



CFIS, an experience of academic excellence at the UPC



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In January 2003, the Polytechnic University of Catalonia (UPC) created the Centre of Higher Interdisciplinary Training (CFIS). It is a centre of academic excellence addressed at the most motivated and capacitated students to do scientific work at the UPC. The university's goal is to offer the most suited environment to the best prepared students willing to become pioneers in developing 21st century engineering studies and enjoy the best and most complete university education. To do so, at the CFIS we offer a demanding, high-quality education while fostering multi-disciplinary teamwork.



The CFIS came out of the lack of a public reference centre of higher education concentrating the best students of Spain. It is true that Spanish universities, and more specifically the UPC, have long-standing schools and faculties, well prepared and with a good reputation in training engineers. Taking part in these structures, the CFIS acts as a pole of attraction for the most talented students.

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The creation of the CFIS was the highlight of an experience started five years earlier by which the double degree of telecommunications engineering and mathematics was created. Based on this experience, the CFIS offers a double degree programme including any two of civil engineering, industrial engineering, computer science, telecommunications and mathematics.

Double degrees as such are not a novelty in Spanish universities. What makes the CFIS proposal different and unique is that obtaining two university degrees is associated to a very rigorous selection process and an extremely high educational level. And it is so because the aim is not only to offer double degrees but also to create synergies and linkage points among the most innovative future engineers so they contribute significantly to the development of the country.

Why the CFIS?

The Spanish university system is homogeneous, rigid and massified, access to which is through an accession exam that essentially assesses the degree of academic maturity attained by the student. Let us be more specific on this.

It is homogeneous in the sense that equivalent degrees in different universities have few differences in structure and none in value. For instance, the industrial engineering degree is the

same at the UPC as in any other Spanish university. Hence geographical proximity becomes a primary criterion in choosing the university to study at. Nevertheless, there are universities with acknowledged academic reputation but rarely visible for prospective students.

It is rigid as university curricula and bureaucracy leave students with few choices to create their own academic curriculum and make progress according to their own capacity and interests.

Technical schools and faculties often meet a big variety of students, ranging from those looking for basic training to those wishing to deepen into chosen subjects for their later development.

From a social and national development perspective, it is undeniable that there are increasingly more youngsters entering university and higher education, which is beneficial and prepares us better for future challenges. However, this means that university needs to assume massification, which poses new challenges. Technical schools and faculties thus bring together a big variety of students, ranging from those looking for basic training so as to enter the labour market immediately to those wishing to deepen into chosen subjects for their later development.

Finally, the accession exam has despite some obvious advantages the drawback of not ensuring the students' capacity for the career chosen as it assesses overall academic maturity, which not always involves specific maturity required for the career they are confronted with. It thus can occur – and in fact there have been some cases – that a student enters an engineering career with minimum scores in scientific subjects, compensated by excellent results in subjects not related to their field of specialisation.

The CFIS is the instrument created by the UPC to overcome these and other disadvantages of

the current system, addressed at a group of brilliant students and encouraging collaboration between the most creative minds.

Some data

CFIS students do courses taught at different UPC schools and departments. What makes this offer different from doing two degrees simultaneously? From a strictly curricular perspective, some appealing double degrees have been created, double study facilitated and integrative knowledge-building fostered. The true innovation of the programme is based on the process to recruit and monitor students and their participation in different university projects.

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From the very beginning, it was clear to us that a centre of excellence needs to address the best students, for which the recruitment scheme is paramount. Students enter university through the accession exam scores that are in our case completed with a second selection, which encompasses two issues: knowledge in mathematics and physics, subjects common to all engineering careers, and maturity and ability of scientific reasoning following the tests done, for instance, at the French *grandes écoles* of engineering. For a good selection it is indispensable to address the biggest possible base, which in our case encompasses all of Spain.

In spite of this, we know that recruitment is no guarantee for the success of the project. As a consequence, we have set out individual and group monitoring and coaching plans. For instance, workshops are regularly held to foster interaction between the different branches of knowledge, either with the participation of a

university professor or a prominent one from outside or by encouraging joint study sessions among students from different degrees. Besides, from the third year, participation in research groups and institutions is fostered. This way, CFIS students take part in different research projects such as signal theory or the Institute of Robotics, just to mention a few.

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The selection process and support given have been highly satisfactory, as they lead to pursued academic excellence in a natural and very reliable way. However, it has to be mentioned that we are talking of a necessarily select group of students. The number of applications to enter the CFIS is on average 80 or 90 each year. Between 15 and 20 students pass the selection process and have access to double degree studies, which sets the current number of students at the CFIS at more than a hundred.

I already mentioned the importance of addressing an offer like this to the maximum possible number of students. Right now, 25% of students come from outside Catalonia. There are from all Spanish regions. Taking into account the difficulties in promoting our offer and the competition of other regions such as Madrid, offering big administrative advantages and grants to the most capacitated students, we believe this percentage to be positive. Our challenge is to increase it, and for this reason we collaborate with different civil society organisations that are funding a specific grant programme covering in some cases student accommodation.

Double degrees are completed with so-called «end of career projects» that need to combine different fields of study. These projects are done either at centres of the same university or other reputed universities all over the world like the MIT, Stanford University, the École

Polytechnique, etc. An evidence of the level reached is the number of offers these students receive to become part of research groups at those universities, either to do their PhD or to participate in R&D projects in collaboration with a company. This means that most of the 40 CFIS graduates, namely those having done the first joint telecommunications and mathematics degrees, are spread over different research groups throughout the world, including the UPC, and in companies with a strong technological base such as Google.

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to be seen how we recover them to contribute to the development of our environment.

The future

The most demanded double degrees are those combining any engineering with mathematics as well as industrial with civil engineering and computer science with telecommunications. Progressive adaptation of the CFIS to the European higher education space will allow to review the current offer and consider new degrees such as aeronautical higher engineering, recently included into the UPC curriculum. This shall allow us to have an attractive offer beyond cycles and hypes.

The first degrees have been completed now, but it will be in the next years when these generations will attain professional maturity, and then we will be able to have more accurate tools to assess the success of the way gone so far.

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