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Accreditation of Spanish Engineering Programs, first experiences. The case of the Terrassa School of Engineering

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Abstract
The implementation of the European Space for Higher Education has entailed new requirements for Spanish Higher Education Programs. Regulations (RD 1393, 2007) stablish that university programs, in order to have official validity, must be submitted to an external evaluation process before their official implementation, denominated Validation, and to an ex-post process or Accreditation. Terrassa School of Engineering (EET) was one of the first schools in Spain to adapt to the European Space for Higher Education, in the academic period 2009-10 and then, one of the first university institutions submitted to an accreditation process. In this communication, the important role of the Internal Quality Assurance System in the assessment of the school's programs is exposed as well as the approach followed in the key steps of the process: Accreditation

Keywords
Internal Quality Assurance System, Programme assessment, Accreditation, European higher education area

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1. Introduction

In recent years, due to the implementation of the European Higher Education Area (EHEA), university studies in Spain have undergone great changes.

The Spanish legislation (RD 1393, 2007) states that the official university degrees must undergo a process of external evaluation in order to be officially valid. These external evaluation processes include an ex ante assessment, which is called Validation and an ex post assessment process, which is Accreditation.

Between these two stages, there is an annual monitoring of all university programs, which may include corrections or modifications, aimed at improving aspects under consideration.

Thus, the Validation of a degree, its annual monitoring and implementation, the introduction of possible modifications and the accreditation are assessment processes that nowadays are an important part of the life cycle of a university degree.

The Internal Quality Assurance System of every School (IQAS), as a relevant part in the process of developing the curricula, plays a key role throughout the lifecycle of programs. It enables improvement in evaluation, lecturers and lecturing quality, external traineeships and international mobility, as well as in analysing stakeholders satisfaction and employability of graduates.

The implementation of the IQAS allows detecting necessary modifications and opportunities, planning actions of improvement and measuring results in relation to the actions carried out, which results in better quality of the university system.

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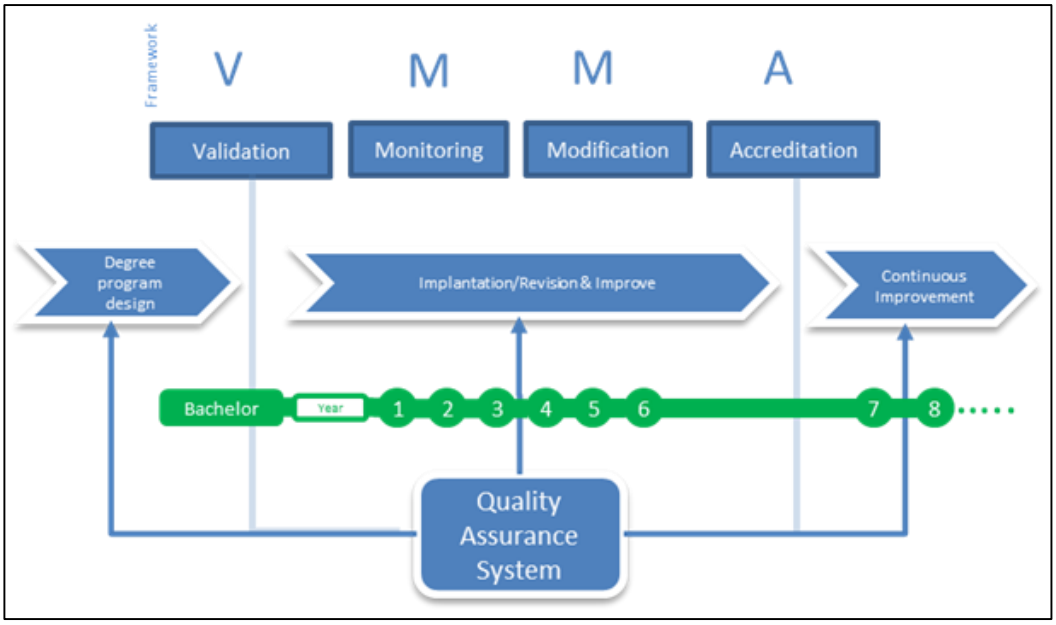

Figure 1 Life cycle of a recognized university degree (GPAQ, 2015)

In this document, the important role that the IQAS of Terrassa School of Engineering (EET) is exposed. The approach to the evaluation of the different programs, the new experiences related to the process and the methodology used in monitoring, and the final accreditation of the implemented degrees will be described and discussed in order to provide relevant information about this important improvement in the Spanish University System.

The Spanish National Agency of Evaluation and Accreditation (ANECA) validates the proposal of new study programs through the process called Verifica. The accreditation request is processed after 6 years of monitoring the Institution, where the programs have been implemented. The process includes an inspection visit at the Terrassa School of Engineering in 2015, carried out by an External Evaluation Committee (EEC) designated by the Agency.

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2. Terrassa School of Engineering. Study programmes.

Terrassa School of Engineering (EET) is a higher education school belonging to Polytechnic University of Catalonia (UPC). During its more than 100-year history, EET is specialized in engineering education, and is well known for its prestige and quality.

EET is located on the campus of the Polytechnic University of Catalonia (UPC) in Terrassa sharing services and resources with other schools. The campus includes higher education, research centres and other facilities, occupying 72,000 m2 in which are located 4 Schools, 23 departments, an Institute of Textile Research INTEXTER, the Catalonian Centre for Plastic, 37 research groups, 5,500 students, 400 teachers and 250 professionals and researchers. Every day, over 6,000 people work and study in this campus, making it an important economical centre of the city.

Starting the process in 2009-10, the Terrassa School of Engineering was one of the first schools to adapt its studies to European Higher Education Area (EHEA). This adjustment included simplification of the syllabi and development of common itineraries between similar programs, improving the efficiency of the implementation of the new curricula.

The different programs currently taught at the EET-UPC are on in Table 1. The term Industrial Engineering, in Spain encompasses all competences related to mechanical, electrical, electronical, textile, chemical and industrial design engineering.

The EET-UPC in addition offers the students the possibility of obtaining a double degree. This double programme requires that students enrol for one extra year of additional subjects (66 ECTS credits). Once these subjects are accomplished, the students obtain two diplomas awarded by the UPC. The additional year ensures the achievement of competencies corresponding to both degrees. (See Table 2)

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Table 1 Academic programs offered by EET-UPC.

Area	Obtained Degree
Industrial Engineering	Degree in Industrial Design and Product Development Engineering
	Degree in Electrical Engineering
	Degree in Industrial Electronics and Automation Engineering
	Degree in Mechanical Engineering
	Degree in Chemical Engineering
	Degree in Textile Engineering
Telecommunications Engineering	Degree in Audio-visual Systems Engineering
Master (90ECTS)	Master in fibrous materials technology (Textile, Paper, Graphic)

Table 2 Academic programs offered by EET-UPC. Double Degrees

First Degree	Second Degree (Double Degree)
Degree in Electrical Engineering	Degree in Mechanical Engineering
	Degree in Industrial Electronics and Automation Engineering
Degree in Industrial Electronics and Automation Engineering	Degree in Electrical Engineering
	Degree in Mechanical Engineering
Degree in Mechanical Engineering	Degree in Electrical Engineering
	Degree in Industrial Electronics and Automation Engineering

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First Degree	Second Degree (Double Degree)
	Degree in Chemical Engineering
	Degree in Textile Engineering
	Degree in Industrial Design and Product Development Engineering
Degree in Chemical Engineering	Degree in Mechanical Engineering
	Degree in Textile Engineering
Degree in Textile Engineering	Degree in Mechanical Engineering
	Degree in Chemical Engineering
	Degree in Industrial Design and Product Development Engineering
Degree in Industrial Design and Product Development Engineering	Degree in Mechanical Engineering
	Degree in Textile Engineering

3. The importance of the Internal Quality Assurance System in the life cycle of a university degree. Monitoring process.

As already mentioned above, programs annual monitoring is compulsory during the period going from the Validation of the study programs to their Accreditation.

According to the Quality Assurance Agency (AQU), the monitoring has two main objectives:

- Constitute a useful tool for managing the School allowing assessment of the academic contents, development through the analysis of data and indicators, and producing, when necessary, improvement proposals oriented to correct any observed deviations in the ordinary development from the stated syllabi.
- Produce a source of useful evidences for degree accreditation.

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As specified in the “Bachelor and Master Degree Programs Monitoring Guide" published by the agency (AQU, 2013), the Annual Monitoring Reports of the EET-UPC degrees focused in four different dimensions:

- Public information on the operational development of academic program.
- Public information on the indicators.
- The analysis of academic programme and improvement actions.
- The adequacy of the Internal Quality Assurance System (IQAS) for monitoring the university degree.

The university, UPC through its Planning, Evaluation and Quality Office (GPAQ) has developed a computer application called SAT where different centres must submit annually their reports. The Office after reviewing these reports forward them to the accreditation agency AQU.

The deep discussion on these four dimensions is not easy. In this sense, the IQAS implemented in the EET-UPC, ensures collecting relevant information and data in order to provide an efficient management of the whole results corresponding to academic programs, which facilitates the monitoring process and modification in degrees, ensuring continuous improvement through objective data analysis.

The IQAS EET-UPC is divided in different processes. Each process has a responsible person that will assure that the process is properly operating, and that will be regularly reviewing it in order to determine the need for modifications. In addition, monitoring indicators characterize each process. (See Figure 2)

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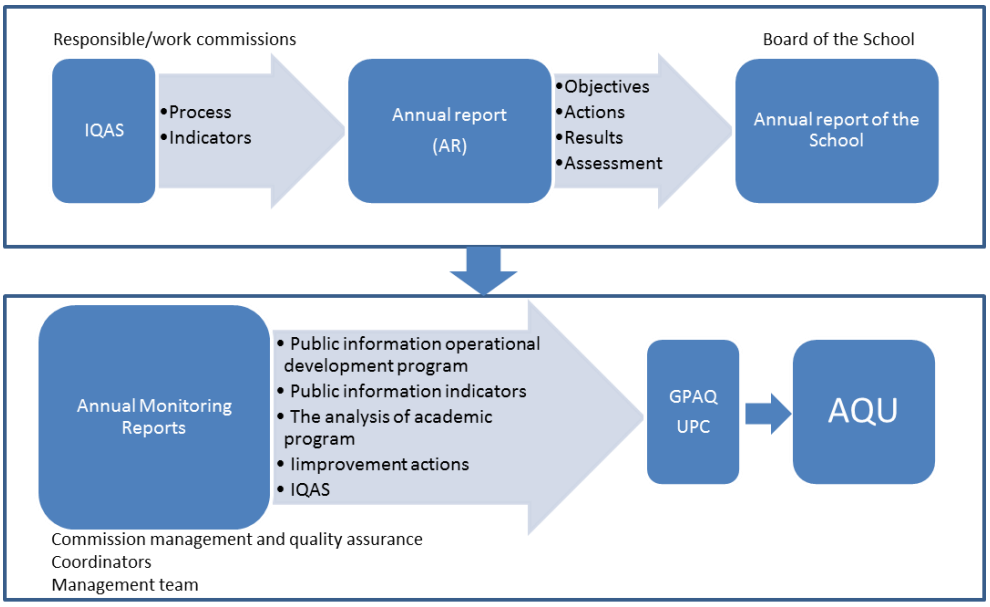

Figure 2 Importance of the IQAS in the monitoring process

Measurement, analysis and temporal evolution of these indicators is a task assigned to the responsible for the process. He, in collaboration with a Commission, generates an annual report (AR) that is included in the annual report of the School. This report is annually approved by the Board of the School and is a public document.

The reports generally include the following sections:

- Aiming goals: The specific objectives are specified in relation to the process.
- Actions: actions taken to achieve the specified objectives.
- Results: indicators / results and their evolution.
- Assessment: achievements assessment and improvement proposal

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4. The accreditation process. The EET-UPC experience

In order to apply for accreditation, the EET-UPC, developed a preparatory report for this purpose (self-assessment report) that was elaborated following a template provided by AQU. Figure 3 shows the process.

As in the case of the Annual Monitoring Reports, the UPC has developed a software application that allows filling the different sections of the template that generates evidences by linking relevant documents. The application is available in a workspace to members of the Internal Evaluation Committee (IEC) and a section for the technical review of the self-assessment report that the GPAQ performs.

Several standards are discussed in the report, most of them are related to the School in general, but some of them are specific for each study program. Any statement or justification included in the analysis must be supported by relevant documentation (evidence). An External team of auditors (external panel), appointed by AQU analyses the report, reviews the evidence and pays a visit to the School. For one or more days, the external panel holds meetings with several groups of stakeholders, visits the facilities and analyses in situ, if further documentation is needed. The panel elaborates a report that is delivered to AQU for final approval.

The self-assessment report for accreditation considers six standards: the quality of the study program, the relevance of public information, the effectiveness of IQAS, the adequacy of the faculties to the study program, the effectiveness of the learning support systems and the quality of the results of the programs.

The implementation of the IQAS has been fundamental in order to analyse the 6 standards, the evidences and the improvement proposals included in the report.

As explained in previous section, since the implementation of IQAS, the School gather:

- Historical values of indicators related to the quality processes of the School.

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- The annual reports provided by the responsible for the processes including objectives, actions and results. Depending on the achievements, an evaluation is issued.
- The Annual Monitoring Reports submitted to the AQU containing detailed proposals for improvement and, in some cases, proposals for some modifications in the study programs.

Furthermore, and linked to each process constituting IQAS of the School, a documentary check of system own evidences is available. Often, these evidences are included in the report.

Given the previous analysis and documents generated internally along the life cycle of the degrees, the final presentation of the self-assessment report has been much more agile and detailed, producing a report of excellent quality.

4.1. Self-assessment report. Internal organization

Figure 3 shows the flowchart for the process leading to the elaboration of the self-assessment report required for accrediting the degree programs at the EET-UPC.

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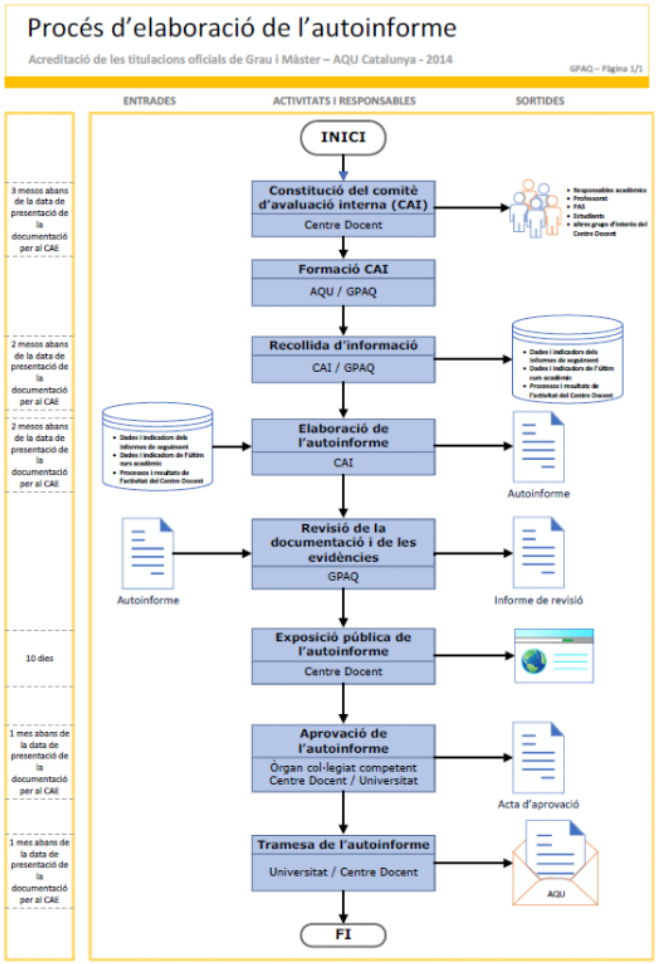

Figure 3 Elaboration of the self-assessment report

The first step was the creation of a self-assessment commission (SAC) whose composition and functions were approved by EET-UPC. Table 3 shows the composition and functions of SAC. As shown in the flowchart (see Figure 3), the SAC was responsible for the elaboration of the report which, once reviewed by the GPAQ and made available to the public, was approved by the Board of the Centre.

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Table 3. Composition and functions of the self-assessment commission (SAC)

Stamen	Description	Responsibilities for the accreditation	Number
Faculties	Coordinators of the study programme	Assessment, review/editing of the report, evidences	7
Administrative staff	Head of administration	Editing, technical consulting	6
	Responsible for the direction area	Technical consulting, evidences	
	Academic management	Technical consulting, evidences	
	IT manager	Technical consulting, evidences	
	Logistics and services	Technical consulting, evidences	
	Direction Assistant	Technical consulting, evidences	
Direction	Director	Editing of the report, evidences	3
	Vice director for quality	Editing of the report, evidences	
	Vice director for academic organization	Editing of the report, evidences	
Students	Students representatives	Assessment, review/editing of the report	4
Enterprise	Companies	Assessment, review/editing of the report	1
Total			**21**

The self-assessment Commission decided the appointment of four members to start setting out a draft document (see Table 3). The first draft was reviewed and modified by the rest of the members in the Commission. This working method enabled the possibility to all the individuals involved to contribute with data and expertise, to the analysis.

The report is public (Spanish only) and available to all groups (internal and external) through the website of the School (EET 2015).

The External team of auditors, in turn, issued a report reviewing the evidences available, and requesting some clarifications and additional information regarding some specific evidences.

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4.2 Contents of the self-assessment report

As stated above the report for accreditation included the analysis of the 6 quality standards criteria set by AQU:

• Standard 1: Programme quality (analysis at School level): The programme's design (competences profile and structure of the curriculum) is updated according to the requirements of the discipline and it meets the academic required level according to QF-EHEA (MECES) in Spain.

• Standard 2: Relevance of public information (analysis at school level): The institution properly informs all stakeholders of the programme characteristics and the management processes necessary for quality assurance.

• Standard 3: Efficacy of the programme internal quality assurance system (analysis at school level): The institution has a formal internal quality assurance system that assures the quality efficiently and the continuous improvement of the program.

• Standard 4: Adequacy of faculties for the programme (analysis at school level): Faculties are enough in number and their profile fits academic needs according the quality criteria.

• Standard 5: Effectiveness of learning support systems (analysis at school level): The institution has adequate and efficient guidance services and resources for student learning.

• Standard 6: Quality of programme learning outcomes (analysis at specific degree level): Learning and assessment activities are consistent with the programme competences profile. The outcomes of these processes are adequate in terms of both academic achievements, which correspond to the programme's level as of the QF-EHEA in Spain, and the academic and employment indicators.

As previously stated, each quality standard is associated to evidences that support the analysis. From the analysis, several proposals of improvement are included in the report.

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At Table 4 we highlight some contents of the report related to the standards.

Table 4 Relevant aspects of the accreditation report

Standard	important contents
Standard 1: Programme quality	Analysis on student's profile. Academic coordination
Standard 2: Relevance of public information	Information resources and their adequacy to the different interest groups
Standard 3: Efficacy of the programme's internal quality assurance system	Importance of SGIC in the lifecycle of the degrees Mechanisms for information compilation about the learning outcomes, results and satisfaction
Standard 4: Adequacy of faculties	Analysis of the faculties' adequacy, curriculum, experience, research. Analysis of the degree of satisfaction of students regarding faculties Analysis of the satisfaction of UPC with with regard to faculties. Mechanisms for assigning subjects to faculties.
Standard 5: Efficiency of learning support systems	Explanation and analysis of the professional and academic counselling provided by the School. Description and analysis of learning resources available to the students and pedagogic approaches.
Standard 6: Quality of programme (learning) outcomes	4 subjects of every degree programme were selected and studied specifically including achievement, evaluation system, competences provided, learning methodology. Results of the evaluation of every subject of the syllabi. Final thesis, issues, typology, results. Traineeship possibilities, companies and placements Relevant indicators of the development of the students. Employment data analysis.

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4.3 Visit of the external evaluation committee

The UPC GPAQ informed us on the composition of the External Team of Auditors, and proposed a schedule for the visit to the school. All panel members were external to our institution and were selected according to a specific profile and requirements set by AQU. The external committee consisted of a president, two academic members, a representative from a company, a student representative and a secretary.

Table 5 shows the schedule for the visit. This programme was agreed on the proposal of the committee.

The visit schedule shows that an important point is the focus on interviewing representatives of different agents present at the educational institution: responsible, teachers, students, graduates and employers. Apart from visiting the facilities, the External Team of Auditors objective is to gather opinions and comments from several groups, assessing their satisfaction with the services and academic programs of the school.

Table 5 Programme of the visit of the External Team of Auditors

May 13th of 2015	
Timetable	**Activity**
8:30-10:30	External Team of Auditors previous work (documentation review)
10:30-10:45	Self-assessment team reception by the management team
10:45-11:30	Interview with the management team and the self-assessment team
11:30-11:45	Break
11:45-12:30	Interview with Initial Common Phase Industrial Engineering students, and Initial Phase of Bachelor's degree in Audio-visual Systems Engineering students.
12:30-13:15	Interview with students of 3rd and 4th BD in Audio-visual Systems Engineering BD in Mechanical Engineering BD in Electrical Engineering BD in Industrial Electronics and Automatic Control Engineering

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May 13th of 2015	
Timetable	**Activity**
13:15-14:00	Interview with students of 3rd and 4th BD in Industrial Design and Product Development Engineering BD in Textile Technology and Design Engineering BD in Chemical Engineering
14:00-15:00	Lunch
15:00-16:00	External Team of Auditors work
16:00-16:45	Graduates interview
16:45-17:30	Employers interview
May, 14th of 2015	
Timetable	**Activity**
8:30-9:15	Interview with Initial Common Phase Industrial Engineering teachers and Initial Phase of Bachelor's degree in Audio-visual Systems Engineering teachers.
9:15-10:00	Teachers staff interview (not included in previous audience)
10:00-11:00	Space and facilities visit
11:00-11:30	Break
11:30-12:15	Public audience/ panel´s work
12:15-13:00	2nd Interview with the management team and the self-assessment team
13:00-13:45	Preparation of conclusions
13:45-14:15	Preliminary conclusions and farewell
14:15-15:15	Lunch
15:15-17:15	External Team of Auditors work/ Start preparing the external evaluation report

The school management team proposed the members for each group, and Vice director for Quality organized the meetings. Table 6 shows the selection criteria for the representatives of each group.

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The purpose of these meetings was to inform about:

- The accreditation process and its importance.

- Members who were part of the External team of Auditors.

- The programme of the visit.

- Possible issues at hearings. The questions listed in the "Guide to the accreditation of recognized bachelor and master's degree programs" Version 1.0 "published by the AQU (AQU, 2013).

Table 6 Criteria for the selection of the representatives of each group at the audience

Group	Criteria	Number
Students 1st and 2ond year (2 for degree minimum)	Students representatives	10
Students 3rd and 4th year (2 for degree minimum)	Must have participated in international or Company placement programs Must be doing final thesis	17
Faculty 1st and 2ond year (2 for degree minimum)	Coordinator of compulsory subjects Representatives of the departments involved in the degree	8
Faculty 3rd and 4th year (2 for degree minimum)	Lecturers assigned to the departments involved in the degree Wide age range	13
Graduated (2 for degree minimum)	Graduates with double degree Master students Working students	9
Employers	Companies that provide placements for students Companies that participate in grants, agreements, etc.	7
TOTAL		**64**

Including the Self-assessment team, members of the management team and the participants in the public audience, more than 90 people met the External Team Auditors.

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The visit of the facilities was programmed to show common spaces (classrooms, study rooms, computer rooms, library ...) and teaching laboratories. The coordinators provided the committee with a dossier describing the labs that included the following data:

- Use of the laboratory in the degree.

- Name of the coordinator of the degree.

- Name of the facility.

- Capacity (Number of workplaces).

- Subjects that make use of the facility.

- Photographs, name, description and special features of the most relevant equipment.

Before concluding the visit, the external panel presented preliminary findings to the management. At this moment, we are expecting the external evaluation report, but the EAC anticipated that they will propose the accreditation of every degrees at the time they highlighted a number of good practices related to various standards.

They highlighted specifically some aspects as good relationship with industrial environment, learning support systems; tutoring and counselling, internationalization, library resources and digital campus, also praised the evaluation system for transversal competences and and labour market indicators.

5. Conclusions

The implementation of IQAS at EET-UPC has been effective for continuous improvement and quality assurance for the programme degree offered. IQAS has enabled the monitoring and the appropriate modification of academic programs through the validation and accreditation thereof.

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The accreditation process of the degree programs offered by the EET-UPC has been carried out on a normal course. We emphasize the high participation and collaboration shown by the various stakeholders in this process. The strong relationship with the different interest groups has facilitated the External Team Auditors to have a first-hand perception of stakeholder's opinions and considerations, beyond the specific figures and indicators that appear on the self for accreditation.

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