







Authors

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Institution	Physics and Physics Engineering at UA	Country	Portugal

Suitability of this case to the ApprEnt definition of HEA

Workplace/ training 	Mentoring 	Remuneration 	Formal programme 	Certification 	Contract/ Agreement 
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Evaluation of how the programme/practice reaches the following goals Scale: 1 = not at all; 2 = very little; 3 = somewhat; 4 = well; 5 = very well

	1	2	3	4	5
i. Enhances relevant working life skills and qualifications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii. Promotes professional growth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
iii. Develops learning environment practices as a whole	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv. Develops work-based learning practices and materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
v. Improves work performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
vi. Improves tutoring and mentoring practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
vii. Enhances University-Business collaboration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
viii. Showcases potential aspects for programme standardisation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Title

The Physics and Physics Engineer programmes at UA

Description

Model

Higher Professional Technical Courses (CTeSP)

The University of Aveiro (UA) offers Bachelor's, Master's and Doctoral programmes, programmes of Higher Professional Technical Courses (CTeSP) taught in its Polytechnic Schools. Two of these schools are located outside the Municipality of Aveiro and inserted in areas with a strong industrial component, helping to widen the spectrum of the intervention of the University and to enhance the synergies that can be created with the business sector. The contact with the employers allows to adjust the training according to the needs of the labour market.

In some UA degrees there are also internships, the length of which may vary (e.g. from 12 to 28 ECTS for Bachelor's degree - 180 ECTS), and whose main objectives are to provide students with learning in the work context and to bring them as close as possible to business realities.

Support and Objectives of the Training

Whatever the type of course, the student will be accompanied by a teacher from the UA and a counsellor to be appointed by the host organization where the training takes place. Also for the Master's courses (300 ECTS) is now foreseen the possibility of the student choosing to either do a dissertation, develop a project, or perform a curricular internship (30 to 54 ECTS). The latter encompasses 1000 hours of work in the enterprise. As with the other levels of courses, the objective is for the student to apply in a company context the knowledge acquired throughout the Master's, thus also developing applied scientific research.

In the UA, in addition to the curricular stages, other initiatives are developed along the courses that aim to bring the students closer to the business reality. Examples are the Physics and Physics Engineering Degrees of the Physics Department. From our perspective one of the strongest points of this approach is that it allows students to get in contact with the labour market earlier than usual, so that they may not only gain experience from actual working contexts but also learn directly from the professionals that are tutoring them. We think that one of the aspects to improve will be the relationship between the school and some of the companies, mostly in order to allow the whole process to unfold naturally and without glitches.

Best practice

The University of Aveiro's Physics degree has the following objectives:

- To provide a high quality education, in a stimulating scientific environment;
- To adequately prepare students for the next stage of their careers, either by continuing their studies or by entering the job market;
- To attract the best students on a national scale and provide them with a learning programme which is intellectually challenging and sufficiently flexible for students to be able to develop specialised interests.

Physics graduates from the University of Aveiro will acquire knowledge and understanding of the laws and basic principles of Classical and Modern Physics, as well as their main practical applications, the most important theories of Physics, the main physical phenomena described by these theories, their logical mathematical structure, their experimental evidence and the limits of their applicability.

The Physics Engineering Integrated Master curriculum promotes solid foundations in physics, mathematics and Instrumentation, strategically framed to define different profiles in areas that follow the scientific and technological innovation and technology transfer to laboratories and industries, with emphasis on areas of Energy, Materials, Photonics and Optoelectronics, Instrumentation, and Medical Physics. The training also includes expertise in the scientific areas of Electrical Engineering, Computing, Chemistry, Mechanical Engineering and Management. The training provides the students with analytical skills, modelling competence, and the ability to solve complex interdisciplinary technological problems. This is mainly due to theoretical and experimental expertise in the field of applied physics with regards to various areas of modern technology, particularly micro- and nanotechnologies.

Although, as can be seen in the attached testimonies, projects, theses, or dissertations are desirably and often performed in a workplace context in the form of a non-remunerated internships, the fact is that it is not explicitly stated in none of the degree curricula. The internships are co-supervised: a university supervisor and a company supervisor design the project as well as the work plan and follow the student through it, thus meeting at least three times in the course of the internship. Despite this, the major drawback is that there are no practices for supervision training.

Also, students sometimes reject in-company internships, if that means having to move away from the university and/or from their homes. More than a fear of meeting the unknown or leaving a comfort zone, this attitude stems from their economic and financial issue.

This problem could be overcome if such internship were remunerated. Nonetheless, former student often acknowledge the benefits of having attended a Physics based Higher Education Degree prior to entering the labour market.

Feedback from users

The satisfaction of the industry sector is evidenced by the fact that university tuition fees of the best Physics Engineers students are paid by companies. Several companies will pay tuition fees for the 1st year of the Integrated Master's Degree of Physical Engineering (MIEF) of the University of Aveiro (UA) to the students with the best entrance grades in the course. The initiative intends to reward freshmen with the six best averages above 17.5, since the UA allocates a scholarship of value equal to that of the tuition fees to all freshmen who apply to University with an equal or higher average than the latter. This is the third year that the Physics Department (DFis) is promoting this award, which aims to help reduce the need of engineers in an area that is the third with the highest rate of national higher education employability.

This is the only course in Portugal with the international EUR-ACE seal. Aspöck Portugal, Bosch Termotecnologia, Costa Verde Porcelanas, MTBrandão, Prirev - Technical Coatings and Grupo Preceram are the companies that, for the second consecutive year, sponsor tuition fees to the six best freshmen from MIEF. Cooperation with the industry and business has been a continuous bet on the training provided by the DFis. In particular, recalls João Miguel Dias, the director, "MIEF promotes, in the 5th year of the course, the accomplishment of Dissertation and Internship in business environment, strategically framed for the definition of different profiles of industries and companies of high technological value". Indeed, "innovation in this type of industries and companies is favoured by scientific and technological courses such as MIEF, as recognised by companies that have sponsored this prize since 2015".

This support by the industry to the future physical engineers of the UA, emphasizes João Miguel Dias, "recognizes the excellent training provided to these graduates, which is based on the transfer to the pedagogical intervention of the results of the scientific research carried out in DFis, developed in close collaboration with industries through the provision of services and projects in partnership".

Former student UA - António José Trindade, MS in Physical Engineering Physicist in Ireland revolutionizes optoelectronic devices (16.4.2018)

He is at the forefront in researching and producing devices optoelectronics three to four times smaller than the diameter of a human hair. His name is António José Trindade. He holds a Master's in Physical Engineering from the University of Aveiro (UA) and is a scientist at XCeleprint, the Irish startup that is bringing to the present the future of micro-LED displays, medical sensors, and communications at high velocity.

He finished his Master's Degree in Physical Engineering in 2011 at Department of Physics of the UA. The knowledge gained there was essential at the time when he began his PhD in Applied Physics for the University of Strathclyde, Scotland, where he first came into contact with manufacturing rooms and production of semiconductor devices. He is currently working for X-Celeprint, a small start-up specialized in device integration of ultra-miniaturized optoelectronics (3 to 4 times smaller than the diameter of a human hair). "Our prototypes can thus have a single device or millions of these arranged in arrays. Through this high level of heterogeneous integration, we are revolutionizing critical areas for society such as micro-LED screens, medical sensor devices, hard disk storage, high-speed communications, sensors, etc." explains Antonio Trindade, principal investigator at the company.

"The degree exceeded much the initial expectations. There were two possible areas (Physics or Engineering Physics), the choice ended up falling on the second because of the engineering component and the practical application of the knowledge was much more attractive to me than pursuing a course with a greater theoretical component. The added value in relation to the years of study was the applicability and experimental observation of the knowledge acquired, which in itself were fundamental to deepen the taste for the area and to motivate me to want to know more."

Antonio also explained which skills acquired in the UA he consider the most fundamental for the exercise of his current activity: "The rigor, and the development of several approaches to the different types of challenges/problems that I encounter daily. Because these are never the same, the UA and its teachers were fundamental in favouring the learning of the best methods to use for each approach. But above all, they helped to understand why we see, what is behind, what effects it has, had or could have because conditions may change constantly and we cannot predict that they will only work in a standard way."

Former student UA: Luís Filipe Silva, Master's Degree in Physics Engineering (21.5.2018)

"The UA allowed my personal and scientific development and made me feel part of a global society"

Luís Filipe Silva, 30, is a former student of the Integrated Master Engineering Degree, completed in 2010. He currently works in Engineering, either in terms of meeting customer requirements or taking part in exploratory research and innovation, within a unit of the TMG in Guimarães. TMG Automotive coats all surfaces of the car interior with a vast array of materials.

"The professional trajectory started with a research grant from FCT in the University of Aveiro (UA) in the area of growth and characterization of crystals under the project 'Development of microstructures textured and ultrafine by laser zone fusion - LaFlorZone' (PTDC / CTM / 66195/2006). In the course of this project on the development of new gamma radiation for use in medical imaging, we produced mono and polycrystalline fibres through the use of the Laser Floating Zone (LFZ). Then, in 2011, I started my work in the Research, Development and Innovation Department of TMG Automotive, acting as Product Engineer, position that I am currently maintaining, and through which I have been assuming responsibilities in the technical management of projects with a more explorative component, with which innovative products are expected to be produced."

Furthermore, Luís Filipe did not forget to clarify with factors have contributed the most while starting his professional activity:

“Being able to start the professional activity was more difficult than expected, mainly due to wanting to work within the country, since at that time Portugal was experiencing an economic crisis. I think attending a curricular internship would have been a good opportunity, because it would have allowed me to gain experience in an industrial environment and thus create some contacts on the ground. However, the fact that the course had provided us with knowledge that can be applied in different industries, was a great added value, since it allowed us to compete for different positions and to choose the most interesting project.”

On the other hand, the initial adaptation to the professional activity in an industrial environment, having obviously been gradual, happened without problems, given the strong academic preparation he knew to possess.

Relevance and Transferability

N/A.

Comments

N/A.