# . – Experimental Physics (with a Teaching Workshop on Physics)

## Prof. Stefania Pagliara

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The course aims to provide students with the basic theoretical knowledge required to teach the topics of physics included in primary school programs, to suggest teaching activities suitable for the type of school and aimed at emphasizing the methodological aspects related to the scientific description and interpretation of nature, and finally to explore some educational issues.

At the end of the course, students:

- should have a clear and complete view of what physics is and what type of brain activity is activated by physicists/scientists.

- will be able to critically manage real cases from daily life which involve basic principles from the course.

The expected learning results are the following:

- acquisition of some phenomena of basic physics

- ability to discuss and approach in a critical way real and everyday case involving the basic principles of the course.

- ability to organise teaching activities aimed at teaching the topics covered in the course.

- ability to create teaching activities aimed at promoting abstraction, reasoning, and problem-solving using the experimental method.

- ability to use collaborative learning, play and technological devices to discover and learn certain phenomena from physics.

***COURSE CONTENT***

Teaching physics

– Teaching science according to the National teacher guidelines

– Alternative methods of teaching science

– The issue of the conceptual change.

– Images of science and teaching.

– The role of laboratory activities in teaching physics.

– The language tools for physics.

Elements of physics with suggestion of educational activities

– Quantities and measurements; relations between quantities and graphical representations. Measuring instruments and their characteristics; errors in measurement.

– Mass, volume, density.

– Motion: reference system; displacement, time interval, velocity, acceleration.

– Forces and motion: principle of inertia; law of motion, force and velocity variation; mass and weight; force of friction.

* Forces and balance; weight, centre of gravity; force of friction, elastic force, rheonomic constraints, inclined plane and model levers of the point-like body and the rigid body. Dynamometer. Pair of scales.
* Work and forms of energy.
* Fluids: pressure, Pascal’s law and Stevin’s law (communicating vessels), Archimedes’ principle (floatation), atmospheric pressure (Torricelli’s experiment).
* Definition of temperature and thermometric scales. Heat and heat transfer. Thermal expansion. Ideal gases and their transformations. The states of matter and phase changes
* Light and colours. Propagation of light. Light reflection and refraction. Composition and decomposition of colours.

The course is supplemented by didactic-workshop activities entrusted to expert conductors, and characterised by specific themes and methodologies agreed upon with the course teacher. Each workshop edition will be aimed at the production of a project/artefact, the assessment of which will be entrusted to the above-indicated conductor/s on the basis of parameters shares with the course teacher, and based on criteria of: completeness, coherence, originality, didactic value

***READING LIST***

Coursepacks available on the lecturer’s website and on his Blackboard platform.

Any physics textbook suitable for scientific high school, which includes sections on mechanics, fluids, thermodynamics and light.

***TEACHING METHOD***

The course includes 60 hours of lectures and 25 hours of workshop activities. During the workshop students will be asked to work in groups of 3-4 people.

***ASSESSMENT METHOD AND CRITERIA***

The assessment consists of an oral exam. To be admitted to the oral exam, students have to present the written assignments (group work) on the activities carried out during the workshop along with an authentic assignment.

During the oral exam the lecturer will assess the following:

* students’ acquisition of the issues covered during the workshop activities
* students’ ability to plan educational activities on the topics examined in the course
* students’ correct use of the language and their communication skills

Students must complete the workshop in order to sit the examination.

***NOTES AND PREREQUISITES***

There are no prerequisites for attending the course.

Further information can be found on the lecturer's webpage at http://docenti.unicatt.it/web/searchByName.do?language=ENG, or on the Faculty notice board.