# 6. ES: España (Spain)

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#### 6.1. General information



The access to University is dependent on the passing of an examination called "Selectividad", which takes place right after the completion of the "Bachiller" (at the age of 18). A general view of the Spanish higher educational system is depicted in A general view of the Spanish higher educational system is depicted in figure 6.1. As of 2008, most of the degrees still follow the general schema represented in the upper part of the figure. However, some Universities have started to implement the new Bologna schema, depicted in blue. In particular, the 240 credit Bachelor

degrees and the 60-120 credit Master degrees, following the *Real Decreto 1393/2007 of 29<sup>th</sup> October* that regulates the organization of the official Higher Education degrees.

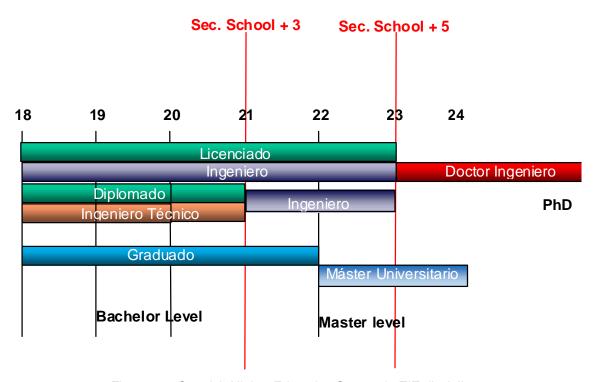


Figure 6.1: Spanish Higher Education System in EIE disciplines.

#### 6.1.1 Electrical and Information Engineering in Spain, boundaries of the field of study

Basically, EIE consists of three major areas:

- 1. Telecommunication engineering: devoted to information and communications technologies;
- 2. Informatics, which can correspond to computer engineering in Anglo-Saxon countries;
- **3.** *Electro-mechanics* and *Automation*: the part of electromagnetism concerned with the generation and distribution of power as well as systems control.

The obtainable diplomas are issued in accordance with the division above, although the so-called "boundaries" are occasionally fuzzy (see 7.3).

#### 6.1.2 Content, degrees and accreditations

The content of the degrees must be compliant with:

- **a.** *Directrices generales comunes*, or general common guidelines, which define the general structure of the studies.
- **b.** *Directrices generales propias*: or specific guidelines for a given diploma (more at http://www.mec.es/consejou/titulos/boestitu.html).

The guidelines above establish the minimum requirements necessary in order to obtain a particular diploma. These directions are set by an expert's commission; this commission consists of members of the academic community appointed by the *Consejo de Coordinación Universitaria* (University Council).

The Consejo de Coordinación Universitaria is a board under the Ministerio de Educación, Cultura y Deporte for the improvement of teaching and research, the co-ordination of universities and the planning of higher education. It consists of a president (the minister of the government responsible for university education), the Consejeros de Educación (education ministers) of the Comunidades Autónomas (the 17 autonomous regions of Spain), the rectors of all the public universities of the country and fifteen people of acknowledged qualification, ten of which are elected by the national parliament and five by the government.

In addition to the above, the syllabi may optionally comply with the:

c. Directrices universitarias, which are guidelines specifically set by each university.

Each university periodically releases the syllabi of its studies; since these are often updated, a web search in the site of each institution is probably the best way to obtain them.

#### 6.1.3 Implementation of the Bologna-BMD system in Spain

At present two systems coexist:

**1.**A "**5-7**" system: 5 years, divided in two cycles of 3 and 2 years respectively, for getting a master (Ingeniero); afterwards a third cycle of two years and a thesis for the doctorate (Doctor Ingeniero).

**2.**A "**3-5-7**" system: 3 years for becoming a bachelor (Ingeniero Técnico), then joining the second and third cycles above for getting the master (Ingeniero) and the doctorate (Doctor Ingeniero).

**3.**A "**4-5/6-**" system: 4 years for becoming a Bachelor (Graduado), then joining the second and third cycles above for getting the Master (Máster Universitario) and the Doctorate (Doctor). This system represents the adopted Bologna model.

The design of the new curricula is quite different from the previous ones. In particular, they must contain more elements than the mere description of the formative contents. This new model conceives the curriculum as a project of implantation of a higher education degree. Thus, in order to obtain the corresponding approval, the curriculum should include:

- Justification
- Objectives
- Students' Admission
- Contents
- Planning
- Resources
- Expected Results
- Quality Assurance System

Universities should propose the assignment of the new degrees to a particular knowledge branch. In our case, EIE degrees will lie in the Engineering and Architecture branch. Moreover, some basic subjects have been defined for each of the each knowledge branches. In our case, these subjects are: Business, Graphic Expression, Physics, Computing, Mathematics and Chemistry.

There is currently a great controversy over the implementation of the Bologna-BMD model, particularly concerning those degrees that enable to practice regulated professions (Industrial Eng. and Telecommunication Eng.). In these cases, in addition to the definition of the corresponding curriculum, some competences files have to be included.

# 6.2. Figures on the weight of EIE in Spain.

A few general statistics about education in Spain are presented in order to provide some context to the information on EIE.

The following table summarizes the most relevant figures concerning EIE education in the academic year 2005-2006;

Academic year 2005-2006	No. of registered students		
	Total	% Male	% Female
INGENIERÍAS TÉCNICAS (Bachelor level)	Total	Walc	Terriale
Ingeniería Técnica Industrial (EIE) (Industrial Engineering)	29.674	85,6	14,4
Ingeniería Técnica Informática (Computer Engineering)	61.208	81,5	18,5
Ingeniería Técnica de Telecomunicación (Telecommunications Engineering)	19.046	77,5	22,5
INGENIERÍAS (Master level)			
Ingeniería Industrial (EIE) (Industrial Engineering)	21.273	80,4	19,6
Ingeniería Informática (Computer Engineering)	30.033	82,5	17,5
Ingeniería de Telecomunicación (Telecommunications Engineering)	19.139	73,2	26,8

No. of graduated students			
Total	% Male	% Female	
3.734	76,2	23,8	
5.704	75	25	
2.072	70,8	29,2	
2.903	76,1	23,9	
3.059	75,5	24,5	
1.824	68,9	31,1	

(Source: 'Ministerio de Ciencia e Innovación. Estadística Universitaria. Resultados detallados. Curso 2005-2006'

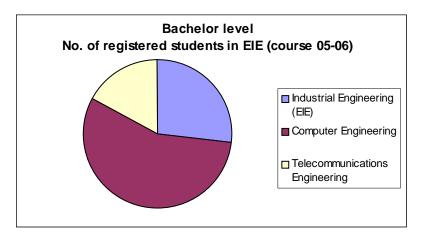


Figure 6.2a: Distribution of students enrolled in EIE Bachelor according to their character.

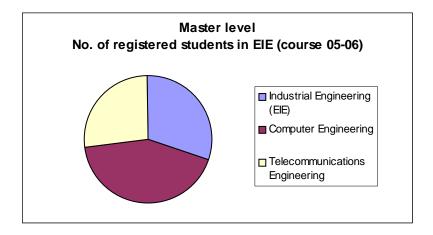


Figure 6.2b: Distribution of students enrolled in EIE Master studies according to their character.

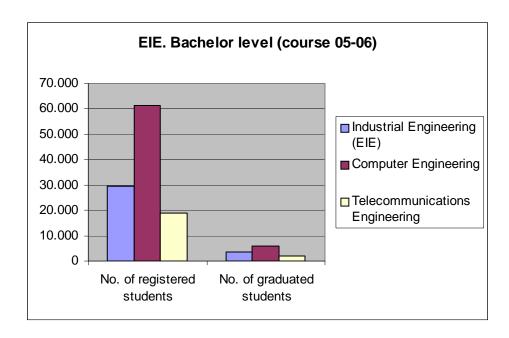


Figure 6.3: Detail of the figures concerning EIE Bachelor students.

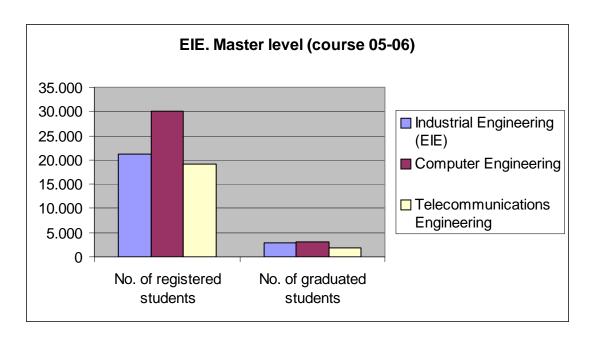


Figure 6.4: Detail of number of students pursuing an EIE Master.

## 6.3. Degrees in EIE in Spain

The degrees related to EIE are listed below, more or less in correspondence with section 7.1.1, as well as the level achieved. The links below define their core contents (main subjects), as provided in a wide but *mandatory* sense by the Ministry. Along with them, *obligatory* as well as *optional* subjects, both ruled by each Centre, complete the degree syllabus. These latter subjects (obligatory and optional) must comply with each particular University's regulations, as already mentioned in epigraph 7.1.2.c, and, due to the large amount of institutions, they are not linked in this document.

The doctoral study (Doctores Ingenieros or PhD) is only possible after the master degree.

#### 6.3.1 Before bachelor (Formación Profesional or technician level)

There are two levels for a technician degree. The lower, or *Formación Profesional Específica de Grado Medio*, runs parallel to the *Bachillerato* (high school), while the upper, or *Formación Profesional Específica de Grado Superior* can only be obtained afterwards. We will only refer here to the latter.

The duration of these studies is 2000 hours, and the specialities related to EIE are:

- T1. Development of electronic products (Desarrollo de Productos Electrónicos)
- **T2.** Electrotechnical installations (*Instalaciones Electrotécnicas*)
- T3. Regulation and automatic control systems (Sistemas de Regulación y Control Automáticos)
- **T4.** Telecommunications and informatic systems (*Sistemas de Telecomunicación e Informáticos*)
- T5. Informatic applications development (Desarrollo de Aplicaciones Informáticas)
- **T6.** Informatic systems management (Administración de Sistemas Informáticos)

More information can be obtained from the web of the Ministry.

#### 6.3.2 Bachelor level (Ingeniero Técnico)

- B1. Ingeniero Técnico de Telecomunicación. There are four different specialities:
  - Telecommunications systems (Sistemas de Telecomunicación)
  - Electronic systems (Sistemas Electrónicos)
  - Sound and Image (Sonido e Imagen)
  - Telematics (Telemática)
- B2. Ingeniero Técnico en Informática de Gestión
- B3. Ingeniero Técnico en Informática de Sistemas
- B4. Ingeniero Técnico Industrial, with only two specialities related to EIE:
  - Electricidad
  - Electrónica Industrial

- B5. Diplomado en Radioelectrónica Naval
- 6.3.3 Master level

#### 6.3.3.1 Ab initio master

- M1. Ingeniero de Telecomunicación
- M2. Ingeniero en Informática
- M3. Ingeniero Industrial (some specialities only)

#### 6.3.3.2 Master level (Bachelor level + 2nd cycle)

These diplomas may only be awarded after a bachelor degree, enrolling for a second cycle of two years.

- M4. Ingeniero en Automática y Electrónica Industrial
- M5. Ingeniero en Electrónica
- M6. Licenciado en Radioelectrónica Naval

#### 6.4. References

The information given in this monograph is based on the following documents and web links:

- La integración del sistema universitario español en el Espacio Europeo de Enseñanza Superior. Documento-Marco. Ministerio de Educación, Cultura y Deporte. Febrero, 2003.
- El grado en el Espacio Europeo de Educación Superior (EEES). Grupo de trabajo de la Conferencia de Rectores de las Universidades Españolas (CRUE) sobre Espacio Europeo de Educación Superior. 16 de marzo de 2003.
- Ministerio de Educación y Ciencia. Real Decreto 1393/2007, de 29 de octubre. BOE núm 260.
- Ministerio de Ciencia e Innovación. Estadística Universitaria. Resultados detallados. Curso 2005-2006:

http://www.micinn.es/univ/jsp/plantilla.jsp?id=E125&area=ccuniv&contenido=/ccuniv/html/estadistica/curso2005-2006/Resultados\_detallados/index.html

- Datos y Cifras del Sistema Universitario Español. Curso 05-06
- Web of the Ministry for Science and Innovation at:

http://www.micinn.es



# Doctoral

Studies

# 6.5. Doctoral Studies in Spain

# 6.5.1. Supervision

#### Scientific Board or Supervisor

The <u>Scientific board</u> is composed by three members elected by the Faculty or the Department. The student, <u>in most cases</u>, has the same personal supervisor during its thesis work on an <u>active</u> research area of the supervisor.

### Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

#### Who can be a Supervisor

Any professor or lecturer in the department with PhD.

#### Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	YES
3.	Assigning a thesis subject	YES

#### **Duration**

Three to four years.

### 6.5.2. Development

#### Courseware?

Yes.

#### Course Work

- **1.** The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as special doctoral courses.
- **2.** Extension: 200 hours of theory, 20 hours per course unit, depending on the course CP.
- 3. Credit system: no ECTS system. Twenty credits allocated to course work (2 per unit).
- **4.** No monitoring of the doctoral student. In case of failure the student must retake the exam or take a different course unit.

### Contribution to Teaching

Supervision of undergraduate laboratory work

#### Presentation of Work

- **1.** In the department.
- **2.** At national conferences.
- 3. At international conferences and journals.

#### 6.5.3. Thesis Work

#### **Submission of Doctoral Written Thesis**

- 1. <u>Language</u>: Spanish. Use of alternative language only in case of European PhD thesis.
- 2. <u>No credits</u> allocated to the doctoral thesis.
- 3. The doctoral thesis is a previously unpublished substantial written report

#### **Oral Presentation of Thesis Work**

- 1. <u>Language</u> normally used: Spanish. No alternative languages.
- **2.** Oral presentation with oral examination for an open/public audience.
- 3. <u>Duration</u>: typical duration of 1 hour including examination with an upper time limit of 1,5 hours.

### 6.5.4. Examination

#### **Thesis Examination Board**

- 1. <u>Composition</u>: two internal examiners and one external examiner (three members).
- 2. <u>Selection</u> by the supervisor.

#### **Evaluation**

- **1.** Result based on the reading of the thesis and the oral presentation of the thesis work, with a grading system not specified.
- **2.** <u>If the student fails</u>, he/she may resubmit a revised thesis or do further work as specified by the examination board.

## 6.6. Questionnaires

3.1.5.1

3.1.6

department?

# Spain

3 - ACTIVITIES DURING DOCTORAL STUDIES 3.1- SUPERVISION OF DOCTORAL STUDIES 3.1.1 Are the doctoral studies supervised by a Scientific Board/supervisor? If no, YES please proceed to 3.1.5. 3.1.2 How many members are in the Scientific Board? 3 3.1.3 How are the members of the Scientific Board chosen? 3.1.3.1 Elected by the Faculty, Department? Υ 3.1.3.2 Chosen by the student? Y/N 3.1.3.3 Chosen in another way? Please specify: Y/N 3.1.4 Which are the main tasks of the Scientific Supervisor? 3.1.4.1 General management of the doctoral studies. Υ 3.1.4.2 Deciding the layout of the course, advising the students on their Υ coursework. 3.1.4.4 Assigning the thesis subject. Υ 3.1.4.5 Other. Please specify: Supervision of the research work. 3.1.5 Does the student need a personal supervisor during her/his studies? Υ

Does the same person supervise her/his thesis work?

Must the subject of the doctoral thesis be an active research area in the

#### 3.1- SUPERVISION OF DOCTORAL STUDIES 3.1.7 The doctoral thesis subject is normally assigned: 3.1.7.1 At the beginning of the doctoral studies? Υ 3.1.7.2 After a specified period of coursework? Y/N 3.1.7.3 Other. Please specify: Y/N 3.1.8 The thesis supervisor of a doctoral student can be: Any professor or lecturer in the department? 3.1.8.1 Yes 3.1.8.2 Any researcher in the department? Y/N 3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department? 3.1.8.3 Any researcher in another institution? Y/N 3.1.8.3.1 In the latter case, is there a need for an internal supervisor? Y/N 3.1.8.4 Other methods. Please specify: 3.1.9 The thesis subject is assigned by: 3.1.9.1 Agreement between the student and the proposed supervisor? 3.1.9.2 Other methods. Please specify: Y/N 3.2- COURSE WORK 3.2.1 Do the students have to take coursework during their doctoral degree Y/N preparation? If no, please proceed to 3.3. 3.2.2 Extension and assessment. According to course CP, f doctoral studies 3 years or 4 years for part-time (working) students. What is the number of contact hours spent in 3.2.2.1 Year Year Year Year coursework in each year? 2 3 hrs hrs hrs hrs 200 hours, in theory. 20 hours per course. PhD work between 3 and 4 years.

#### 3.2- COURSE WORK

#### 3.2.2.2 In which form is this coursework offered?

- As specialist graduate course units.
- As course units taken from the undergraduate programme.
- Other. Please specify.

Υ

Special doctoral courses.

**3.2.2.3** Is the coursework assessed by examinations? If not, please give details:

Υ

#### 3.2.3 Credit system

**3.2.3.1** Is the coursework in your institution described by a credit system?

Υ

**3.2.3.2** Is it the ECTS system?

Ν

If not, what is the relationship with ECTS?

**3.2.3.3** How many credits are allocated to coursework?

credits

20 Credits in total – 2 credits/course. 12 crds. research work, different from PhD.

#### 3.2.4 Monitoring

**3.2.4.1** Do you monitor the performance of the doctoral student taking coursework?

Υ

Not the courses. The supervision involves the 12 credits in research work and the PhD research only.

- 3.2.4.2 What regulations apply in case of failure in one or more course units?
  - Retake the exam.
  - Take a different course unit.

Either is possible.

#### 3.3- PRESENTATION OF WORK RESULTS:

- **3.3.1** In the department.
- **3.3.2** At national conferences.
- **3.3.3** At international conferences.

National and international magazines and conferences.

3.4- CON	TRIBUTION TO TEACHING:	
3.4.1	Supervision of undergraduate laboratory.	YES
3.4.2	Teaching undergraduate courses.	NO
4 - AWAF	RDING OF DOCTORAL DEGREE	
4.1- SUBI	MISSION OF DOCTORAL THESIS	
4.1.1	Which language is normally used for the thesis?	Spanish
4.1.2	Are alternative languages used for the thesis? Please Specify:	
	Only in case of European PhD Thesis.	
4.1.3	Which language is normally used for the oral presentation and/or examination?	Spanish
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	No
4.1.5	Are credits allocated to the doctoral thesis?	No
4.1.6	The doctoral thesis is:	
4.1.6.1	A previously unpublished substantial written report.	
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	
4.1.6.3	Other. Please specify:	
4.2- THES	SIS EXAMINATION AND DEGREE AWARDING	
4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of	:
4.2.2.1	Internal examiners.	2
4.2.2.2	External examiners.	3

4.2.2.3

TOTAL.

## 4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3	How is the examination board chosen?	
4.2.3.1	By the supervisor.	Yes
4.2.3.2	By the scientific committee of the institution.	
4.2.3.3	By the rector or equivalent.	
4.2.3.4	By the national ministry.	
4.2.3.5	Other. Please specify:	
4.2.4	Do the examiners base their evaluation mark on:	
4.2.4.1	Reading the thesis.	Υ
4.2.4.2	The oral presentation of the thesis work.	Υ
4.2.4.3	Both.	
4.2.4.4	What is the typical duration of the oral part of the thesis examination, if applicable?	1 hour
4.2.4.5	Is there an upper limit to the duration of the thesis examination?	
	1.5 hours.	
4.2.5	Is the oral part of the examination taken behind closed doors?	Open
4.2.6	What happens if the student fails?	
4.2.6.1	May not resubmit for doctorate.	Y/N
4.2.6.2	May resubmit revised thesis.	Υ
4.2.6.3	May do further work as specified by examination board.	Υ
4.2.6.4	If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:	Y/N
4.2.7	Is there a grading system for the doctoral degree based on the quality of the work?	Υ

# ES: España (Spain)

The list of universities and diplomas can be obtained easily from the web of the Ministerio de Educación, Cultura y Deporte (Ministry for Education, Culture and Sport) at http://www.mec.es/consejou/oferta/index.html

Region	Name of the institution	http address
ANDALUCÍA	Universidad de ALMERÍA	http://www.ual.es
ANDALUCÍA	Universidad de CÁDIZ	http://www.uca.es
ANDALUCÍA	Universidad de CÓRDOBA	http://www.uco.es
ANDALUCÍA	Universidad de GRANADA	http://www.ugr.es
ANDALUCÍA	Universidad de HUELVA	http://www.uhu.es
ANDALUCÍA	Universidad de JAÉN	http://www.ujaen.es
ANDALUCÍA	Universidad de MÁLAGA	http://www.uma.es
ANDALUCÍA	Universidad de SEVILLA	http://www.us.es
ARAGÓN	Universidad de ZARAGOZA	http://www.unizar.es
ASTURIAS	Universidad de OVIEDO	http://www.uniovi.es
BALEARS, ILLES	Universitat de les ILLES BALEARS	http://www.uib.es
CANARIAS	Universidad de LAS PALMAS DE GRAN CANARIA	http://www.ulpgc.es
CANARIAS	Universidad de LA LAGUNA	http://www.ull.es
CANTABRIA	Universidad de CANTABRIA	http://www.unican.es
CASTILLA Y LEÓN	Universidad CATÓLICA DE ÁVILA	http://www.ucavila.es/
CASTILLA Y LEÓN	Universidad de BURGOS	http://www.ubu.es
CASTILLA Y LEÓN	Universidad de LEÓN	http://www.unileon.es
CASTILLA Y LEÓN	Universidad PONTIFICIA DE SALAMANCA	http://www.upsa.es
CASTILLA Y LEÓN	Universidad de SALAMANCA	http://www.usal.es
CASTILLA Y LEÓN	Universidad de VALLADOLID	http://www.uva.es
CASTILLA-LA MANCHA	Universidad de CASTILLA-LA MANCHA	http://www.uclm.es
CATALUÑA	Universidad AUTÓNOMA DE BARCELONA	http://www.uab.es
CATALUÑA	Universidad de BARCELONA	http://www.ub.es
CATALUÑA	Universitat OBERTA DE CATALUNYA	http://www.uoc.es/
CATALUÑA	Universidad POLITÉCNICA DE CATALUNYA	http://www.upc.es
CATALUÑA	Universitat POMPEU FABRA	http://www.upf.es
CATALUÑA	Universitat RAMÓN LLULL	http://www.url.es/
CATALUÑA	Universitat de VIC	http://www.uvic.es/
CATALUÑA	Universitat de GIRONA	http://www.udg.es
CATALUÑA	Universitat de LLEIDA	http://www.udl.es
CATALUÑA	Universitat ROVIRA I VIRGILI	http://www.urv.es
EXTREMADURA	Universidad de EXTREMADURA	http://www.unex.es
GALICIA	Universidade da CORUÑA	http://www.udc.es
GALICIA	Universidade de VIGO	http://www.uvigo.es
LA RIOJA	Universidad de LA RIOJA	http://www.unirioja.es
MADRID	Universidad de ALCALÁ	http://www.uah.es
MADRID	Universidad ALFONSO X EL SABIO	http://www.uax.es/
MADRID	Universidad ANTONIO DE NEBRIJA	http://www.nebrija.es
MADRID	Universidad AUTÓNOMA DE MADRID	http://www.uam.es
MADRID	Universidad CAMILO JOSÉ CELA	http://www.ucjc.edu
MADRID	Universidad CARLOS III DE MADRID	http://www.uc3m.es

Region	Name of the institution	http address
MADRID	Universidad COMPLUTENSE DE MADRID	http://www.ucm.es
MADRID	Universidad EUROPEA DE MADRID	http://www.uem.es
MADRID	Universidad FRANCISCO DE VITORIA	http://www.mec.es/consejou/oferta
		/univer/ufv.html
MADRID	Universidad POLITÉCNICA DE MADRID	http://www.upm.es
MADRID	Universidad PONTIFICIA COMILLAS	http://www.mec.es/consejou/oferta
		/univer/upco.html
MADRID	Universidad REY JUAN CARLOS	http://www.urjc.es
MADRID	Universidad SAN PABLO C.E.U.	http://www.ceu.es
MADRID	Universidad NACIONAL DE EDUCACIÓN A DISTANCIA	http://www.uned.es
MURCIA	Universidad CATÓLICA SAN ANTONIO	http://www.ucam.edu
MURCIA	Universidad de MURCIA	http://www.um.es
MURCIA	Universidad POLITÉCNICA DE CARTAGENA	http://www.upct.es
NAVARRA	Universidad de NAVARRA	http://www.unav.es
NAVARRA	Universidad PÚBLICA DE NAVARRA	http://www.unavarra.es
PAÍS VASCO	MONDRAGÓN UNIBERTSITATEA	http://www.muni.es
PAÍS VASCO	Universidad de DEUSTO	http://www.deusto.es
PAÍS VASCO	Universidad del PAÍS VASCO/EUSKAL HERRIKO UNIBERTSITATEA	http://www.ehu.es
VALENCIANA, COMUNIDAD	Universidad de ALICANTE	http://www.ua.es
VALENCIANA, COMUNIDAD	Universidad MIGUEL HERNÁNDEZ	http://www.umh.es
VALENCIANA, COMUNIDAD	Universitat JAUME I DE CASTELLÓ	http://www.uji.es
VALENCIANA, COMUNIDAD	Universidad CARDENAL HERRERA-CEU	http://www.ceu.es
VALENCIANA, COMUNIDAD	Universidad POLITÉCNICA DE VALENCIA	http://www.upv.es
VALENCIANA, COMUNIDAD	Universitat de VALENCIA ESTUDI GENERAL	http://www.uv.es