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

1. CURSO

MA104FCCS. Advanced Differential and Integral Calculus (Mandatory)

2. INFORMACIÓN GENERAL

2.1 Curso	:	MA104FCCS. Advanced Differential and Integral Calculus
2.2 Semestre	:	3^{rd} 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

This course extends the concepts of differential and integral calculus to functions of several variables. Topics covered include partial derivatives, multiple integrals, and their applications in computing.

5. OBJETIVOS

- Understand and apply the concept of partial derivatives.
- Calculate multiple integrals and apply them to problem-solving.
- Apply multivariable calculus concepts in computational contexts.

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: Functions of Several Variables (6 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Functions of two or more variables. • Graphs and level curves. • Limits and continuity.	• Represent functions of several variables graphically. [Familiarizarse] • Evaluate limits and determine the continuity of multivariable functions. [Usar] • Interpret level curves. [Evaluar]
Lecturas : [Ste15], [LE14]	

Unidad 2: Partial Derivatives (8 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Partial derivatives. • Geometric interpretation. • Higher-order derivatives. • Chain rule.	• Calculate partial derivatives of multivariable functions. [Familiarizarse] • Interpret partial derivatives geometrically. [Usar] • Apply the chain rule for partial derivatives. [Evaluar]
Lecturas : [Ste15], [LE14]	

Unidad 3: Applications of Partial Derivatives (8 horas)	
Resultados esperados: 1,6,AG-C07,AG-C12	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Tangent plane and linear approximation. • Extreme values. • Lagrange multipliers.	• Find the tangent plane to a surface. [Familiarizarse] • Determine the extreme values of a multivariable function. [Usar] • Apply Lagrange multipliers for constrained optimization. [Evaluar]
Lecturas : [Ste15], [LE14]	

Unidad 4: Multiple Integrals (8 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Double integrals over rectangles. • Double integrals over general regions. • Triple integrals. • Change of variables in multiple integrals.	• Calculate double integrals over rectangular regions. [Familiarizarse] • Calculate double integrals over general regions. [Usar] • Evaluate triple integrals. [Evaluar] • Apply changes of variables in multiple integrals. [Evaluar]
Lecturas : [Ste15], [LE14]	

Unidad 5: Applications in Computing (8 horas)	
Resultados esperados: 1,6,AG-C07,AG-C12	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• 3D graphics and geometric modeling. • Computer vision (e.g., image processing). • Machine learning (e.g., cost function optimization).	• Apply multivariable calculus to the representation of 3D objects. [Familiarizarse] • Use multiple integrals in image processing. [Usar] • Apply partial derivatives in machine learning algorithms. [Evaluar]
Lecturas : [Ste15]	

Unidad 6: Vector Calculus (8 horas)	
Resultados esperados: 1,6,AG-C07,AG-C12	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Vector fields. • Line integrals. • Surface integrals. • Green's Theorem, Stokes' Theorem, and the Divergence Theorem.	• Visualize and interpret vector fields. [Familiarizarse] • Evaluate line integrals. [Usar] • Calculate surface integrals. [Evaluar] • Apply Green's Theorem, Stokes' Theorem, and the Divergence Theorem. [Evaluar]
Lecturas : [Ste15]	

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

[LE14] Ron Larson and Bruce H. Edwards. *Calculus*. Cengage Learning, 2014.

[Ste15] James Stewart. *Calculus: Early Transcendentals*. Cengage Learning, 2015.