Peruvian Computing Society (SPC)
School of Computer Science
Sillabus 2021-I

1. COURSE

CB111. Computational Physics (Mandatory)

2. GENERAL INFORMATION

2.1 Credits	:	4
2.2 Theory Hours	:	2 (Weekly)
2.3 Practice Hours	:	2 (Weekly)
2.4 Duration of the period	:	16 weeks
2.5 Type of course	:	Mandatory
2.6 Modality	:	Face to face
2.7 Prerrequisites	:	MA100. Mathematics I. (1^{st} Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

The course develops the knowledge and skills to recognize, evaluate and apply the effects of physical phenomena related to mechanics in the field of engineering. In industry in general, the control of processes, the operation of machines, their maintenance, etc., are always governed by some kind of physical manifestation. Because of this, it is important for the student to understand the foundations of physical phenomena, the laws that govern them, their manifestation and the way to detect them. This course will allow the student to understand and identify the physical phenomena related to mechanics in order to control their effects on some technical process.

5. GOALS

- Ability to apply science knowledge.
- Ability to design and conduct experiments.
- Ability to apply computer and mathematical knowledge.
- Ability to develop research principles at an international level.

6. COMPETENCES

a) An ability to apply knowledge of mathematics, science. (**Usage**)

b) An ability to design and conduct experiments, as well as to analyze and interpret data. (**Usage**)

i) An ability to use the techniques, skills, and modern computing tools necessary for computing practice. (**Usage**)

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. (**Usage**)

7. SPECIFIC COMPETENCES

a54) Use the relationship between speed, frequency and wavelength for a periodic wave.

a55) Interpret and use the mathematical expression for a sine-periodic wave

a56) Calculate the speed of waves in a string.

a57) Describe the rotation of a rigid body in terms of angular coordinate, angular velocity and angular acceleration.

b26) Describe the rotation of a rigid body in terms of angular coordinate, angular speed and angular acceleration.

b27) Analyze the rotation of a rigid body when the angular acceleration is constant.

b28) Relate the rotation of a rigid body to the linear velocity and acceleration of a point on the body.

b29) The meaning of the body's moment of inertia around an axis and how it relates to rotational kinetic energy.

i12) Know the importance of the net force on an object and what happens when the net force is zero.

i13) Know the relationship between the net force on an object, the object's mass and its acceleration.

i14) Know how the forces that two objects exert on each other are related.

j13) Write a sound wave in terms of particle displacements or pressure fluctuations

j14) Calculate the speed of sound waves in different materials.

j15) Obtain the intensity of a sound wave.

j17) Know how resonance occurs in musical instruments.

8. TOPICS

Unit 1: Work, Energy and Power (6)	
Competences Expected: a,b,i,j	
Topics	**Learning Outcomes**
• Definition of work and the relationship between net work and kinetic energy. • Power and Efficiency.	• Determine the variables that affect the opposition to translation and opposition to rotation (moment of inertia) and calculate the kinetic energy of translation and rotation. • Calculate the work of a force, apply the Net Work and Energy Theorem to a real life system, and determine the power and efficiency.
Readings : [Hug13], [Hew07]	

Unit 2: Kinematics (6)	
Competences Expected: a,b,i,j	
Topics	**Learning Outcomes**
• Spatial and temporal reference systems. • Average speed, average acceleration, linear and angular. • Position, velocity and acceleration vectors, linear and angular • Relationship between linear and angular kinematics.	• Understand the concepts of spatial and temporal reference system kinematics and trajectory and determine position, velocity, linear and angular acceleration, according to a physical or graphical context. • Decompose the linear acceleration, according to a coordinate system, in order to describe the position and in radial and tangential acceleration. • It determines position, speed and acceleration, using differential and integral calculus.
Readings : [Hug13], [Hew07]	

Unit 3: Newton's three laws (6)	
Competences Expected: a,b,i,j	
Topics	**Learning Outcomes**
• Newton's 3 laws and their application to particles. • Moment of a force. • Rotation of a rigid body.	• To propose the rotation and translation equations for a solid and apply Newton's laws. • Analyze the characteristics of the friction force. Calculate the net radial force and the net centripetal force. • Calculate the center of mass and analyze the relationship between the variables of net force, time and speed change.
Readings : [Hug13], [Hew07]	

9. WORKPLAN

9.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

9.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

9.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

10. EVALUATION SYSTEM

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

11. BASIC BIBLIOGRAPHY

[Hew07] Paul Hewitt. *Física conceptual*. 10th. Pearson Educación, 2007.

[Hug13] Roger A. Freedman Hugh D. Young. *Física universitaria*. 13th. Pearson, 2013.