Universidad Nacional de Ingeniería (UNI)
Escuela Profesional de
Ciencia de la Computación
Sílabo 2024-II

1. CURSO

MA106FCCS. Numerical Methods (Mandatory)

2. INFORMACIÓN GENERAL

2.1 Curso	:	MA106FCCS. Numerical Methods
2.2 Semestre	:	4^{th} Semester.
2.3 Créditos	:	3
2.4 horas	:	2 HT; 2 HP;
2.5 Duración del periodo	:	16 semanas
2.6 Condición	:	Mandatory
2.7 Modalidad de aprendizaje	:	Face to face
2.8 Prerrequisitos	:	MA103FCCS. Differential Calculus. (2^{nd} Sem)

3. PROFESORES

Atención previa coordinación con el profesor

4. INTRODUCCIÓN AL CURSO

Numerical methods are essential in computer science for approximating solutions to mathematical problems that cannot be solved analytically. This course provides an introduction to the most common numerical methods, including equation solving, interpolation, numerical integration, and the solution of differential equations.

5. OBJETIVOS

- Understand the importance of numerical methods in solving computational problems.
- Apply different numerical methods to approximate solutions to mathematical problems.
- Analyze the accuracy and efficiency of the numerical methods used.

6. RESULTADOS DEL ESTUDIANTE

1) Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions. (Assessment)

6) Apply computer science theory and software development fundamentals to produce computing-based solutions. (Assessment)

AG-C07) Computing Knowledge: Applies appropriate knowledge of mathematics, science, and computing. (Assessment)

AG-C12) Applies computer science theory and software development fundamentals to produce computer-based solutions. (Assessment)

7. TEMAS

Unidad 1: Introduction to Numerical Methods (4 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Computer representation of numbers. • Round-off and truncation errors. • Error propagation. • Analysis of stability and convergence.	• Explain how numbers are represented in a computer and the limitations of this representation. [Familiarizarse] • Differentiate between round-off and truncation errors. [Usar] • Analyze how errors propagate in numerical calculations. [Evaluar]
Lecturas : [CC15], [BF10]	

Unidad 2: Solving Nonlinear Equations (8 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Bisection method. • Newton-Raphson method. • Secant method.	• Apply the bisection method to find roots of equations. [Familiarizarse] • Use the Newton-Raphson method to approximate solutions. [Usar] • Implement the secant method to solve nonlinear equations. [Evaluar]
Lecturas : [CC15], [BF10]	

Unidad 3: Interpolation and Polynomial Approximation (8 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Lagrange polynomial interpolation. • Newton interpolation. • Splines.	• Construct Lagrange interpolating polynomials. [Familiarizarse] • Apply Newton interpolation. [Usar] • Use splines to approximate functions. [Evaluar]
Lecturas : [CC15], [BF10]	

Unidad 4: Numerical Integration (8 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Trapezoidal rule. • Simpson's rule. • Gaussian quadrature.	• Apply the trapezoidal rule to approximate integrals. [Familiarizarse] • Use Simpson's rule to calculate integrals numerically. [Usar] • Apply Gaussian quadrature for numerical integration. [Evaluar]
Lecturas : [CC15], [BF10]	

Unidad 5: Numerical Solution of Ordinary Differential Equations (8 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Euler's method. • Runge-Kutta methods.	• Apply Euler's method to approximate solutions of ODEs. [Familiarizarse] • Implement Runge-Kutta methods to solve ODEs numerically. [Usar]
Lecturas : [CC15], [BF10]	

Unidad 6: Applications in Computing (12 horas)	
Resultados esperados: 1,6,AG-C07,AG-C12	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Simulation of physical systems. • Scientific modeling. • Machine learning (e.g., model optimization).	• Use numerical methods to simulate physical systems. [Familiarizarse] • Apply numerical methods in scientific modeling. [Usar] • Implement numerical methods in machine learning algorithms. [Evaluar]
Lecturas : [CC15]	

8. PLAN DE TRABAJO

8.1 Metodología

Se fomenta la participación individual y en equipo para exponer sus ideas, motivándolos con puntos adicionales en las diferentes etapas de la evaluación del curso.

8.2 Sesiones Teóricas

Las sesiones de teoría se llevan a cabo en clases magistrales donde se realizarán actividades que propicien un aprendizaje activo, con dinámicas que permitan a los estudiantes interiorizar los conceptos.

8.3 Sesiones Prácticas

Las sesiones prácticas se llevan en clase donde se desarrollan una serie de ejercicios y/o conceptos prácticos mediante planteamiento de problemas, la resolución de problemas, ejercicios puntuales y/o en contextos aplicativos.

9. SISTEMA DE EVALUACIÓN

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

10. BIBLIOGRAFÍA BÁSICA

[BF10] Richard L. Burden and J. Douglas Faires. *Numerical Analysis*. Cengage Learning, 2010.

[CC15] Steven C. Chapra and Raymond P. Canale. *Numerical Methods for Engineers*. McGraw-Hill Education, 2015.