extremes)
Readings : [Ste12], [Lar18]	

Unit 4: Integral (22)	
Competences Expected: C20	
Topics	**Learning Outcomes**
• Indefinite integral and integration methods (substitution, integration by parts, trigonometric substitutions and decomposition by partial fractions). • Riemann sum to estimate areas. • Calculation theorems (TFC1, TFC2, TCN). • Calculation of area between curves and average value. • Differential equations that are solved by separable variables.	• Solve undefined integrals by various methods (substitution, integration by parts, trigonometric substitution, decomposition into partial fractions). • Estimate the area under a curve by dividing it into Riemann rectangles and sums, with interpretations in physics and other everyday contexts. • Apply the calculation theorems (TFC1, TFC2, TCN) to solve undefined integrals using different integration methods. • Solve area and average value problems of a function, with the corresponding physical interpretations of the integral in kinematics. • Model real situations using differential equations and solve them using variable separation method (Newton's Cooling Law, Population Dynamics (Logistics, learning curve), etc.). • It defines a complex number and represents it in various ways. It uses Moivre's formula to calculate operations with complexes.
Readings : [Ste12], [Lar18]	

9. WORKPLAN

9.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

9.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

9.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

10. EVALUATION SYSTEM

********* EVALUATION MISSING ********

11. BASIC BIBLIOGRAPHY

[Lar18] Ron Larson. *Cálculo*. Ed. by Cengage Learning. 10th. 2018.

[Ste12] James Stewart. *Cálculo de una variable Trascendentes tempranas*. Ed. by Cengage Learning. 7th. 2012. ISBN: 978-607-481-881-9.