San Pablo Catholic University (UCSP)
Undergraduate Program in Computer Science
SILABO

MA101. Mathematics II (Mandatory)

2021-I

1. General information

1.1 School	:	Ciencia de la Computación
1.2 Course	:	MA101. Mathematics II
1.3 Semester	:	2^{do} Semestre.
1.4 Prerrequisites	:	MA100. Mathematics I. (1^{st} Sem)
1.5 Type of course	:	Mandatory
1.6 Learning modality	:	Virtual
1.7 Horas	:	2 HT; 4 HP;
1.8 Credits	:	4

2. Professors

3. Course foundation

The course develops in students the skills to deal with models of science and engineering skills. In the first part of the course a study of the functions of several variables, partial derivatives, multiple integrals and an introduction to vector fields is performed. Then the student will use the basic concepts of calculus to model and solve ordinary differential equations using techniques such as Laplace transforms and Fourier series.

4. Summary

1. Multi-Variable Function Differential 2. Multi-Variable function Integral 3. Series 4. Ordinary Differential Equations

5. Generales Goals

- Apply derivation rules and partial differentation in functions of several variables.
- Apply techniques for calculating multiple integrals.
- Understand and use the concepts of vector calculus.
- Understand the importance of series.
- Identify and solve differential equations of the first order and their applications in chemical and physical problems.

6. Contribution to Outcomes

This discipline contributes to the achievement of the following outcomes:

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. Content

<table>
<tr><td colspan="2">UNIT 1: Multi-Variable Function Differential (24)</td></tr>
<tr><td colspan="2">Competences:</td></tr>
<tr><td>Content</td><td>Generales Goals</td></tr>
<tr><td>

Concept of multi-variable functions.
Directional Derivates
Tangent line, normal plane to curve line and tangent plane, normal line to a curve plan. Know to calculate their equations.
Concept of extreme value and conditional extreme value of multi-variable functions
Applications problems such as modeling total production of an economic system, speed of sound through the ocean, thickener optimization, etc.

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Understand the concept of multi-variable functions.
Master the concept and calculation method of the direction derivative and gradient of the guide.
Master the calculation method of the first order and second order partial derivative of composite functions.
Master the calculation method of the partial derivatives for implicit functions.
Understand tangent line, normal plane to curve line and tangent plane, normal line to a curve plan. Know to calculate their equations.
Learn the concept of extreme value and conditional extreme value of multi-variable functions; know to find out the binary function extreme value.
Be able to solve simple applications problems.

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<tr><td colspan="2">Readings: Stewart (2012), Zill (2013)</td></tr>
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<table>
<tr><td colspan="2">UNIT 2: Multi-Variable function Integral (12)</td></tr>
<tr><td colspan="2">Competences:</td></tr>
<tr><td>Content</td><td>Generales Goals</td></tr>
<tr><td>

Double integral, triple integral and nature of the multiple integral.
Method of double integral
Line Integral
The Divergence, Rotation and Laplacian

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Understand the double integral, triple integral, and understand the nature of the multiple integral.
Master the calculation method of double integral (Cartesian coordinates, polar coordinates) the triple integral (Cartesian coordinates, cylindrical coordinates, spherical coordinates).
Understand the concept of line Integral, their properties and relationships.
Know to calculate the line integral.
Master the calculation the rotational, divergence and Laplacian.

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<tr><td colspan="2">Readings: Stewart (2012), Zill (2013)</td></tr>
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UNIT 3: Series (24)	
Competences:	
Content	**Generales Goals**
• Convergent series • Taylor and McLaurin series • Orthogonal functions	• Master to calculation if series is convergent, and if convergent, find the sum of the series trying to find the radius of convergence and the interval of convergence of a power series. • Represent a function as a power series and find the Taylor and McLaurin Series to estimate function values to a desired accuracy. • Understand the concepts of orthogonal functions and the expansion of a given function f to find its Fourier series.
Readings: Stewart (2012), Zill (2013)	

UNIT 4: Ordinary Differential Equations (30)	
Competences:	
Content	**Generales Goals**
• Concept of differential equations • Methods to resolve differential equations • Methods to resolve the secod order linear differential equations • Higher order linear ordinary differential equations • Applications problems using Laplace transforms	• Understand differential equations, solutions, order, general solution, initial conditions and special solutions etc. • Master the calculation method for variables separable equation and first order linear equations. Known to solve homogeneous equation and Bernoulli (Bernoulli) equations; understand variable substitution to solve the equation. • Master to solve total differential equations. • Be able to use reduced order method to solve equations. • Understand the structure of the second order linear differential equation. • Master calculation method for the constant coefficient homogeneous linear differential equations; and understand calculation method for the higher order homogeneous linear differential equations. • Know to apply the differential equation calculation method to solve simple geometric and physic application problems. • Solve properly certain types of differential equations using Laplace transforms.
Readings: Stewart (2012), Zill (2013)	

8. Methodology
El profesor del curso presentará clases teóricas de los temas señalados en el programa propiciando la intervención de los alumnos. El profesor del curso presentará demostraciones para fundamentar clases teóricas. El profesor y los alumnos realizarán prácticas Los alumnos deberán asistir a clase habiendo leído lo que el profesor va a presentar. De esta manera se facilitará la comprensión y los estudiantes estarán en mejores condiciones de hacer consultas en clase.

9. Assessment
Continuous Assessment 1 : 20 % **Partial Exam** : 30 % **Continuous Assessment 2** : 20 % **Final exam** : 30 %

References

Stewart, James (2012). *Calculus*. 7th. CENGAGE Learning.
Zill, Dennis G. (2013). *Differential equations with Boundary value problems*. 8th. CENGAGE Learning.