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

1. CURSO

FI201FCCS. Computational Physics (Mandatory)

2. INFORMACIÓN GENERAL

2.1 Curso	:	FI201FCCS. Computational Physics
2.2 Semestre	:	2^{nd} 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	:	FI101FCCS. Physics I. (1^{st} Sem)

3. PROFESORES

Atención previa coordinación con el profesor

4. INTRODUCCIÓN AL CURSO

This course applies the principles of physics to computational problems, with an emphasis on light, wave propagation, collisions, and energy transfer. These concepts are essential in areas such as computer graphics, physical simulations, and video game development.

5. OBJETIVOS

- Understand the physical principles relevant to computing.
- Apply these principles to solve specific computational problems.
- Implement physics-based algorithms for simulations and computer graphics.

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-C09) Solution Design and Development: Designs, implements, and evaluates solutions for complex computing problems. (Assessment)

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

7. TEMAS

Unidad 1: Optics and Light Propagation (10 horas)	
Resultados esperados: 1,6,AG-C07,AG-C12	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Nature of light. • Reflection and refraction. • Lenses and mirrors. • Interference and diffraction. • Illumination models (e.g., Phong, Blinn-Phong).	• Describe the properties of light and its propagation. [Familiarizarse] • Apply the laws of reflection and refraction. [Usar] • Implement illumination models in computer graphics. [Evaluar]
Lecturas : [YF18], [Hec17]	

Unidad 2: Collisions and Energy Transfer (8 horas)	
Resultados esperados: 1,6,AG-C07,AG-C12	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Impulse and linear momentum. • Elastic and inelastic collisions. • Conservation of energy in collisions. • Deformation of elastic meshes (e.g., mass-spring model).	• Apply the principles of conservation of linear momentum and energy in collisions. [Familiarizarse] • Model the deformation of elastic meshes due to impact. [Usar] • Implement collision simulations in a computational environment. [Evaluar]
Lecturas : [YF18], [Tay05]	

Unidad 3: Rigid Body Mechanics (8 horas)	
Resultados esperados: 1,6,AG-C07,AG-C12	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Rotation of rigid bodies. • Moment of inertia. • Torque and rotational kinetic energy.	• Describe the rotation of rigid bodies. [Familiarizarse] • Calculate the moment of inertia. [Usar] • Apply the equations of rotational dynamics. [Evaluar]
Lecturas : [YF18], [Tay05]	

Unidad 4: Fluid Dynamics (6 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Basic principles of fluid dynamics. • Viscosity. • Laminar and turbulent flow.	• Describe the properties of fluids. [Familiarizarse] • Explain the concepts of viscosity and laminar/turbulent flow. [Usar] • Solve simple fluid dynamics problems. [Evaluar]
Lecturas : [YF18]	

Unidad 5: Thermodynamics (6 horas)	
Resultados esperados: 1,6,AG-C07	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Laws of thermodynamics. • Heat transfer.	• State the laws of thermodynamics. [Familiarizarse] • Describe the mechanisms of heat transfer. [Usar]
Lecturas : [YF18]	

Unidad 6: Physical Simulation (10 horas)	
Resultados esperados: 1,6,AG-C07,AG-C12	
Temas	**Objetivos de Aprendizaje (*Learning Outcomes*)**
• Numerical methods for physical simulation. • Verlet integration. • Collision detection. • Particle systems. • Constraints and solvers.	• Implement basic numerical methods for physical simulation. [Familiarizarse] • Use Verlet integration to simulate motion. [Usar] • Implement collision detection algorithms. [Evaluar]
Lecturas : [Tay05]	

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

[Tay05] John R. Taylor. *Classical Mechanics*. University Science Books, 2005.

[Hec17] Eugene Hecht. *Optics*. Pearson, 2017.

[YF18] Hugh D. Young and Roger A. Freedman. *University Physics with Modern Physics*. Pearson, 2018.