Title:

## Operationalisation of Essential Learning in Physics

Scope

This initiative aligns seamlessly with the activity plan of the proposing institution, as outlined in the statutes of the Polytechnic of Tomar (IPT), which define “IPT as a polytechnic institution within the European higher education framework. The institution is distinguished by its strengths in science, technology, arts, and humanities — areas that have complemented one another since its foundation — delivering higher education that cultivates relevant knowledge, skills, and competencies, while preparing students for the workforce and active participation in a democratic society”. IPT also undertakes, as part of its mission: (...) to expand access to knowledge for the benefit of individuals and society, through research, education, and cooperation, within a project aimed at the holistic development of the individual; active participation in building a European space for research and education, and in a regional development model based on the creation, innovation, and enhancement of scientific and technological knowledge (...)”.

In line with this, the present proposal for the Microcredential Course is hereby submitted for approval. The course is worth 2 ECTS credits, corresponding to 27 contact hours, distributed as follows: 12 hours of synchronous classes, 8 hours of face-to-face laboratory sessions + 7 hours of asynchronous learning. A total of 27 hours of self-directed work is required.

Context

This training initiative is the result of a request from the Portuguese Association of Physics and Chemistry Teachers for IPT to offer instruction in specific Physics and Chemistry topics, previously identified and reflected in the Action Structure detailed above. It is entirely appropriate to respond favourably to the request, as it already aligns with the daily academic practices carried out at IPT.

Target Audience

Secondary School Physics and Chemistry Teachers

Student Places

The minimum number of places is fifteen (15) and the maximum is twenty (20).

Course Structure

Vibrations and waves. Types of Waves: Transverse and Longitudinal. Wave Characteristics: amplitude, period, and wavelength. Sound Waves: sound intensity, pitch, and speed of sound propagation in different media. Human audibility. .Geometrical optics and optical phenomena: absorption, reflection, refraction, and total reflection. Wave optics and light diffraction. .

First experimental assignment: "Wave Properties", observation and measurement of .standing waves using a vibrating string and vibrating plate. Sound Waves - measurement of propagation speed in various media. Measurement and calibration of characteristic sound parameters.

Second experimental assignment: “Geometrical and Wave Optics” observation and measurement of absorption, reflection, refraction, and total internal reflection phenomena using both normal light and coherent laser light. Diffraction patterns using various diffraction gratings and laser light. Measurement of the wavelength of multiple lasers.

Assessment Method

- Laboratory work and submission of group experimental reports – 50%.
- Submission of an individual written assignment on a topic to be defined by the instructors – 50%.