Physics practical works at the Barcelona School of Nautical Studies

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At the Barcelona School Nautical Studies (FNB), from the Polytechnic University of Catalonia (UPC), Physics is taught as a basic subject. This is common to the three degrees: Degree in Nautical Science and Maritime Transport, Degree in Marine Technologies, and Degree in Systems Engineering and Naval Technology. In the actual curricula, there are 9 ECTS of Physics in the first year, with the idea of introducing the basics of fundamental subjects of the Engineering, or that are in the requirements of the STCW agreement, and are the subject of further study during the careers. The Physics curricula contain elements of mechanics, basic fundamentals of fluid mechanics, notions of vibratory movements, concepts of waves, introduction to thermodynamics, and fundamentals of electromagnetism.

In order to get a better understanding of the phenomena studied, in the course of Physics some practical work is required, from which written reports are delivered by the students and corrected by the teachers. These practices are subdivided into two introductory practices, performed individually with homemade material; 4 practices that use simulators, carried out in a small group (2 people), in a computer classroom, from which reports are given by group; and 4 practices with small instruments, which are taken to the classroom or to the computer classroom where appropriate. The practical works have been designed as solid material and reduced cost, since they are done in the first course, and that allow a gradual progress and an improvement in the capacity of synthesis and elaboration of results by students. As a more transversal activity, in the use of suggested computer tools, there are office tools (Office or LibreOffice or equivalent: text editor, data graphing, regression and adjustment of curves, basic statistics; and calculations (data sheets, Matlab or equivalent).

The evaluation of the subject is carried out according to the provisions given in the teaching guide (Which is in agreement with the "*Verifica"* documents approved by the Spanish Ministry), by default following the indications of continuous assessment given at the UPC and the recommendations in [Isalgue 2010 and Cadenato 2012]. In this case, the practices have a weight of 25% of the total mark, corresponding 45% to the mark of an exam that is done once the classes are finished, and the remaining 30% to partial exams, tests and deliveries during the course.

-List of practices:
0: The measure of friction coefficients and statistics
0 ': The measure of gravity with the help of a pendulum
1: Relative motion (Rotating system of reference) and Coriolis acceleration
2a: Movement with friction: Stopping of a ship (with navigation simulator or video)
2b: Stopping of a ship: Numerical integration of the movement
3: Superposition of waves
4: Interference of waves
5: Doppler effect
6: Cooling of a body
7a: Magnetic field on the axis of a magnet as a function of distance, observation on the compass
7b: Magnetic field on the perpendicular to the axis of a magnet as a function of distance, observation on the compass
8: Lens focal lengths and optical images

The practical works produce that complex issues such as understanding the origin of the Coriolis effect, the dynamics of ship stopping, or the time needed to cool or heat an object are better understood by the students. Here we have selected some simple practical works that have some relation to what seafarers might encounter in their professional work.
It is also important the fact that asking systematically for the delivery of reports makes the written expression of the students improve, form its level at the admission in the FNB.

Finally, the contact with the students show that they appreciate more the practices that allow contact with real instruments, even though work with computers and simulators is also acknowledged.

References:

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