

## **From the *Polytechnic Academy* of 1837 to today's Faculty of Engineering 175 years of higher education in engineering in Porto**

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### **Introduction**

January 13<sup>th</sup> 1837 saw the publication in the national press in Lisbon of the official 1<sup>st</sup> Semester edition of the 'Collection of Laws and Other Official Documents', signed by Manuel da Silva (Passos Manuel), Minister in the reign of Queen Maria II responsible for education policy, and which contained two articles, no. 155 and no. 171, underpinning the creation of the *Polytechnic Academy of Porto*<sup>1</sup>.

January 13<sup>th</sup> 2012 was thus the 175<sup>th</sup> anniversary of the Academy's establishment, an important event for Portugal since it is historically documented ([2] – [11]) that the founding of this institution represented effectively the formal beginning of higher level 'civil' engineering in Portugal.

In the same historic lineage, it is also an important event for the Faculty of Engineering, University of Porto, which is heir to the Academy, continuing its mission and history in the field of engineering.

It has for 175 years been playing a leading institutional role in the economic development of the city, the region and the country, both in terms of the quality of its educational service, producing engineers of world-class standard, and the scientific and technological advances that have contributed to global scientific development, industrial progress and quality of people's lives.

### **Brief Historical Note**

#### Milestones – from the Academy to today's FEUP<sup>2,3</sup>

The origins of higher level *technical study* carried out in the region of Porto, and leading to the University of Porto, date from the eighteenth century, the age of the emergence of the *Nautical School*, established by a decree of July 30, 1762, with the purpose of training mariners and sailors essential to commercial navigation [6], [11].

The Nautical School was followed by the foundation of the *Drawing and Sketching Class*, by a decree of Queen Maria I on November 1<sup>st</sup> 1779, in accordance with the essential need felt for better training of seamen [11].

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<sup>1</sup> What article 155 says in full:

*"The Royal Naval and Commercial Academy of the City of Porto, hereafter to be known as – the Polytechnic Academy of Porto-; has the special aim of teaching Ciencias Industriaes, and intends to provide training for: 1<sup>st</sup> Civil Engineers of all classes, including mining engineers, building engineers and engineers of bridges and roads; 2<sup>nd</sup> Naval Officials; 3<sup>rd</sup> Mariners; 4<sup>th</sup> Merchants; 5<sup>th</sup> Farmers; 6<sup>th</sup> Factory Managers; 7<sup>th</sup> Artists in general"*

<sup>2</sup> The brief description here given results from the study and cross-checking of references [2] to [11], being confined to the succession of institutions whose mission and history FEUP is heir to. It does not, therefore, include the history of technical study which began with the *Porto Industrial School*, founded on December 30<sup>th</sup> 1852, which led to the Porto Higher Institute of Engineering [10].

<sup>3</sup> The UP website also provides condensed information on this same question of the forerunners to the University of Porto [12].

The natural growth in demand for more knowledge gave rise to the Royal Naval and Commercial Academy of the City of Porto, founded by Royal Charter on February 9<sup>th</sup> 1803, replacing the Nautical Sketching and Drawing Classes, and including “...a system of *Mathematical Doctrines and Navigation, a Commerce class, a Drawing class, and classes in both the English and French languages...*” [6], to which would later be added a course in Rational and Moral Philosophy and an Agriculture class.

As stated in the introduction, major reform to higher education in Portugal led to the establishment on January 13<sup>th</sup> 1837 of the Polytechnic Academy of Porto, the result of significant restructuring of the Royal Naval and Commercial Academy of the City of Porto.

It was the first College in Portugal set up with the mission to train ‘civil’ engineers, the name adopted at the time as opposed to ‘military’ engineers.

During the 74 years of its existence, the Academy carried out its mission effectively, albeit with some turmoil and upheaval.

On March 22<sup>nd</sup> 1911, by Decree of the Provisional Government of the Republic, and regulated by the University Constitution announced by Decree on 19<sup>th</sup> April of that same year, the University of Porto was created, with two faculties from its inception, the Faculty of Science and the Faculty of Medicine, and with it came the dismantling of the Polytechnic Academy.

Artur Magalhães Basto documents this transition from Academy to University as follows [3, p. 484]: “...with the creation of the University of Porto, by Decree with force of law on April 19<sup>th</sup> 1911, the Polytechnic Academy was able to pass on to its successors – the Faculty of Science and School (later Faculty) of Engineering – a most honourable and glorious inheritance of services to the nation and to Science.”

In the early years of the University’s life, by decree of May 12<sup>th</sup> 1911, the subjects which in the Academy corresponded to courses in Engineering were grouped together in the ‘School of Civil Engineering’ attached to the Faculty of Science.

It was soon realized that the study of applied sciences demanded greater autonomy in order to fulfill its aim. It was as a result of these demands felt by the University that the Technical Faculty was created, established by Law no. 410, on August 31<sup>st</sup> 1915, with the mission to provide teaching of sciences applied to engineering.

The increasing openness of the Technical Faculty’s mission towards research activity in the fields of engineering led to significant reform in the organization of studies in this area, formalized in Decree no. 12.696 of November 19<sup>th</sup> 1926, which also formalized the change of name from Technical Faculty to Faculty of Engineering, a designation that remains today, known to all by its acronym FEUP.

### The installation of institutions in their own buildings

The installation of an institution in its own dignified buildings with the necessary working conditions is always a very important factor in the success of the institution in fulfilling its mission.

Historical sources indicate that the lack of resources at various levels, particularly in installations, was the common denominator of life in the Academy.

From its inception, the main building of the Polytechnic Academy, now the university Rectory, was the ‘House for Orphan Boys of the City of Porto’. These installations, which spent several decades of the

19<sup>th</sup> century undergoing renovation work, were at various times shared with other institutions – the Industrial School, the state High School, the Portuguese Academy of Fine Arts, the College of Orphans and the Porto Library [10].

Subsequent institutions, the Faculty of Science, University of Porto and its School of ‘Civil Engineering’, the Technical Faculty, which developed out of the School of Engineering, and its successor, the Faculty of Engineering, also occupied these installations until 1937.

On March 15<sup>th</sup> 1927 the foundation stone laying ceremony took place for FEUP’s ‘celebrated’ installations in the equally ‘celebrated’ Rua dos Bragas. The ‘new’ FEUP premises were finally inaugurated on April 13<sup>th</sup> 1937 after ten years under construction.

The Faculty of Science, on the other hand, remained in the Academy’s original building from its inception in 1911 until it began a phased transition in recent years to new installations in the University’s hub in Campo Alegre.

The FEUP building in Rua dos Bragas now accommodated the final three years of engineering courses, which at the time were of six years’ duration. It can be said that over about 30 to 35 years these premises fulfilled their function, albeit demanding few resources, given the characteristic government policy during this period of our history of restricting development. There were few professors and not many students.

With the arrival of democratic rule on April 25<sup>th</sup> 1974, and due in great part to the pedagogical difficulties experienced with this physical separation of courses, there quickly grew a movement that led to the first years of courses (which from 1971 became two years of study, following the reform of ‘Veiga Simão’) also moving to the Faculty of Engineering.

This, together with new policies to promote higher education and the notable development of all areas of engineering research activity in line with what for many years had already been seen in more developed countries, swiftly led to new strains arising from the lack of facilities of appropriate size and structure to fulfill the Faculty’s mission with its new emphasis on providing training and research activities of an international quality standard.

In September 2000, after another long, very drawn-out process and difficulty in reaching a decision, closely linked to the difficulties of leadership that characterize Portuguese universities, it was finally possible to complete the construction of new installations for the Faculty of Engineering at the university’s campus in Asprela.

The move took place in the academic year 2000/2001 and represented a great qualitative leap in terms of available resources such that nowadays the primary goal is to develop activity in education, research and innovation within a European framework.

#### FEUP heir to the Academy – rise in student numbers in the first centenary

It seems clear that the vision of the beginning of higher education in engineering certainly did not arise from the foundation of the Faculty of Engineering in 1926, nor from the creation of the University in 1911. It arose from the link to the Academy which was established in 1837.

Thomaz Joaquim Dias (dean of FEUP between 1929-1935 and 1936-1946) wrote an article [1] documenting the rise in engineering students from 1837 to 1932. He published the data (Fig.1), associating it with a ‘School of Civil Engineering’ i.e. without any discontinuity of information regarding the series of institutions which during that time had the aim of training engineers.

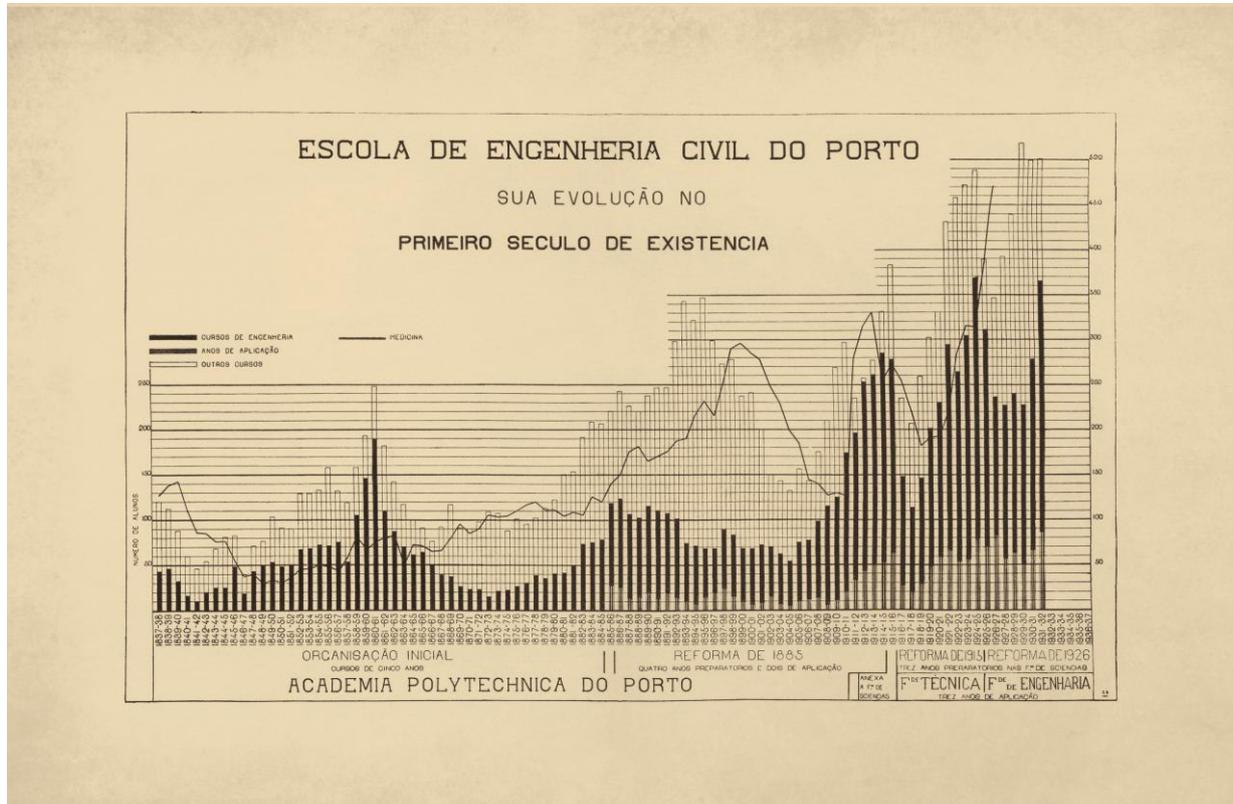


Figure 1 – Increase in the number of engineering students at the Polytechnic Academy and the University of Porto – 1837-1932

For the centenary of the Academy, several authors, [2]-[5] published works converging on this view of continuity, from the days of the Polytechnic Academy to the FEUP of that time, a continuity that extends to the present day.

Essentially, the story of FEUP is of a long continuum of technical study and applied sciences, consolidating the knowledge, experience and prestige of the institution, both nationally and also, during the last 35 years, internationally. It traverses a long period of history, and its 200-year path has taken it through the end of the Monarchy, the First Republic, the ‘Military Dictatorship’ and the New State, and on until the last 38 years of democracy, a period which, more than any other before it, has been characterized by a strong impetus for internationalization, more specifically European integration, the milestone which for Portugal was reached on January 1<sup>st</sup> 1986, when the country joined the European Union.

## **FEUP today and into the future**

The last quarter of the 20<sup>th</sup> century was the stage for the beginning of an evolution-revolution, today still in its initial phase, which History will one day clearly recognize as global, with political, social and economic dimensions impacting greatly on people's lives.

This has been an incredibly rich period in terms of cultural evolution and scientific knowledge, with objectives, strategies and teaching methods, learning and research largely related to the plan of European integration which the winds of contemporary history have increasingly imposed on us.

FEUP, like the University of Porto as a whole, has been making great efforts to adapt to this international model of globalization, so prevalent in today's world, characterized by opportunities and demands for cooperation, in a context of increased competition.

Today, in 2012, FEUP is, under the statutes of the University of Porto and its own statutes<sup>4</sup>, an entity of the University's organizational model, whose aim is to create, convey and propagate knowledge, technology and culture in the field of engineering, for the service of humanity, with respect for all its rights.

Nowadays, the main aspects of this mission are the academic training of professionals in the areas of engineering and related services, research activities, development and innovation with close links to the third cycle teaching programs, as well as the activities of the University's third mission, namely, the transfer of knowledge and technology, the provision of services and continuing vocational training, participation in national political debate and involvement in the economic, cultural and social life of the region and the nation. To these should be added the cultural and humanistic training of the FEUP Community, respect for heritage and the environment and preservation of the memory of the institution.

### Quality, internationalization, collaboration with Society

At this present time of such uncertainty, it is important to give a word of confidence to the future, embracing the vision that is central to our development: cooperation with society and internationalization within a framework of uncompromised quality.

The quality of research activity and innovation at FEUP has been widely recognized over recent years, both nationally and internationally, not only through its involvement in large scale international collaboration projects, some of which the Faculty took responsibility for coordinating, but also as its results have been published in various international ranking systems, its research teams have been

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<sup>4</sup> The University of Porto was established as a Private Law State Foundation, under the terms of Decree Law no. 96/2009 of 27<sup>th</sup> April, becoming governed by new statutes approved by regulatory order no. 18-B/2009 of 14<sup>th</sup> May. Within this new framework, the new statutes of the Faculty of Engineering, University of Porto, were subsequently published on 10<sup>th</sup> December in the *Diário da República*, by University of Porto Rector's Order no. 26712/2009.

distinguished with awards, and the partnerships that have been made between research teams from FEUP and large institutions and national and international companies.

In addition, the quality of teaching and training provided in engineering at FEUP is clear to see from the various satisfaction indicators of demand and occupancy that the General Directorate of Higher Education has recently published with regard to the results of access to higher education in 2011/2012.

#### *Indicators of quality in research, innovation and international and business collaboration*

Recent indicators confirm the growth in the size and quality of FEUP's activity in scientific research within several fields of engineering. A few notes should be made:

- The world ranking held by the National University of Taiwan involves the weighting of bibliometric indicators of productivity, impact and research excellence.

In a ranking by area and field of activity, the results published in November 2011 put Mechanical Engineering at FEUP in 13<sup>th</sup> place in Europe and 47<sup>th</sup> in the world, Chemical Engineering in 16<sup>th</sup> place in Europe and 58<sup>th</sup> in the world and Civil Engineering in 25<sup>th</sup> position in Europe and 97<sup>th</sup> worldwide.

It should be noted that the 13<sup>th</sup>/47<sup>th</sup> place occupied by Mechanical Engineering is the best position in any given area or field of activity reached by a Portuguese higher education institution in 2011.

Overall, in this system, with regard to the data from 2011, the engineering area of the University of Porto is ranked 46<sup>th</sup> in Europe and 165<sup>th</sup> worldwide.

These results and indicators of quality in FEUP's activity are the result of growing investment in scientific production – FEUP is responsible for about 19% of the publications indexed in the Web of Science from the University of Porto, which in turn represents 22% of national production.

- There have been a growing number of European projects, within the seventh framework-project, led by FEUP researchers, in research groups at FEUP or interface institutions where they work, in top level European consortiums.
- Recently a young FEUP researcher obtained approval for a project in the program that is considered one of the major indicators of research excellence – the “Starting Grants Program” from the European Research Council
- The quality of research can also be seen in cooperation, particularly in partnerships with international institutions:

FEUP was the institution chosen by IBM Portugal to install the only “Center for Advanced Studies” (CAS) in Portugal.

Within the broader interdisciplinary framework of activity in the University of Porto, and given the acknowledged preponderance of FEUP, the “Fraunhofer Portugal Research Center” has been set up on the Asprela campus, serving as anchor for many collaborative scientific and business projects, with particular reference to projects in the fields of Electrical Engineering, Information and Computer Science, Multimedia and Biomedical/Bioengineering Engineering.

Likewise within the interdisciplinary framework of activity in the University of Porto, and with the same predominance of various fields of engineering, FEUP has signed accords in partnership with other national institutions and with some of the most important American institutions of higher

education: Massachusetts Institute of Technology (MIT), Carnegie Mellon University (CMU) and the University of Texas in Austin (UTA).

- FEUP scores highly in innovation activities, in close cooperation with economic activities, especially with industry.

Recent highlights include winning the Solvay & Hovione Innovation Challenge, awarded in December 2011, the ACP Diogo Vasconcelos prize, awarded in October of the same year, and the Air Products – Faculty Excellence Award, also given in 2011 to a research team from FEUP, for projects involving large national companies, such as CIN, EFACEC and EDP-Innovation.

#### *National indicators of quality in the provision of engineering training and education*

The General Directorate of Higher Education recently released a set of significant indicators of demand and occupancy regarding access to higher education in 2011/2012.

There were three applicants per place on the nine integrated masters courses offered by FEUP in 2011/2012 and 60% of students were allocated their first choice of course. Places were filled at a rate of 100%.

Compared to similar courses in other national institutions, FEUP has the highest demand satisfaction index in five of these courses, this index being defined as the number of first choice applicants per place offered. The minimum placement rankings were the highest in seven of these courses, scoring between 14.1 and 18.3 (on a scale of 0-20).

#### **Conclusion - A tribute to the generations of teachers, engineers, technicians and students**

An institution gains its reputation and wins the confidence of society when its quality is appreciated by the wider community.

The indicators presented speak for themselves regarding the quality of activity today's FEUP, the heir to the Academy, in the various aspects of its mission to develop learning, convert this into added-value knowledge, in collaboration with business, and train young people in the areas of engineering and related fields.

The Polytechnic Academy, the School of 'Civil' Engineering, the Technical Faculty and FEUP were until the present day the result of the ability and commitment of the academic community, and of the generations who worked in that community and passed through it.

They were generations of teachers, engineers, technicians and students, and among them tribute is paid to those who were chosen to represent and preside over the destiny of the different institutions during these 175 years and whose names are here registered for future posterity:

- Deans of the Polytechnic Academy (1837-1911):

João Baptista Ribeiro (1837-1868); Joaquim Torcato Álvares Ribeiro (acting dean 1864-1868; 1868); Adriano de Abreu Cardoso Machado (1868-1883; intermittently in public office between

1881-1883); Francisco de Sales Gomes Cardoso (always acting dean 1881-1883; 1883--1886); Francisco Gomes Teixeira (1886-1911, first Rector of the University of Porto).

- Deans of the Faculty of Science (1911-1915), in the period preceding the creation of the Technical College:

António Joaquim Ferreira da Silva (1911–1912); José Diogo Arroyo (1912-1919)

- Deans of the Technical College (1915-1926):

Vitorino Teixeira Laranjeira (1915-1919); Luís Couto dos Santos (1919-1926).

- Deans of FEUP (1926–2010):

Luís Couto dos Santos (1926-1929); Thomaz Joaquim Dias (1929-1935); Luís Couto dos Santos (1935-1936); Thomaz Joaquim Dias (1936-1946); Antão de Almeida Garret (1946-1947); Theotónio dos Santos Rodrigues (1947-1950); Manuel Corrêa de Barros Júnior (1950-1961); Isidoro Augusto de la Higuera Farinas de Almeida (1961-1968); Francisco Jacinto Sarmento Correia de Araújo (1968-1971); Armando de Araújo Martins Campos e Matos (1972); Joaquim Augusto Ribeiro Sarmento (1973-1974); Luís Jorge de Oliveira Dias (1974-1976); Raimundo Moreno Delgado (1976-1977); Horácio Maia e Costa (1977-1978); Carlos Afonso de Araújo Castro Carvalho (1978-1979); Alírio Egídio Rodrigues (1979-1980); Francisco Correia Velez Grilo (1980-1982); Diogo de Paiva e Proença Leite Brandão (1982-1983); José Carlos Diogo Marques dos Santos (1983-1984); Alírio Egídio Rodrigues (1984-1990); José Carlos Diogo Marques dos Santos (1990-2001); Carlos Albino Veiga da Costa (2001-2010); Sebastião José Cabral Feyo de Azevedo (2010 - ).

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Thanks also to Professor João Porto for providing his wonderful 'Last Lecture' on 'Engineering and Humanism', given at FEUP on 10<sup>th</sup> November 2011, a precious document historically contextualizing the evolution of engineering and engineering education.

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