

Course Unit	Elements of Physics and Chemistry		Field of study	Natural Sciences	
Bachelor in	Environmental Education		School	School of Education	
Academic Year	2021/2022	Year of study	1	Level	1-1
Type	Annual	Semester	-	ECTS credits	10.0
Code	9082-620-1002-00-21				
Workload (hours)	270	Contact hours	T	-	TP
			63	PL	36
			TC	-	S
			-	E	-
			OT	18	O
			-		-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Adorinda Maria Rodrigues Pereira S. Gonçalves

### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

- Express a critical and objective discussion of environmental problems in using a scientific language in describing the events and scientifically substantiating one's options;
- Demonstrate capacity to strictly observe the facts and phenomena, to analyze and formulate hypotheses to interpret / explain situations in the context of Physics and Chemistry;
- Explain concepts and apply basic principles on the behavior, structures and transformations of materials, especially on the fluids water and air and its influence on the environment;
- Explain the changing nature of scientific models recognizing the limited duration of their conceptions;
- Describe energy transformations and discuss the different energy alternatives considering their environmental impacts;
- Use the appropriate tools and procedures to carry out experiments;
- Develop a research work on a specific environmental problem, using literature procedures, data collection and analysis for the interpretation of situations;
- Prepare and implement environmental education activities for different audiences based on content covered.

### Prerequisites

Before the course unit the learner is expected to be able to:  
They are not required prerequisites.

### Course contents

1. Materials and Environment: Properties and materials structures. 2. Chemical Reactions and Environment. 3. Mass and energy transfers between systems. 4. The radioactivity and the atomic structure. 5. Organics Chemistry. 6. Fluids: Principles of hydrostatic and fluids dynamics.

### Course contents (extended version)

- Materials and Environment: Properties and materials structures
  - Behavior of materials and the Corpuscular Theory of Matter
  - Properties of materials, substances and mixtures
  - Physical transformations: dissolution and changes of state
  - The importance of water and air: properties
  - Atmospheric pressure
  - The air and water in the environment: quality problems
  - Evolution of atomic models and chemistry bonds
- Chemical Reactions and Environment
  - Chemical Reactions and symbology
  - Chemical Reactions and stoichiometric calculations
  - Chemical Reactions and equilibrium
  - Acid-base; Oxidation-reduction equilibrium
  - Transformations of materials and waste treatment
  - Mass transfer and quematical reactions: the vital functions of living things and the environment
- Mass and energy transfer between systems
  - Forms and sources of energy: the internal energy of a system; the atomic / nuclear energy
  - Temperature, thermal energy and heat
  - Energy Transfers
  - Electrical phenomena - Static electricity and Electricity
  - Electrical and magnetic phenomena in Environment
  - Chemical Reactions, chemical bonds and Energy
  - Mass transfer: Convection currents
  - Thermodynamics and Thermochemistry: Energy conservation and Entropy
- Radioactivity and the atomic structure
  - Radioactivity phenomena and Environment
  - Isotopes and types of radiation
  - Radioactive processes: decay, nuclear fission and nuclear fusion
  - Applications of radioactive isotopes
- Organic chemistry
  - Nomenclature of organic compounds
  - Organic compounds families and properties. Isomers
  - Aromatics-Halogenated compounds
  - Acid-base behavior of organic compounds
  - Redox reactions of organic compounds
  - Other Reactions of Organic Compounds
- Hydrostatic and fluids dynamics Basics Law.
  - Properties of Fluids
  - Pressure and pressure forces
  - Hydrostatics Fundamental Law and Pascal's Law.
  - Fluid flow: continuity.
  - Fundamental law of hydrodynamics - meanders, accumulation and erosion of riverbanks

### Recommended reading

- Atkins, P. & Paula, J. (2017). Físico-Química: Fundamentos (6.ª ed. ). Rio de Janeiro: Livros Técnicos e Científicos Editora
- Rocha, J. C. (2009). Introdução à Química Ambiental. Editora: Bookman
- Atkins, P. , Jones, L. & Laverman, L. (2018). Princípios da Química - Questionando a vida moderna e o meio ambiente (7.ª ed. ). São Paulo: Bookman Ed.
- Chang, R. (2009). Química Geral - Conceitos Essenciais (4.ª ed. ). Lisboa: McGrawHill
- Almeida, M. J. & Costa, M. M. (2012). Fundamentos de Física (3.ª ed. ). Coimbra: Edições Almedina

**Teaching and learning methods**

Research methodology on some of the issues, conclusions then discussed a large group. Diverse material resources will be used and made accessible to the training component of the practical and experimental work. This training practice will support the general presentation of topics in theoretical sessions. Development of a research about a concrete environmental issues.

**Assessment methods**

1. Continuous evaluation - (Regular, Student Worker) (Final)
  - Intermediate Written Test - 15%
  - Intermediate Written Test - 20%
  - Intermediate Written Test - 25%
  - Development Topics - 20%
  - Laboratory Work - 20%
2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
  - Final Written Exam - 60%
  - Development Topics - 20%
  - Laboratory Work - 20%

**Language of instruction**

Portuguese

**Electronic validation**

Adorinda Maria Rodrigues Pereira S. Gonçalves	Delmina Maria Pires	Paulo Miguel Mafra Gonçalves	Carlos Manuel Costa Teixeira
21-10-2021	24-10-2021	29-10-2021	05-12-2021