Universidad Nacional San Cristobal de Huamanga (UNSCH)
Programa Profesional de
Ciencia de la Computación
Sílabo 2024-II

1. CURSO

MA102. Calculus I (Mandatory)

2. INFORMACIÓN GENERAL

2.1 Curso	:	MA102. Calculus I
2.2 Semestre	:	3^{rd} Semester.
2.3 Créditos	:	4
2.4 horas	:	2 HT; 4 HP;
2.5 Duración del periodo	:	16 semanas
2.6 Condición	:	Mandatory
2.7 Modalidad de aprendizaje	:	Face to face
2.8 Prerrequisitos	:	MA100. Mathematics I. (1^{st} Sem) MA100. Mathematics I. (1^{st} Sem)

3. PROFESORES

Atención previa coordinación con el profesor

4. INTRODUCCIÓN AL CURSO

This course introduces the first concepts of linear algebra as well as numerical methods with an emphasis on problem solving with the Scilab open source libe package. Mathematical theory is limited to fundamentals, while effective application for problem solving is privileged. In each subject, a few methods of relevance for engineering are taught. Knowledge of these methods prepares students for the search for more advanced alternatives, if required.

5. OBJETIVOS

- Ability to apply knowledge about Mathematics.
- Ability to apply engineering knowledge.
- Ability to apply the modern knowledge, techniques, skills and tools of modern engineering to the practice of engineering

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)

7. TEMAS

Unidad 1: Introduction (18)	
Resultados esperados:	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Importance of linear algebra and numerical methods. Examples.	• Be able to understand the basic concepts and importance of Linear Algebra and Numerical Methods.
Lecturas : [AR14], [CC15]	

Unidad 2: Linear Algebra (14)	
Resultados esperados:	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Elementary matrix algebra and determinants • Null space and exact solutions of systems of linear equations Ax=b: – Tridiagonal and triangular systems and Gaussian elimination with and without pivoting. – LU factorization and Crout algorithm. • Basics on eigenvalues and eigenvectors: – Characteristic polynomials. – Algebraic and geometric multiplicities. • Least squares estimation. • Linear transformations.	• Understanding the basics concepts of Linear Algebra. • Solve properly linear transformations problems.
Lecturas : [AR14], [CC15]	

Unidad 3: Numerical methods (22)	
Resultados esperados:	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Basics on solutions of systems of linear equations Ax=b: Jacobi and Gauss Seidel methods. • Application of matrix factorizations to the solution of linear systems (singular value decomposition, QR, Cholesky) Numerical computation of null space, rank and condition number. • Root finding: – Bisection. – Fixed-point iteration. – Newton-Raphson methods. • Basics on interpolation: – Newton and Lagrange polynomial interpolations – Spline interpolation • Basics on numerical differentiation and Taylor approximation • Basics on numerical integration: – Trapezium, midpoint and Simpson rule – Gaussian quadrature • Basics on numerical solutions to ODEs: – Finite differences; Euler and Runge-Kutta methods – Converting higher order ODEs into a system of low order ODEs – Runge-Kutta methods for systems of equations – Single shooting method • Short introduction to optimization techniques: overview on linear programming, bounded linear systems, quadratic programming, gradient descent.	• Understanding the basics concepts of Numerical Methods. • Applying the most frequent methods for the resolution of mathematical problems. • Implementing and applying numerical algorithms for the solution of mathematical problems using the Scilab open-source computational package. • Applying Scilab for the solution of mathematical problems and for plotting graphs.
Lecturas : [AR14], [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

[AR14] H. Anton and C. Rorres. *Elementary Linear Algebra, Applications Version*. 11th. Wiley, 2014.

[CC15] S.C. Chapra and R.P. Canale. *Numerical Methods for Engineers,* 7th. Vol. 1. McGraw-Hill, 12015.