EUROPEAN CHEMICAL
REGIONS NETWORK

STUDY 1
«Science and Chemical Industry»

Principality of Asturias

Gobierno del Principado de Asturias

IDEPA
Instituto de Desarrollo Económico del Principado de Asturias

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AIQPA
Asociación de Industrias Químicas y de Procesos de Asturias

The Association of Chemical and Process Industries of Asturias (AIQPA) was appointed by the Institute for Economic Development of the Principality of Asturias (IDEPA) to perform the study "Science and Industry", that discloses the structure of the science network in the Principality and the links with the Asturian chemical industry. The association AIQPA declares in this paper the interest to promote collaboration between research and productive sectors.

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Oviedo, 15th November 2005
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1. RELEVANT DATA REGARDING THE ASTURIAN ECONOMY.

The Principality of Asturias is located in the north of Spain and has a surface area of 10,603 square kilometres. The total population, as of January 1st 2004, is 1,073,760 people. Approximately 80 % of this population is concentrated in the central zone, within which the three largest and most important cities of the Principality are to be found. The region has been undergoing a slight population decrease since the 1980s.

The working population statistic for Asturias in May 2005, was of 448,800 people, which then represented an employment level regarding the total population of 47.9% and an unemployment level of 11.4%. Between 1995 and 2003 the gross domestic product level of the Principality of Asturias registered a growth rate of 2.2%, a little bwer than the average growth rate for all of Spain (3.3%).

As regards the European Union figures, The Principality of Asturias occupied position number 173 of the 215 European regions NUTS in terms of GDP per inhabitant. The influence of the Principality of Asturias within the economy of the European Union of 15 member states (UE15) is around 0.2 % and approximately 2.5 % with respect to the Spanish economy.

The contribution of the different productive sectors to the VAB of the Principality of Asturias in 2003 was 64.4 % in the services sector, 33.4 % in industry, energy, and construction, and 2.2 % in agriculture, fishing and livestock.

In Asturias, there are 68,175 active companies, which represent 2.2 % of the more than 3 million active companies in Spain.

Nº companies Principality of Asturias	68.175
Nº companies / 1000 inhabitants	63
Nº companies Spain	3.064.129
Industrial structures respect to Spain	2,2 %

Source: INE. DIRCE, Municipal Register of inhabitants (1st January 2005) and EPA (2004).

2. DESCRIPTION OF THE ASTURIAN CHEMICAL INDUSTRY.

According to the Central Business Directory (DIRCE) of the National Statistics Institute (INE), the number of chemical companies in Spain, on 1st January 2001 was 4,684.

Approximately 48 % of chemical production is concentrated in Catalonia. The chemical sector provides 10 % of GNP in Spain and provides around 500,000 directly related jobs.

On 1st January 2001, 1.3 % of Spanish chemical companies (62 companies) were located in the Principality of Asturias.

These 62 Asturian chemical companies generated, in the year 2000, a turnover of 475 million euros and employed (directly related workforce) 1,779 people. This value represented 1.3 % of the total employment in the chemical industry in Spain.

The principal activities of the chemical sector in Asturias are carbochemistry, pharmaceutical products, fertilizers, and synthetic fibres.

According to the data of the Institute de Foreign Trade (ICEX) the exportation of chemical products generated, in the year 2001, 8.6 % of the total income of the Asturian commercial balance.

3. DESCRIPTION OF THE LOCAL SYSTEMS OF UNIVERSITY EDUCATION: OVIEDO UNIVERSITY.

Currently, the Spanish educational system structures non-university education into Infant Education, Primary Education, Compulsory Secondary Education (ESO), and Post obligatory Secondary Education. Post obligatory Secondary Education includes the Bachillerato, the formative cycles of Medium Grade and Superior Grade, and the teaching of specific subjects such as graphic arts and design.

Chart 3.1. Inscription data for the academic year 2003-2004 at the different educational levels in the region.

Educational level	Nº pupils	%
Infant Education	20.466	12,5
Primary Education	43.137	26,3
Compulsory Secondary	36.687	22,4
Bachillerato and Professional training	29.658	18,1
Special Education	499	0,3
University Education	33.343	20,4

Source: data and figures of the Asturias economy 2003, SADEI.

The University of the Principality of Asturias was inaugurated on 21st September 1608 in Oviedo. The first studies imparted, in the Minor Arts Faculty and the three Mayor Faculties of Legal Cannons, Law, and Theology have been extended over the years reaching a current status where it has more than forty thousand students, two thousand lecturers, a workforce of nearly a thousand, divided into 35 departments, 26 centres y 57 different degrees (chart 4.2).

The diversification of the studies, the history of the university itself and that of the region and the growth of the student population have led to the creation of various different campuses, decentralised from the city of Oviedo: in Gijón, the campus of Viesques and in another in Mieres. There are also university sites in another dozen other Asturian towns, largely in Avilés.

The courses offered, by educational levels, in the academic year 2003-2004 are indicated in chart 3.2.

Chart 3.2. Courses offered by Oviedo University and year of foundation.

Faculties:
Law (1608), Chemistry (1848), Philology (1892), Geology (1958), Biology (1961), Geography and History (1965), Medicine (1968), Economics and Business Studies (1974), Educational Sciences (1976), Science (1990), Psychology (1991), Philosophy (1993).
Technical Schools:
Mining Engineering (1959), Industrial Engineering, Computer Engineering and Telecommunication Engineering (1978, 1990 y 2000), Merchant Shipping (1979).
University Schools:
Teacher Training (1848), Technical Mining Engineering (1855), Gijón Business Sciences (1866), Technical Industrial Engineering (1887), Oviedo Business Sciences (1913), Nursing and Physiotherapy (1977 y 1990), Computing (1982), Social Work (1884), Labour Relations (1988), Tourism (1997).
Professional Schools:
Stomatology (1978).

Source: www.uniovi.es, 2005.

3.1. University preparation resources in the chemical field in Asturias.

The preparation for the chemical sector offered by Oviedo University is fairly diversified, here we shall focus our study on the degrees in chemistry, chemical engineering, industrial technical engineering in the industrial chemistry branch and biochemistry.

The degree course in Chemistry is one of the oldest and dates from 1848. Over the last three decades, it has been organised in three different study plans. This course is taught by 115 university lecturers, principally from the departments of Physics, Analytical Chemistry and Organic and Inorganic Chemistry and includes the subjects outlined in Annex IV.

The degree course in Chemical Engineering was created in 1994 and is taught by 71 university lecturers, principally from the department of Chemical Engineering and Environmental Technology, the teaching staff normally being completed by lecturers from the Chemistry Faculty and from the Higher School of Industrial Engineering. The subject offer of this degree course is reflected in annex IV.

The degree course in Industrial Technical Engineering in the Industrial Chemistry branch and Biochemistry could be considered as a transformation of a first cycle qualification granted in Oviedo University since 1972, which was later restructured into two study plans, the current organisation being established in 2000. The subject offer of this degree course is outlined in annex IV.

The Biochemistry degree course was created in 1996 as a second cycle degree and is taught, principally by lecturers from the Biochemistry of Molecular Biology Department of Oviedo University and offers the subject offer outlined in annex IV.

All of these degree courses will have to reform their study plans in order to adapt themselves to the requirements of the agreement regarding the creation of a common European university training scheme (The Bolonia Declaration), and accordance with the regulations establishing nowadays.

3.2. Data of interest.

Chart 3.3. Statistics, by academic years, of new intake students and graduates in the chemistry field at Oviedo University.

	New intake (first year) students							
Academic year	**97/98**	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**	**03/04**	**04/05**
Chemistry	209	202	132	124	146	108	86	69
Biochemistry	30	27	39	29	33	22	32	26
Technical Industrial Engineering Specialising in Industrial Chemistry	-	-	-	80	72	57	64	60
Chemical Engineering	74	66	79	76	71	73	53	57

	Graduates		
Academic year	**2002/03**	**2003/04**	**2004/05**
Chemistry	**143**	**104**	**116**
Biochemistry	**20**	**16**	**16**
Technical Industrial Engineering specialising in Industrial Chemistry	**23**	**26**	**29**
Chemical Engineering	**72**	**61**	**28**

[1] Data extracted from the Gauss computing application of Oviedo University.
[2] The official figures for September have not been confirmed. These data are not definitive.

Chart 3.4. Place of origin of Oviedo University students studying degree courses in the chemistry field (%).

	Asturias	Outside Asturias
Chemistry	95.5	4.5
Biochemistry	94.7	5.3
Technical Industrial Engineering specialising in Industrial Chemistry	97.2	2.8
Chemical Engineering	92.6	7.4

Source: Employability of Oviedo University graduates.
Economy and Public Administration Council of the Government of the Principality of Asturias, 2005.

3.3. Analysis.

As can be seen in chart 3.3 there is a clear downward tendency in the number of new students in the degree courses associated with chemistry. In the case of degree courses, this drop is much more marked than in the case of Engineering. In the last seven years, the number of new students has dropped by more than 70%, compared to a drop of 20% in Engineering. On the other hand, in the case of students of Technical Engineering, there has been a general rise.

We would also like to draw your attention to some of the weaknesses and strengths that have been indicated by those interviewed, indicated in Chart 3.5, leaving to one side factors which were mentioned yet whose nature was too specific, corresponding to opinions regarding very limited topics. Theoretical preparation has been indicated as a strength, and lack of resolution or focus over practical problems as weaknesses.

Chart 3.5. Weaknesses and strengths of graduates in chemical fields.

STRENGTHS	1. Considerable interest 2. Capacity of work 3. Good theoretical knowledge 4. Good handling of laboratory techniques
WEAKNESSES	1. Lack of initiative and personal maturity 2. Lack of professional skills 3. Low capacity of critical analysis

4. DESCRIPTION OF REGIONAL RDI RESOURCES.

4.1. Public research centres.

4.1.1. Oviedo University.

Oviedo University occupies an outstanding place in the field of research, both regionally and nationally; as can be observed from the results obtained in competitive research projects held, in the number of contracts with business and institutional sectors, as well as, to give but two examples, the participation in the Ramón and Cajal and Juan de la Cierva programmes. At the same time the participation of researchers in the Framework Programmes of the European Union have borne fruit, demonstrating the vocational skills and the capacity of the different research groups participating in these programmes to increase the international range of their activities, seeking recognition of quality and merit to obtain a stamp of quality and to enable access to complementary sources of financing.

Chart 4.1. Departments of the University of Oviedo that have been considered to be more directly related by chemical areas .

DEPARTMENT	Nº OF TEACHERS	Nº OF GRANTS	BUDGET (€)
PHYSICAL AND ANALYTICAL CHEMISTRY	55	30	88.299
INORGANIC AND ORGANIC CHEMISTRY	50	70	78.981
BIOCHEMISTRY AND MOLECULAR BIOLOGY	26	25	61.779
CHEMICAL ENGINEERING AND ENVIRONMENTAL TECHNOLOGY	26	35	55.889

Another aspect of Oviedo University's research activities can also be viewed through University Institutes, which associate research groups from different departments and faculties. The University Institutes of Oviedo University relevant to the field of chemistry currently in operation are the University Institute of Technology of Asturias and the Institute of Organo-metallics Chemistry "Enrique Moles".

4.1.2. Other research and technology centres.

- **Public Research Organisms (PROs).**

In this section we have included three PROs based in Asturias; two of them are CSIC centres and the third forms part of the Principality. Information sent by these organisms is shown below (September 05).

Chart 4.2. PROs: Fields of activity, personnel and budgets.

INCAR, National Coal Institute		
Field of activity: founded in 1947 and belonging to High Council of Scientific Research, CSIC, its scientific activity has been oriented towards the study of both domestic and imported coal, towards conversion processes –combustion for the production of electrical energy and coke-treating in order to obtain blast-furnace coke– towards the aim of contributing towards a cleaner and more efficient use of coal and its derivatives. INCAR also plays an important role in the development of new carboniferous materials.		
Personnel:	Total: 108	Grant holders: 19
Budget:	Approximately 1,100,000 €	

IPLA, Asturias Institute for Dairy Products		
Field of activity: belongs to the Area of Science and Food Technology of the Higher Council of Scientific Investigation. It was inaugurated in April 1990 and is established as an Institute with Patronage. It is located in the experimental site that the Principality of Asturias possesses in Villaviciosa. Apart from its own research work, it possesses an exterior analysis laboratory for the dairy sector.		
Personnel:	Total: 42	Grant holders: 6
Budget:	Approximately 2,100,000 €	

SERIDA, Regional Food Research and Development Service		
Field of activity: public entity pertaining to the Principality of Asturias with its own independent legal status, ancillary to the Rural and Fishing Areas via the General Direction of Agriculture and Foodstuffs, whose prerogative is to contribute to the modernisation and improvement of the capacities of the agricultural sector through research processes and agricultural technological development, to improve production, the diversification of the sector and the raising of the incomes of the primary producers.		
Personnel:	Total: 168	Grant holders: 10-12
Budget:	Approximately 7,000,000 €	

- **Public technology centres.**

Chart 4.3. Other research centres: Fields of activity, personnel, and budgets.

ITMA Foundation		
ITMA, Technology Institute for Non-metallic Materials		
Field of activity: Created in 1990. ITMA participates in RDI projects in the fields of refractory, plastics, chemical industry, compound materials, the extraction industry as well as other non-metallic materials. It also offers metrology services, consultancy, technological vigilance, and training in these same areas.		
CEAMET, Technology Centre for Steel and Metallic Materials		
Field of activity: Set up in April 2005, their activity is concentrated on RDI projects, testing and technical assistance, training, specialised diffusion and support services to business competitiveness. The lines of activity will be focussed principally on steel technologies, casting, metallic materials, and primary stage alloys, surface technologies, corrosion, welding and soldering technologies, numerical simulation and calculation, technical treatments and environmental technologies.		
Personnel:	Total: 76	Grant holders: 1
Budget:	Approximately 3,622,000 €	

PRODINTEC, Technology Centre for Design and Industrial Promotion		
Field of activity: Inaugurated in 2005, its objective is to aid the competitiveness of Asturian business enterprises applying technological advances both to their products and to their manufacturing processes.		
Personnel:	Total: 14	Grant holders: 2
Budget:	Not available	

CTIC Foundation, Technology Centre for Information and Communication Technologies	
Field of activity: Inaugurated in 2003. The basic premise of the CTIC Foundation is to promote and stimulate activities related to the development of the Information and Technology Society destined to regional development. In order to reach this objective, the CTIC Foundation has, amongst its functions, those of carrying out activities de diffusion, promotion, training, design strategy , the managing and development of technological projects, the transfer of technology, as well as research activities.	
Personnel:	Not available
Budget:	Not available

- **Analysis of the public R&D centres.**

In the following, we shall give a resume of opinions expressed regarding the public centres of research and technology. The strengths and weaknesses are influenced to a large extent by the development and recent progress of some of the centres, taking into account their available infrastructure.

Strengths:

1. Specialisation and training in the corresponding lines of work.
2. High availability and confidentiality.
3. Existence of up-to-date technology in the instruments necessary to carry out the work.
4. Capacity to evolve on a par with the needs of society.
5. Ability and adaptability in the successful completion of projects.
6. Capacity for resolving specific or unforeseen problems.

Weaknesses:

1. A lack of tradition in the region regarding R+D+i projects and a lack of knowledge within the private sector regarding what is carried out in the public institutions.
2. A lack of confidence in the public sector from the private sector's point of view.
3. A need for a lessening of the gap between the acquirement of knowledge to the practical use of the same.

Opportunities:

1. After a major investment in the creation of infrastructures has been effected, substantial RDI activity will be able to be created.
2. Different changes in the management of the private sector may generate a change in the managerial viewpoint that could favour RDI projects.

Threats:

1. The private sector may rely on research centres from outside the region and collaborate with them, benefiting from the new communication systems.
2. Equally, well-prepared research personnel could go to other regions possessing a more highly developed R&D infrastructure.

- **Private research centres.**

Some private companies also have at their disposal their own research centres in the region, some of them of national and international level. In particular, three stand out: Saint Gobain with their CIDA (Centre of Applied Research and Development) plant in Avilés, Arcelor who have their centre of Technological Development, and also the research centre that Ence have in their plant in Navia.

Evidently, there are also a large number of companies that privately contract projects with the research centres previously mentioned, and principally with the university.

5. THE DEMAND FOR PREPARATION IN ASTURIAS.

With a view towards studying the demand for training of graduates in the chemistry field as well as the further demand for research and technology transfer, the companies with an important chemistry factor in the region have been consulted. A total of 56 companies in the region have been visited, of which approximately 40 % belong to the chemical sector as such, the rest being divided amongst different sectors related to chemistry. Of the companies consulted, the vast majority are SMEs (small to medium-sized companies), only 17 % large companies, and more than half of these companies have an annual turnover of between 1 and 10 million euros per annum. The results obtained are presented in detailed form, as follows.

Chart 5.1. List of companies consulted for the study by CNAE code, and other relevant information.

CNAE	% COMPANIES	NUMBER OF WORKERS	% COMPANIES
13	2.13	1 -- 10	10.64
15	17.02	11 -- 30	21.28
21	2.13	31 -- 50	8.51
23	4.26	51 -- 75	10.54
24	40.43	76 -- 100	4.26
26	14.89	101 -- 250	27.66
27	8.51	> 250	17.02
35	2.13		
37	2.13		
40	2.13		
41	4.26		

SME	% COMPANIES	TURNOVER (million euros)	% COMPANIES
SI	82.98	<1	2.78
NO	17.02	1 -- 10	55.56
		11 -- 50	22.22
		51 -- 250	19.44
		> 250	0

5.1. Chemistry graduates in proportion to the total number of chemical industry contracts given in Asturias.

In chart 5.2 the results obtained from the study of the percentage of graduates in Chemistry, Biochemistry, Biology and Chemical Engineering currently working in the companies from the region included in our study is shown in detail:

Chart 5.2. Percentage of chemistry graduates employed in the companies in the region consulted.

Graduates chemistry area / total workers (%)	0 -- 5	6 -- 15	16 -- 25	> 25
Nº companies (%)	66.1	28.6	1.8	3.6

5.2. Functional areas into which graduates are incorporated and those incorporated in the last year.

The fields in which the majority of these graduates work are the following: Quality Control, Environment, Production, and Laboratories. In chart 5.3. The results obtained are shown in detail.

Chart 5.3. Percentage of chemistry graduates employed in the different business fields. Percentage of those incorporated in the last year.

FIELD	Quality Control	Environment	Production	Laboratory	Research	Others
% Graduates	16	8	15	22	10	29

It is important to point out the large proportion of incorporation (or renovation) of graduates that is happening, as a factor that may influence changes the future. The study reveals that 10.8% of graduates in the chemistry field have been taken on in the last year

5.3. Graduate training by companies.

Companies comment that they habitually give continuous training, specifically designed for each particular post filled by graduates. Before being contracted, knowledge of foreign languages is especially emphasised, fundamentally English. Experience in the company's sector, though not in an exclusive manner, is highly valued. Only a minority of the companies consulted (30%) consider experience a fundamental factor when contracting employees.

As regards the level of higher studies, the survey found that only a small fraction of these graduates is in possession of a master's degree, as with doctorates. The following chart shows this:

QUALIFICATION	Graduate	Master	Doctorate
% QUALIFIED	74.30	12.85	12.85

5.4. Contractees with qualifications from Oviedo University.

The survey carried out also shows that a great majority of the graduates have studied at Oviedo University. The results are as follows.

PLACE OF STUDY	Oviedo University	Others
% GRADUATES	92.4	7.6

5.5. Evaluation of the initial preparation of graduates contracted.

It is important to stress the result given by the value given by the companies to the knowledge and skills that graduates possess when they make contact with the company. The results are shown in percentage form in chart 5:

Chart 5.4. Company evaluation of graduates' previous knowledge.

	Very good	Good	Average
- Theoretical knowledge	58,2	39,5	2,3
- Practical expertise:	13,9	41,9	44,2
- Professional ability:	25,6	55,8	18,6
- Knowledge of the company:	11,6	23,3	65,1

Two major conclusions can be drawn from these figures: (1) the high percentage of companies which give great importance to the theoretical knowledge acquired while studying and (2) the comparative lack of knowledge of the business world.

5.6. SWOT analysis of graduate training in the system.

The people interviewed in the different companies have drawn special attention to the following characteristics as the main strengths and weaknesses (SWOT) of the graduates contracted in the Asturian system:

Weaknesses:

1. Subjects as important as computer skills and languages are not included in their academic programmes.
2. Too much scientific knowledge that is not always practical or applicable.
3. The lack of preparation in communication techniques, bureaucratic issues or a relationship with administration.
4. Issues that are very important to the world of industry, such as quality, risk prevention and the environment, are not considered.
5. The lack of more specific qualifications for some sectors (Refractory, Energy) was also mentioned.

Threats:

1. Graduates from other university centres who might possess better academic preparation and knowledge that is more applicable or practical for the company.
2. Collaboration with centres external to Oviedo University.

Strengths:

1. It provides a large number of graduates per year.
2. A wide range of degree subjects.
3. Capable and qualified personnel.
4. Adaptability, versatility, enthusiasm, and drive.
5. Ability for teamwork.
6. High theoretical knowledge.

Opportunities:

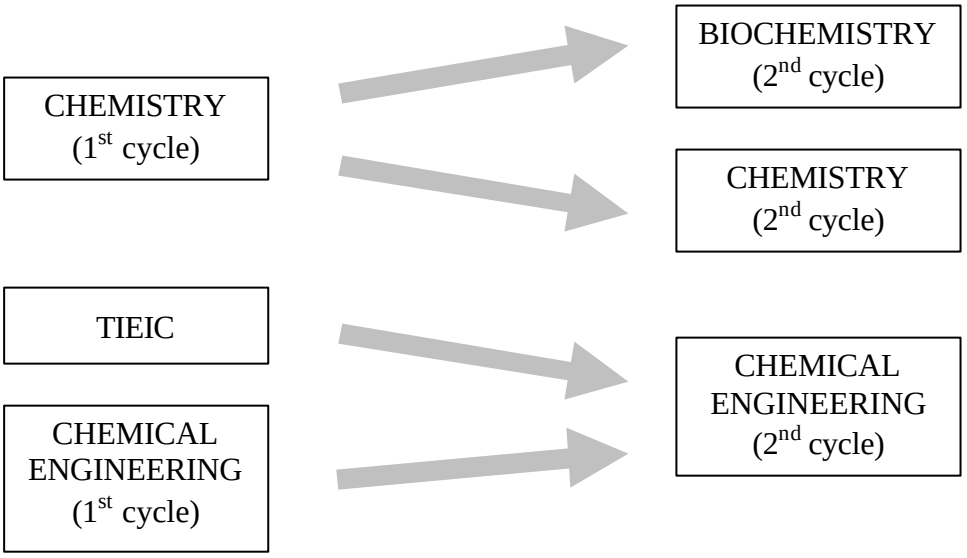
1. University courses that companies could participate in.
2. Unification of university studies on a European level.

6. TRAINING OPPORTUNITIES IN ASTURIAS.

6.1. Oviedo University.

6.1.1. Degree courses available.

The present training opportunities with a base in chemical knowledge can be summed up in tour degree courses: two higher grades (Chemistry and Chemical Engineering), one first cycle (Technical Industrial Engineering, Industrial Chemistry branch, TIEIC) and another second cycle (Biochemistry):



The manner by which these degree qualifications are structured in different cycles allows direct access from one to another. In this way, the qualification as Technical Engineer in Industrial Chemistry (TEPIC) permits access to the second cycle of Chemical Engineering, while from the first cycle of Chemistry one progresses to the second cycle of Biochemistry. Other interactions require certain complementary requisites.

6.1.2. List of Master and PhD courses available in the region.

Basically, the postgraduate course offered by Oviedo University is somewhat limited as regards Master courses (chart 6.1) yet at the same time it has a much wider offer where doctorate programmes are concerned (chart 6.2). In this case, it has been considered appropriate to show the results in a more detailed form than with the Grade courses.

Chart 6.1. Masters and courses of Oviedo University related to the chemistry field of study for the two-tear period 2004-2006.

Master Lists	Expert Courses
1. University Masters Degree in administration and business management, MBA **2.** University Masters Degree in business management, executive MBA **3.** University Masters Degree in integrated systems of quality, environment and prevention of industrial risks management. **4.** Masters Degree in foodstuffs biotechnology.	**1.** University expert in the evaluation of environmental impact. 2. University expert in the management of quality systems.

Chart 6.2. Description of the doctorate programmes of Oviedo University for the two-year period 2004-2006 with relation to the chemical area (Q.M = Quality Mention of the Science and Education Ministry).

SCIENCE OF MATERIALS AND METALLURGY ENGINEERING
-Science and technology of materials
ENERGY
-Fluids, turbine machinery, and fluid potential (interuniversity) -Technology, diversification, quality and energy saving
CHEMICAL ENGINEERING AND ENVIRONMENTAL TECHNOLOGY
-Process and environmental engineering (Q.M.)
UNIVERSITY INSTITUTE OF CHEMISTRY ENRIQUE MOLES
-Organic chemistry and organo-metallics (Q.M.)
PHYSICS AND ANALYTICAL CHEMISTRY
-Advanced chemical, biochemical and structural analysis (Q.M.) -Electrochemistry. Science and technology (interuniversitary) (Q.M.) -Theoretical and computational chemistry (interuniversitary) (Q.M.) This doctorate programme will become the EUROPEAN MASTER degree "Theoretical Chemistry and Computational Modelling" once the new legislation regarding studies is approved.
ORGANIC AND INORGANIC CHEMISTRY
-Organo-metallic chemistry (Q.M.)

6.1.3. International projects with which Oviedo University collaborates.

There is an interchange with other Spanish universities involved in the Seneca programme, and likewise the European programmes with which it is involved are the following:

1. Sócrates.
2. Erasmus.
3. Erasmus Mundus.
4. Leonardo da Vinci.

It also participates in the following international programmes:

1. Alfa (Latin America Training Scheme).
2. Cooperation between the European Union and the United States on higher education, teaching, and work training.
3. Cooperation between the European Union and Canada on higher education and work training.

Chart 6.3. Oviedo University students who have received Erasmus grants (%).

	% of students
Chemistry graduates	10,8
Biochemistry	16,7
TIEIC	4,8
Chemical Engineering	28,6

Source: Employability of Oviedo University graduates. Economy and Public Administration Council of the Government of the Principality of Asturias, 2005.

6.1.4. In-company training programmes.

- **Students.**

The degree courses in Chemistry and Chemical Engineering do not have any type of in-company training as part of their course plans. However, as a result of personal contacts, and, on occasion, research relationships between teaching staff and companies, around 65-70 places are offered annually for final year students. Given that there is no type of

official agreement, this is in practise a bilateral company-student relationship - the company benefits from the knowledge of the future graduates and the student acquires work experience. Occasionally, and always at the discretion of the company, the student may receive some financial compensation.

Regarding the Industrial Technical Engineering (Industrial Chemistry branch) degree, there is a university-company agreement. Final year students studying only two subjects as well as the end of course project may apply for company training. This training varies from three to 9 months, equivalent to course credits of free configuration. This is a bilateral company-student relationship, and according to data given by the technical school department of the university between 50-80 training periods each year are granted. The companies that ask for students range from small and medium-sized companies (SMEs) to large established companies in the region. As above, occasionally, and always at the discretion of the company, the student may receive some financial compensation.

- **Graduates.**

As regards in-company training for graduates, mention should be made of the main intermediary body that liaises to aid the entry of the recently qualified to the work market: the locating agency UNIVERSIT, which regulates more than 300 places for work experience. In the chemistry field, the Chemists College of Asturias and León organises 50 contracts for training with companies, largely within the region, annually.

6.1.5. Employment prospects for Oviedo University students.

To give a broad idea, according to the data obtained from surveys carried out in the departments of Oviedo University and deaconries, the average period of time spent to find employment in a post suitable for a 4/5 year degree qualification for graduates and Chemical Engineers can be easily calculated, and as can be seen, Technical Engineers tend to take a shorter period of time.

According to the register of chemistry graduates (2003), the main occupational categories offered to chemists are computing, electricity and electronics, glass and ceramics, health, services, research, foodstuffs, hospitals, industrial and chemistry as such.

According to the data of the Economy and Public Administration Council of the Principality of Asturias (2005), chart 6.4 shows the occupational results obtained for the four qualifications, by sex.

Chart 6.4. Employability of Oviedo University graduates in the chemistry field and specification by sexes (%).

	TOTAL		MEN		WOMEN	
	Employed	Unemployed	Employed	Unemployed	Employed	Unemployed
Chemistry graduates	64.9	35.1	58.3	41.6	69.8	30.2
Biochemistry	78.9	21.1	100.0	0.0	63.6	36.4
Chemical Engineers	78.6	21.4	80.0	20.0	77.8	22.2
Industrial Technical Engineers (Esp. Industrial Chemistry)	78.0	22.0	81.1	18.9	75.0	25.0

The same source gives us data concerning the place of residence of Oviedo University graduates, as seen in chart 6.5, as well as data regarding the location of the company that offers the first job, shown in chart 6.6.

Chart 6.5. Current residence of Oviedo University students working in the chemistry field (%).

	Asturias	Rest of Spain	Abroad
Chemistry graduates	72	17	11
Biochemistry	53	33	13
Chemical Engineers	41	36	23
Industrial Technical Engineers (Esp. Industrial Chemistry)	76	21	3

Source: Employability of Oviedo University graduates. Economy and Public Administration Council of the Government of the Principality of Asturias, 2005.

Chart 6.6. Location of the company that offers the first job (%).

	Asturias	Rest of Spain	Abroad	Never
Chemistry graduates	47.4	21.1	10.5	21.0
Biochemistry	79.6	18.4	0.0	2.0
Chemical Engineers	64.6	8.9	3.8	22.8
Industrial Technical Engineers (Esp. Industrial Chemistry)	77.3	15.3	2.7	4.7

Source: Employability of Oviedo University graduates. Economy and Public Administration Council of the Government of the Principality of Asturias, 2005.

Also indicated in the results of the above study are the types of contract offered graduates in the region (chart 6.7), as well as the length of time taken to find their first job (chart 6.9).

Chart 6.7. Type of contract of employed graduates in the region (%).

	Steady	Temporary	Work experience	Researchers and others
Chemistry graduates	29	49	10	12
Biochemistry	27	47	0	27
Chemical Engineers	43	38	10	10
Industrial Technical Engineers (Esp. Industrial Chemistry)	35	41	23	2

Source: Employability of Oviedo University graduates. Economy and Public Administration Council of the Government of the Principality of Asturias, 2005.

Chart 6.8. Length of time taken to find first job by graduates in the chemistry field in Asturias, in month intervals (%).

	0 months	0-3 months	3-6 months	6-12 months	12-24 months	24-36 months	Never
Chemistry graduates	2.7	10.9	12.8	20.0	19.1	7.1	18.0
Biochemistry	14.4	0	21.1	21.1	21.1	0	20.0
Chemical Engineers	7.1	14.3	21.4	25.0	10.7	7.1	7.1
Industrial Technical Engineers (Esp. Industrial Chemistry)	2.9	5.8	18.1	25.3	12.3	11.6	4.7

Source: Employability of Oviedo University graduates. Economy and Public Administration Council of the Government of the Principality of Asturias, 2005.

6.2. Other training centres.

The following is a list of other institutions of interest that offer courses and that specialise within the autonomous community of Asturias (the courses are detailed in annex IV).

1. Asturias Business School.
2. Escuela de Alta Gestión Empresarial (High Management Business School).
3. Fundación ITMA. Instituto Tecnológico de Materiales (ITMA Foundation. Technology Institute of Materials).
4. Colegio Oficial de Químicos de Asturias y León (Official Chemists College of Asturias and León).
5. Colegio Oficial de Ingenieros Industriales Superiores de Asturias y León (Official Higher Industrial Engineers College of Asturias and León).
6. Colegio Oficial de Ingenieros Técnicos Industriales del Principado de Asturias (Official Industrial Technical Engineers College of the Principality of Asturias).
7. Colegio de Ingenieros Superiores de Minas de Asturias (Higher Mining Engineers College of Asturias).
8. Colegio de Ingenieros Técnicos de Minas de Asturias (Technical Mining Engineers College of Asturias).

The available courses of specialisation in the region are completed with other courses offered by: The RECHAR Foundation (Foundation for Training Development in Coal Mining Areas), The FUCOMI (Mining Zones Foundation), aids from the European Social Fund, the FLC (Building Labour Foundation) and the Asturias Metal Foundation. There are a number of academies and other private companies that also play a part in this sector.

Also there are some public research centres (IPLA, INCAR y SERIDA) that offer specific complementary courses on subjects forming part of their research projects, which can also be attended by researchers from private companies.

7. The demand for public research and technology transference in Asturias.

7.1. General situation.

Initially, an analysis has been made of the situation of the companies surveyed regarding the availability, and, where appropriate the, characteristics, of RDI areas or departments. A few of the results obtained were the following:

- 43 % have a permanent department.

- 13 % do not possess a department registered as such, but conduct R&D studies.

- Of all of them, 30% receive regional subventions in order to conduct work of this type.

- Another important piece of data is the percentage of chemical area graduates who work and collaborate in the companies' RDI departments. The figure was found to be 10%.

The valuation given to the projects by the companies is, practically unanimously, very positive. The relationship established is frequently contracted per service, owing to the fact that in the vast majority of companies these collaborations take place for very concrete, specific projects.

It is worth noting that only 23 % of companies have needed to seek technological services outside the region.

7.2. Relevant R&D topics for the industry.

The companies surveyed were requested to specify the R+D fields of activity they considered the most relevant to their activities and interests. The results obtained were as follows.

Chart 7.1. Relevant R&D topics for the industry.

Materials
Nanotechnology, biotechnology, textile fibres. Metallurgic themes; materials.
Advanced carbon materials.
Heat-resistant materials; non-conformed products.
Plastic-resistance.
Processes
Analysis techniques and protocol focussed on dairy products.
Molecular biology of forest species (genetic improvement of eucalyptus).
Vacuum and freezing treatments.
Extraction and whitening of cellulose. Treatments of sulphur compounds.
Complete thermodynamic analysis of the performance of bio diesel in engines.
Processes of metal recuperation by chemical means without environmental impact.
Technologies adapted to BATs.
Products
Studies on antifoaming substances.
New solar filters for lip protectors.
Characteristics of agar and derivatives.
Research into new pharmaceutical products.
Plastics manufacture based on naphtalene. Fine chemistry.
Applications of permanganates.
Additives for enamels with the end of eliminating the formation of crackles.
Performance of various oils.
Raw materials for paints.
Additives against cold for bio diesel.
Improvement of refractory paintings, catalysts and resins.
Elimination or reduction of fluoride in lime.
Research into diatomene.
Development of formulas and new products related to el Sodium Hypochlorite.
Study on packaging and additives for the foodstuffs industry.
Energy
Alternative fuels.
Products that avoid corrosion in furnaces.
Waste management and treatment in power plants.
Energy saving in the manufacture of aluminium.
Environment
Emissions into the atmosphere.
Water treatment.
Reusage of residue such as tar and coke.
Recycling of foundry sub products.
Regeneration of PCBs.
Reusage of drip-feed residue.
Applications of sewage-farm residue.
Processes of use of waters with a low contamination factor.
Decontamination of land.

7.3. Analysis of the demand for technological services by the regional chemical industry.

The data corresponding to the SWOT analysis are shown:

Weaknesses:

1. Lack of communication between university and company.
2. Difficult connection between groups of the same and different departments.
3. Little interest on the part of some groups in the University to work on projects with companies.

Threats:

1. Collaboration from the company with centres outside Oviedo University and other research centres in Asturias.
2. The existence of external research centres that could be more competitive with problems within the industrial sector and with relationships facilitated by advances in IT.

Strengths:

1. The University has the technological means and sufficient personnel to carry out studies that cannot be performed by the companies.
2. Very capable personnel. Large research potential.

Opportunities:

1. Responding to the technological challenge in companies, more pressing as time passes.
2. Large-scale growth in the companies of the RDI departments.
3. Collaborations via research trainees, trained specifically for a specific job function in the companies.

8. The public research offer and technology transfer in Asturias.

8.1. Oviedo University.

8.1.1. Research groups in the chemical field.

In Oviedo University there are at least 24 research groups integrated in the four departments which we consider to make up the chemical area, as shown in chart 8.1.

Chart 8.1. Departments and research groups in the chemical area.

Departments in the chemical area	Number of research groups
Chemistry Physics and Analytics	9
Organic and inorganic chemistry	11
Biochemistry	8
Chemical engineering and environment	5

Source: Oviedo University (www.uniovi.es/vicinves/unidades/gruposInv/index,htm).

Oviedo University's budgets for the research vicerectorate and the departments in the chemistry area are shown in Chart 8.2.

Chart 8.2. Funds destined to research in the 2005 budget.

FINANCIAL YEAR 2005	Financing (€)	% BUDGET
Research Vicerectorate	29.133.805	16,557
Biochemistry and Molecular Biology Dpt.	74.622	0,042
Chemistry Physics and Analytics Dpt.	106.996	0,061
Organic and Inorganic Chemistry Dpt.	118.606	0,067
Chemical Engineering and Environmental Technology Dpt.	73.261	0,042
University of Oviedo	**175.961.156**	

Source: Oviedo University Budgets 2005.

It can be seen that 16,5% of the total university budget for the financial year 2005 is dedicated to the research sector, whereas the money destined to each department varies between 73,261€ and 118,606€ - although this is largely due to teaching costs.

Conversely, in chart 8.3 the data corresponding to projects and contracts in the period 1997 – 2004 are shown. Also in chart 8.4 we can observe the results of scientific production for the same period (consult website of the research vicerectorate).

Chart 8.3. Financing of projects and contracts that correspond to the periods 1997/2000, 2000/2002 and 2003/2004 in the chemistry area.

1997-2000				
DEPARTMENT	**FINANCING PROJECTS**	**FINANCING CONTRACTS**	**NUMBER OF PROJECTS**	**NUMBER OF CONTRACTS**
Chemistry Physics and Analytics	2 116 257	110 623	37	10
Organic and Inorganic Chemistry	2 760 209	426 353	33	19
Biochemistry and Molecular Biology	2 166 849	705 743	22	13
Chemical Engineering and Environmental Technology	2 850 455	655 196	47	74

2000-2002				
DEPARTMENT	**FINANCING PROJECTS**	**FINANCING CONTRACTS**	**NUMBER OF PROJECTS**	**NUMBER OF CONTRACTS**
Chemistry Physics and Analytics	1 997 988	11 689	23	3
Organic and Inorganic Chemistry	3 079 786	120 759	25	8
Biochemistry and Molecular Biology	1 636 897	673 827	20	6
Chemical Engineering and Environmental Technology	2 676 749	588 142	30	50

2003-2004				
DEPARTAMENTO	**TEACHING STAFF**	**FINANCING PROJECTS**	**NUMBER OF PROJECTS**	**NUMBER OF CONTRACTS**
Chemistry Physics and Analytics	55	1 564 907	56	13
Organic and Inorganic Chemistry	50	2 481 007	52	17
Biochemistry and Molecular Biology	26	1 862 577	36	16
Chemical Engineering and Environmental Technology	26	1 747 862	47	80

Source: analysis of scientific production and annual summary of Oviedo University.

Chart 8.4. Scientific production in the periods 1997/2000, 2000/2002 and 2003/2004 in the chemistry area departments.

1997-2000

DEPARTAMENT	NUMBER OF PUBLICATIONS	NUMBER OF CONGRESSES	NUMBER PATENTS	NUMBER THESIS
Chemistry Physics and Analytics	330	341	2	30
Organic and Inorganic Chemistry	262	183	1	35
Biochemistry and Molecular Biology	144	139	3	21
Chemical Engineering and Environmental Technology	187	87	3	32

2000-2002

DEPARTAMENTO	NUMBER OF PUBLICATIONS	NUMBER OF CONGRESSES	NUMBER PATENTS	NUMBER THESIS
Chemistry Physics and Analytics	306	292	1	28
Organic and Inorganic Chemistry	257	156	1	32
Biochemistry and Molecular Biology	94	119	8	17
Chemical Engineering and Environmental Technology	126	89	0	18

2003-2004

DEPARTAMENTO	TEACHING STAFF	NUMBER OF PUBLICATIONS	NUMBER OF CONGRESSES	NUMBER PATENTS	NUMBER THESIS
Chemistry Physics and Analytics	55	237	229	0	18
Organic and Inorganic Chemistry	50	218	94	4	25
Biochemistry and Molecular Biology	26	65	76		8
Chemical Engineering and Environmental Technology	26	133	129		18

Source: analysis of scientific production and annual summary of Oviedo University.

Oviedo University possesses research groups which are both nationally and internationally recognised for their scientific work, some of them world leading in their research.

In chart 8.5, we have detailed some of the strengths and weaknesses taken from the comments made by the research groups..

Chart 8.5. Strengths and weaknesses of doctors in the chemical area of Oviedo University.

STRENGTHS	1. Important international relations. 2. Specialised preparation. 3. Ability for the development of R+D+i projects. 4. Confront specific problems for the development of work with possible application in some industrial sectors. 5. Profitable methodology for the synthesis of chemical products and environmental technologies. 6. Practical knowledge and ability to analyse and solve problems.
WEAKNESSES	1. Lack of economic and management vision. 2. Difficulties in transferring the results of research applied to the possible industrial receptors in the region. 3. Certain limitations due to the installations and laboratories. 4. Sociological limitations that impede affronting innovative research that might carry a high failure risk.

8.1.2. Interphase organisms.

Several interphase organisms have been set up, such as Research Result Transfer Offices (OTRIs), interface units of the scientific community in control of managing, within R&D and constitute the relationship between the University and commerce.

The OTRIs came into being towards the end of 1988 based on the initiative and with the support of the Interministerial Commission of Science and Technology (CICYT) as a mechanism to promote the transfer of knowledge between research centres and companies and to promote greater activity of the National Innovation System. The specific function of the OTRIs is to promote, in universities, the generation of knowledge according to the necessities of the wider surroundings and stimulate its transfer.

The OTRIs that Oviedo University participates in are the one created in 1988 (managed until some years ago, by the University of Oviedo Foundation), and the Foundation for the Promotion in Asturias of Applied Scientific Research and Technology (FICYT), a non-profit making private cultural foundation created in 1984.The OTRI of the Technological Institute of Materials (ITMA) created in the year 2000 should also be mentioned.

The representation of the governmental organism FICYT is distributed in the following way: 60 % corresponds to the Government of the Principality of Asturias, 20 % corresponds to Oviedo University, and 20 % corresponds to the protecting companies. The founding objective of FICYT is to promote and foster activities directed towards applied scientific research in all aspects of social and economic life that could contribute to the development and improvement of the living conditions of the Asturian community.

Scope of activities of the Foundation for the Promotion of Applied Scientific Research and Technology (FICYT) are information regarding regional, national and European R+D+i programmes, assistance with the preparation of propositions, help with the search for partners for the propositions, diffusion of technological opportunities, promotion of the transfer of the results of research to companies and promotion of the creation of innovative companies (source: www.ficyt.es, 2005).

As regards the OTRI of Oviedo University, dependant upon the Vicerectorate of Research and Company Relations, it has grown over the last few years especially as a result of the incorporation of a flexible system, embodied by the Centres of Research and Transfer to Companies, CITE´s created in 2001. In chart 8.6 these activities, largely carried out by the CITE (OTRI UO), are detailed.

Chart 8.6. Activities of the Office of Research Results Transfer of Oviedo University (2001-2004).

Sphere	Activities
Business motivation and development	-Business motivation sessions. -Business idea generation courses. -Prizes to the best university business project. -Informative sessions for the stimulation of business activity. -Seminal for the development of business spirit. -University business project sessions. -Creative motivation sessions. -Generation and development of business ideas workshop. -Making of CD "UniOvi Emprende". -IV Oviedo University employment Forum.
Technology and knowledge transfer	-Oviedo University technology transfer sessions Edition I (2001) and II (2002). -GROPE ´02 y ´03. -EXPOAMBIENTE ´03. -Supply corner. -Offer corner.
Spreading of scientific knowledge	-I Oviedo University Science and Technology Week (2001). -Oviedo University Scientific Cultural Observatory (2001). -II Oviedo University Science and Technology Week (2002). -Cycle of Round Tables. -III Oviedo University Science and Technology Week (2003).

Source: www.uniovi.es, 2005.

In the context of Oviedo University, the role placed by the Oviedo University Foundation (FUO) is important too, not only in the contexts of learning and in the organisation of analyses/diffusion activities, but also in job-related themes and research contracts with an extremely important management capacity in these fields, and with many opportunities in other segments. See www.uniovi.es/FUO.

8.2. Research facilities shared by industry and R+D+i centres.

The main research facilities shared by industry and science are Oviedo University's Scientific-Technical Services (SCTs).

Since their creation in 1987, as common research services of Oviedo University they have provided an infrastructure designed to give backup to support research groups belonging to the institution, as well as to public institutions and private companies. These infrastructures handle services grouped into the following 4 areas:

1. Chemical measurement.
2. Characterization of solids.
3. Biomedicine.
4. Technological support.

Some of those available can be seen in chart 8.7.

Chart 8.7. Scientific- Technical Services of Oviedo University.

Chemical measurement	Nuclear Magnetic Resonance Mass Spectrometry Thermocalorimetry and elemental analysis Oceanographic surveying
Characterization of solids	Electronic Microsounding Fluorescent and X-ray diffraction High definition X-ray diffraction Monocrystal X-ray diffraction
Biomedicine	Electronic microscopy and Microanalysis Immune technology cychlometry and animal sequenciality
Technological backup	Image processing and graphic design Nanotechnology Industrial electronics Mechanical workshop

Source: www.uniovi.es, 2005.

Also the technological centres (ITMA, CEAMET, PRODINTEC, CTIC) also allow use to be made of their facilities, which are, in some cases, extremely advanced, via previous arrangement. Likewise, the organisms pertaining to CSIC (INCAR, IPLA) and those of the Principality of Asturias (SERIDA) also offer their facilities for industrial research.

8.3. Capital-risk projects with public and private participation.

Research and transfer technologies require specific support organisms such as capital-risk societies.

Currently, in the region of the Principality of Asturias, there are four main societies that are prepared to invest in high-risk projects. A large number of projects involving substantial financial investment exist, but only a small fraction of them belong to the chemical sector. The data is shown in more detail in the following chart.

Chart 8.8. Main societies in the region that invest in capital-risk projects.

	Total number of projects	Number projects in the chemical field	Investment
SRP (Regional Promotion Society)	41	1	43 000 000 €
SODECO (Society for the Miner Regions Development)	39	6	20-25 million €
SADIM (Asturian Society for Miner Diversification)	42	Not available	Not available
INVERASTURIAS	8	Not available	4 700 000€

8.4. Technology Parks in the Principality of Asturias.

- **Technology Park of Asturias (Llanera).**

Inaugurated in 1991, backed by the Government of the Principality of Asturias, and managed by IDEPA , it is located in Llanera and covers a total of 44 hectares.

Inside the complex there are 52 lots assigned for company use, although there are also some public organisms. Of these lots, 64.4 % are in use, 30.8% reserved, and 4.8 % unused.

- **Science and Technology Park of Gijón.**

In this complex, of more recent creation, there are currently a total of 32 companies installed, occupying approximately 50 % of the surface area (100,000 m2).

8.5. Copyright Treatment.

The treatment of copyright necessary resulting from any collaboration between a research and/or technological centre belonging to the public sector and a company belonging to the private sector depends on the type of contract signed by both parties. Normally if the job is financed for the company, the copyright belongs to the private sector company which initially requested the research from the public sector. On some occasions also to some research centres, normally the university, in practise. Although the possession of the copyright belongs to the private company, the scientific aspects are usually retained for publication in specialised publications, and the authorship is retained in all cases.

In research that has been conducted without collaboration from the private sector, if the presentation of a patent is considered, the university retains the rights over the same. The total number of patents that Oviedo University holds as joint owner is shown in the following chart, the higher percentage being that corresponding to the chemical area.

YEAR	NUMBER OF PATENTS
1989	3
1990	2
1991	4
1992	2
1993	5
1994	4
1995	3

YEAR	NUMBER OF PATENTS
1996	4
1997	7
1998	4
1999	11
2000	6
2001	19
2002	11

8.6. Regional Research Policy.

In addition to the research national policy, the National Plannings and the effects of community research progress, UE, likewise a regional research policy is developed.

The scope of research policy in the Principality is established by the Plan for Science, Technology and Innovation 2005-2008 (PCTI 2006-2008), which is currently in the final stages of drafting. This plan substitutes the previous plan for Research, Technical Development, and Innovation 2001-2004. More detailed information can be found on the websites web www.ficyt.es and www.princast.es.

9. EXAMPLES OF GOOD PRACTICE IN THE TRAINING SPHERE OF ACTIVITIES.

Firstly, it is worth pointing out that, within the bounds of this study, we have considered the analysis of the better practices from two perspectives: the point of view of the private companies (industry) and that of the public research groups (science).

The task has been organised in the following manner:

The opinions of the private sector have been obtained via personal interviews conducted by members of our investigative team with the directors and technical staff of 56 companies installed in Asturias.

The opinions of the public sector have been obtained via personal interviews conducted by a different team (totally independent from the other) with department heads and research group leaders of Oviedo University and of public research centres established in the region. 34 interviews were conducted.

We should point out, however, that the examples of good practice that have been included in this study are exclusively those obtained from the second group of interviews (the public sector). This decision was taken due to the fact that the examples of good practice proposed by the private sector companies were limited to specific cases, and therefore difficult to globalise and not suitable to be taken as examples. Conversely, none of the examples given by the public sector was even mentioned by the private sector, which underlines one of the most frequently repeated weaknesses: the lack of communication between industry and university.

Various examples of good practice in training patterns can thus be defined (following the format of the Italian organism that coordinates this task between chemical regions), essentially in the form of generic training programmes, and which may act as a point of reference applicable to other chemical regions.

NAME

1. Employment Fair

INSTITUTIONS/ORGANISMS INVOLVED

Oviedo University Foundation (FUO) and private companies.

GOALS

Promote the relationship between graduates and private companies.

BASIS

FUO supplies the installations and private companies present their stands, with their activities and job opportunities.

PROCEDURE

FUO gets in touch with private companies to request their participation. For two day-long sessions graduates are in contact with companies compiling information and applying for work with the most interesting companies for each one.

RECENT DATA AVAILABLE

COMMENTS

NAME

2. In-company training programme for chemistry students and graduates

INSTITUTIONS/ORGANISMS INVOLVED

University-Company Foundation and professional association/final year students and chemistry graduates.

GOALS

Improve graduates experience in companies.
Coordinate and control training programmes.

BASIS

Attend to the demand of the industry for student experience.

PROCEDURE

Get in touch with companies to discover their demand for students and graduates.
Carry out staff selection processes.
Students' insurance to be covered by the university or the Chemists College.

RECENT DATA AVAILABLE

The University-Company foundation provides training for approximately 300 students.
Approximately 25 % of students find work immediately afterwards.

The Chemists College of Asturias provides training for approximately 50 new graduates every year. Around 30 % of graduates obtain work in the company.
The Chemistry Faculty provides training in chemical companies for 50 students a year.

COMMENTS

NAME

3. R+D+i human resources training programme

INSTITUTIONS/ORGANISMS INVOLVED

Principality of Asturias (FICYT), public research centres and private companies in the region.

GOALS

Contribute to research & teacher training of young researchers.
Skill improvement of research personnel.
Aids to companies for incorporating university personnel in R+D+I activities.

BASIS

The existence of qualified personnel to perform R+D tasks.

PROCEDURE

The Principality of Asturias (FICYT) offers research training grants in R+D+I centres and private companies since 1985.

RECENT DATA AVAILABLE

- 30 grants for young researchers.
- 90 research grants.
- 25 aid grants for short spells in research centres.
- 15 grants for skill improvement of research personnel.
- 9 aids to companies for incorporating graduates into the company.

COMMENTS

10. EXAMPLES OF GOOD PRACTICE IN THE TECHNOLOGY TRANSFER SPHERE.

The criteria regarding the choice of examples of good practices in the technology transfer area are the same as those laid out in chapter 9.

Obviously, we do not wish here to go into the details of different research contracts, given the large number of them, the difficulties of selection, or knowing which have had the greatest impact on the economic sector. And also due to the difficulty or impossibility of being able to apply the details of one particular investigation to other regions. For this reason, we have essentially mentioned programmes which we consider to have done so, or have appeared to have done so.

NAME
1. Subsidies for research projects in private companies
INSTITUTIONS/ORGANISMS INVOLVED
Principality of Asturias (FICYT) and private companies in Asturias.
GOALS
Encourage the development of R+D+i projects in companies.
BASIS
The Education and Science Council of the Principality of Asturias provides capital to private companies for them to develop research projects.
PROCEDURE
The companies apply either individually or in cooperation with technological centres.
RECENT DATA AVAILABLE
In progress.
COMMENTS

NAME

2. EIBT´s Project (Promotion of technological innovation in Asturias)

INSTITUTIONS/ORGANISMS INVOLVED

The European Centre of Innovation Enterprises CEEI of Asturias, Innovation Asturian Club, Local Agency of economic development and employ of the Town Council of Gijón and The centre of entrepreneurs of the Nalón Region (ValNalón) and CITE (OTRI) of Oviedo University.

GOALS

Creation of new spin-off related with Oviedo University.

BASIS

Create new companies based on the experience obtained from research and Oviedo University r R+D+i, to make the most of the results obtained and seek new markets.
Incentivise the creation of new companies, speak to the students, and promote initiatives for new companies.
Supply facilities to help the development of an innovative outlook in the region.

PROCEDURE

The CEEI of Asturias, Innovation Asturian Club, Local Agency of economic development and employ of the Town Council of Gijón and ValNalón organise various activities (discussions, courses, management, financing etc …) tending towards the identification of the projects of innovative activities with a technological base.

RECENT DATA AVAILABLE

Generation and creation of a significant number of directive initiatives based upon industrial and technological development, generated by the centres with technological potential and the researchers from the autonomous community: the technical departments of companies, universities, and laboratories.

COMMENTS

NAME

3. Transfer of Technology and Knowledge work sessions of Oviedo University

INSTITUTIONS/ORGANISMS INVOLVED

Innovation Asturian Club and Asturian Business Federation (FADE) and Oviedo University.

GOALS

The different research groups (over 100) each present a stand with their offer for industry, companies, and service organisms.
The visitors are directors and company technical staff.

BASIS

The Innovation Asturian Club and the Asturias Business Federation supplies the funding and the research groups from the university prepare and run the stands.
There are also a large number of round tables between the vendors (researchers) and the buyers(business personnel).

PROCEDURE

The Innovation Club and the Asturias Business Federation promotes the importance of these sessions to companies. Oviedo University coordinates the research groups and the stands.

RECENT DATA AVAILABLE

The last sessions were in the year 2002.

COMMENTS

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11. Escuela de Alta Gestión Empresarial: www.eage.net
12. Asturias Business School. Fundación Escuela de Negocios de Asturias: www.abs.fena.es
13. Fundación Metal Asturias: www.fundacionmetal.org
14. Fundación Laboral de la Construcción: www.flcnet.es
15. Fundación para el Desarrollo de las Comarcas Mineras: www.fucomi.com
16. Instituto de Desarrollo Económico del Principado de Asturias: www.idepa.es
17. Sociedad para el Desarrollo de la Comarcas Mineras S.A.: www.sodeco.es
18. Sociedad de Promoción Industrial: www.sadiminversiones.es
19. Fundación para el Fomento en Asturias de la Investigación Científica Aplicada y la Tecnología: www.ficyt.es

12. ANNEXES.

12.1. Annex I: Work procedure.

El desarrollo de este estudio se ha llevado a cabo siguiendo el siguiente esquema:

Se ha contado con cuatro becarios, divididos en dos grupos. Uno de los grupos se ha encargado de realizar encuestas en las empresas privadas y recopilar toda la información relacionada con la demanda mientras que el otro grupo se ocupó de realizar encuestas y recopilar información correspondiente a la Universidad de Oviedo, centros de investigación y organismos públicos. De esta manera se distinguen dos partes claras del estudio, por un lado la demanda y por otro lado la oferta en cuanto a formación se refiere.

Una vez finalizada la fase de recopilación de datos, cada grupo elaboró los apartados del informe donde se recogía la información correspondiente reflejándola en forma de tablas, de forma clara y ordenada. A continuación se juntaron las dos partes, se contrastaron datos y se elaboraron los distintos apartados del informe final, recurriendo a la bibliografía para completar el estudio. Realizadas las correcciones finales se realizó la traducción al inglés.

Han participado en la elaboración de este estudio:

Alba Bermudo Suárez
Belén González García
Mónica González García
Ana María Navas Arias
José Alberto Somocueto Castro

12.2. Annex II: List of companies and people consulted.

EMPRESA/ORGANISMO	CNAE	Persona de contacto	Cargo
Río Narcea Gold Mines, S. A.	13	J. Miguel Hernández	Jefe de Personal
Nestlé España, S. A.	15	Juan Pérez	Responsable de Calidad
Productos Noreñenses, S. L.	15	José Blanco	Jefe de Calidad
Industrias Lácteas Asturianas, ILAS	15	Pablo Ramos Balbona	Jefe de Laboratorio
Valle, Ballina y Fernández, S. A.	15	Margarita Margolles	Encargada de Laboratorio y Elaboración
Grupo El Gallego, S. L.	15	Carolina Díaz	Encargada de Laboratorio
Chupa Chups, S. A.	15	Juan Antonio Blanco	Técnico de Medio Ambiente
Aguas de Fuensanta, S. A.	15	Juan Coto/Enrique Aza	Jefe de Administración/Laboratorio
Danone, S. A.	15	Severino Villanueva	Control de gestión
Celulosas de Asturias, S. A.	21	Víctor Rojo	Jefe de RR. HH.
Industrial Química del Nalón, S. A.	23	Juan José Fernández	Jefe de I+D+i
Industrias Doy Manuel Morate, S. L.	23	Esteban Salvador	Administrativo
Esmaltes del Cantábrico, S. L.	24	Ricardo Albuerne	Responsable de Administración
Laboratorios Brum, S. A.	24	José Mª Mittelbrum	Gerente
Carus Nalón, S. L.	24	Marta Vázquez	Directora de Administración Comercial
Bionorte, S. A.	24	Alfonso Amielgo	Gerente
Tecsolpar, S. A.	24	N. R.	
Air Liquide Medicinal	24	Luis Rodríguez	Responsable Técnico

EMPRESA/ORGANISMO	CNAE	Persona de contacto	Cargo
Laboratorios e industrias Noriega, S. L.	24	Manuel Villacorta	Control de gestión
Servicios Internacionales Reunidos, S. A. (SIRSA)	24	José Blanco Sánchez	Director
Repsol YPF Lubricación y Especialidades, S. A.	24	N. R.	
Barpimo, S. A.	24	N. R.	
Tratamientos Asfálticos, S. A. (TRASFALT)	24	Julio Rodríguez	Jefe administrativo
Laboratorios Kiove, S. A.	24	Maximino Fernández	Dpto. Técnico
General Asturiana de Obras y Servicios, S. L.	24		
Asturpharma, S. A.	24	Ángel Arbolea	Jefe de Administración
Du Pont Ibérica, S. L.	24	Marisa Loredo	Responsable de comunicación y relaciones externas
Álvarez González Contratas	24	N. R.	
Asturquimia, S. L.	24	Francisco Álvarez	Jefe de fabricación
Siderfluor, S. A.	24	N. R.	
Ibérica de Revestimientos , S. A.	24	Yolanda Alonso Rodríguez	Dpto. Financiero
Asturlak, S. L.	24	Fernando Rodríguez	Responsable de dirección
Aglomerados Asfálticos S. A.	24	N. R.	
Auxquimia S. A.	24	Antonio Acuña Vega	Administrador solidario
Química farmacéutica Bayer, S. A.	24	Manuel Fernández Ortega	Director de Fábrica
Industrias Roko, S. A.	24	A. José Pérez Alonso	Responsable de Laboratorio
Asturagar	24	Francisco Gómez Marcos	Dirección Técnica

EMPRESA/ORGANISMO	CNAE	Persona de contacto	Cargo
Fertiberia, S. A.	24	Irene González Ribot Fernando Moure Fernández	Jefe de Dpto. Técnico/Jefe de procesos
Rioglass Astur, S. A. /Curvet-Rioglass, S. A.	26	Arcadio Álvarez	Responsable de RR. HH.
Caleras de San Cucao, S. A.	26	Miguel González Miranda	Jefe de Administración
Sidercal, S. A.	26	Miguel González Miranda	Jefe de Administración
Cerquisa antiácidos y refractarios, S. A.	26	Carlos Álvarez García	Jefe administrativo
Refractaria, S. A.	26	José Luis Pena	Director de Calidad
Cerámica del Nalón, S. A.	26	Miguel Barcina	Director Financiero
Vesuvius Iberzeta	26	Carmen González Berenguer	Responsable de Calidad, Seguridad y Medio Ambiente.
Prefabricados del Nalón, S. A.	26	N. R.	
Alas Aluminium, S. A.	27	Pablo Rodríguez	Director Financiero
Thyssenkrupp Guss, S. A.	27	N. R.	
Felguera Melt, S. A.	27	Jorge Ignacio Fernández Fernández	Jefe de Metalurgia, Control de Calidad e I+D+i
Fundición Nodular	27	María Villazón	Responsable de Calidad y Medio Ambiente
Alcoa Inespal, S. A.	27	José Mª Fernández	Jefe de oficina de personal
Astilleros Armon, S. A.	35	Ramiro Istillarte	Jefe de personal
Grupo Rymoil (Aprochim-Getesarp-Rymoil, S. A. y Rymosoil, S. A.)	37	Ángel Arroyo	Director General
Unión Fenosa, S. A.	40	Ramón Fernández Fano	Técnico de Servicio Químico y Control Ambiental
Asturagua, S. A.	41	Eva Rogado	Jefe de Laboratorio
Empresa municipal de aguas de Gijón, S. L.	41	Rafael Alonso	Responsable de Laboratorio

EMPRESA/ORGANISMO	CNAE	Persona de contacto	Cargo
INCAR		Luis Lavandera	
PRODINTEC		N. R.	Representante
CTIC		Eduardo Álvarez	
SERIDA		Fernando Villamil	
IPLA		Juan Carlos Dado	
ITMA y CEAMET		Francisco Javier Santos	
FICYT		N. R.	Representante
FUO		Natalia Luna	
CEEI		Belén Flecha	
ValNalón		Marta Pérez	
La Curtidora		N. R.	Representante
Colegio de Químicos		N. R.	
Vicerrectorado de Calidad		Samuel Fernández	
Vicedecano de Bioquímica		Fernando Moreno	
Director del Departamento de Química Orgánica e Inorgánica		Vicente Gotor	
Director del Departamento de Química Física y Analítica		Paulino Tuñón	
Director del Departamento de Ingeniería Química		Julio Bueno	
Directores de 15 Grupos de Investigación			
Secretaría de la Facultad de Química			

12.3. Annex III: List of subjects of Chemistry, Chemical Engineering and Biochemistry degrees.

CURSO	LICENCIADO EN QUÍMICA (2001)	CRÉDITOS
1º	ENLACE QUÍMICO Y ESTRUCTURA DE LA MATERIA	9
	FISICA I	12
	FISCA II	7,5
	GEOLOGÍA	6
	INGLÉS	6
	INTRODUCCIÓN A LA EXPERIMENTACIÓN EN QUÍMICA FÍSICA	7,5
	MATEMÁTICAS	12
2º	COMPUESTOS INORGÁNICOS	6
	ESTADÍSTICA	6
	EXPERIMENTACIÓN EN SÍNTESIS INORGÁNICA	7,5
	INGENIERÍA QUÍMICA	7
	QUÍMICA ANALÍTICA	9
	QUÍMICA FÍSICA I	12
	QUÍMICA ORGÁNICA I	12
3º	ANÁLISIS INSTRUMENTAL	9
	BIOQUÍMICA	7
	EXPERIMENTACIÓN EN SÍNTESIS ORGÁNICA	7,5
	INTRODUCCIÓN A LA EXPERIMENTACIÓN EN QUÍMICA ANALÍTICA	7,5
	QUÍMICA FÍSICA II	12
	QUÍMICA INORGÁNICA	9
	QUÍMICA ORGÁNICA II	6
4º	DETERMINACIÓN ESTRUCTURAL	6
	EXPERIMENTACIÓN EN QUÍMICA ANALÍTICA	5,8
	EXPERIMENTACIÓN EN QUÍMICA FÍSICA	5,8
	QUÍMICA ANALÍTICA AVANZADA	4,5
	QUÍMICA FÍSICA AVANZADA I	6
	QUÍMICA FÍSICA AVANZADA II	6
	QUÍMICA INORGÁNICA AVANZADA	12
	QUÍMICA ORGÁNICA AVANZADA I	12
	TÉCNICAS ANALÍTICAS DE SEPARACIÓN	7,5
5º	CIENCIA DE LOS MATERIALES	6
	EXPERIMENTACIÓN EN QUÍMICA INORGÁNICA	5,8
	EXPERIMENTACIÓN EN QUÍMICA ORGÁNICA	5,8

Optativas 2º ciclo	AMPLIACIÓN DE LA QUÍMICA DE LOS PRODUCTOS NATURALES	6
	ANÁLISIS CLÍNICO Y FARMACÉUTICO	6
	ANÁLISIS INDUSTRIAL	6
	CINÉTICA ELECTROQUÍMICA	6
	CINÉTICA QUÍMICA	6
	COMPUESTOS INORGÁNICOS EN CATÁLISIS	6
	COMPUESTOS ORGANOMETÁLICOS EN SÍNTESIS ORGÁNICA	6
	CONTROL ANALÍTICO DE LA CONTAMINACIÓN AMBIENTAL	6
	DETERMINACIÓN ESTRUCTURAL AVANZADA	6
	DETERMINACIÓN ESTRUCTURAL DE COMPUESTOS INORGÁNICOS	6
	LABORATORIO AVANZADO EN QUÍMICA ANALÍTICA	8
	LABORATORIO AVANZADO EN QUÍMICA FÍSICA	8
	LABORATORIO AVANZADO EN QUÍMICA INORGÁNICA	8
	LABORATORIO AVANZADO EN QUÍMICA ORGÁNICA	8
	MATERIALES INORGÁNICOS	6
	MÉTODOS MODERNOS EN RMN	6
	POLÍMEROS	6
	PROGRAMACIÓN Y CÁLCULO EN QUÍMICA FÍSICA	6
	QUÍMICA ANALÍTICA DE LOS ALIMENTOS	6
	QUÍMICA BIOORGÁNICA	6
	QUÍMICA CUÁNTICA I	6
	QUÍMICA CUÁNTICA II	6
	QUÍMICA DEL ESTADO SÓLIDO	6
	QUÍMICA INORGÁNICA INDUSTRIAL	6
	QUÍMICA INORGÁNICA DEL MEDIO AMBIENTE	6
	QUÍMICA ORGÁNICA TEÓRICA Y MECANISMOS DE REACCIÓN	6
	QUÍMICA ORGANOMETÁLICA	6
	QUIMIOMETRÍA Y GESTIÓN DE CALIDAD	6
	SÍNTESIS ORGÁNICA	6
	TÉCNICAS CROMATOGRÁFICAS AVANZADAS	6
	TÉCNICAS ELECTROQUÍMICAS AVANZADAS	6
	TÉCNICAS ESPECTROSCÓPICAS AVANZADAS	6
	TERMODINÁMICA ESTADÍSTICA	6

CURSO	INGENIERO QUÍMICO (plan 2000)	CRÉDITOS
1º	ÁLGEBRA Y CÁLCULO	7,5
	CÁLCULO INTEGRAL Y ECUACIONES DIFERENCIALES	7,5
	ELECTRICIDAD Y ÓPTICA	7,5
	ENLACE QUÍMICO Y ESTRUCTURA DE LA MATERIA	4,5
	EXPERIMENTACIÓN EN QUÍMICA I	5
	EXPRESIÓN GRÁFICA	7,5
	MECÁNICA	6
	QUÍMICA ANALÍTICA	6
	QUÍMICA FÍSICA	6
	QUÍMICA ORGÁNICA	6
2º	ANÁLISIS INSTRUMENTAL	10,5
	COMPUTACIÓN Y MÉTODOS NUMÉRICOS	7,5
	ESTADÍSTICA	7,5
	ESTRUCTURA Y REACTIVIDAD DE COMPUESTOS ORGÁNICOS	4,5
	EXPERIMENTACIÓN EN QUÍMICA II	5
	FUNDAMENTOS DE LOS PROCESOS QUÍMICOS	7,5
	INGENIERÍA MECÁNICA	6
	QUÍMICA INORGÁNICA	7,5
	TERMODINÁMICA APLICADA	4,5
3º	CINÉTICA QUÍMICA APLICADA	6
	EXPERIMENTACIÓN EN INGENIERÍA QUÍMICA I	7,5
	EXPERIMENTACIÓN EN INGENIERÍA QUÍMICA II	7,5
	FENÓMENOS DE TRANSPORTE	9
	INGENIERIA ELÉCTRICA	6
	OPERACIONES BÁSICAS DE FLUJO DE FLUIDOS	6
	OPERACIONES BÁSICAS DE TRANSMISIÓN DE CALOR	4,5
Optativas 1er ciclo	BIOQUÍMICA	6
	GEOLOGÍA	6
4º	CONTROL, INSTRUMENTACIÓN Y SIMULACIÓN DE PROCESOS QUÍMICOS	9
	DINÁMICA Y CONTROL DE PROCESOS QUÍMICOS	4,5
	DISEÑO DE EQUIPOS E INSTALACIONES	7,5
	EXPERIMENTACIÓN EN INGENIERÍA QUÍMICA IV	5
	MÉTODOS ESPECIALES DE SEPARACIÓN	4,5
	OPERACIONES DE SEPARACIÓN	6
	QUÍMICA INDUSTRIAL	6
	REACTORES QUÍMICOS	6
	SEGURIDAD E HIGIENE INDUSTRIAL	4,5
	SIMULACIÓN Y OPTIMIZACIÓN DE PROCESOS QUÍMICOS	6

5º	AMPLIACIÓN DE REACTORES QUÍMICOS	4,5
	DISEÑO DE PROCESOS QUÍMICOS	4,5
	ECONOMÍA Y ORGANIZACIÓN INDUSTRIAL	7,5
	EXPERIMENTACIÓN EN INGENIERÍA QUÍMICA IV	5
	GESTIÓN DE PROYECTOS	4,5
	PROYECTO INDUSTRIAL	12
	TECNOLOGÍA DEL MEDIO AMBIENTE	10,5
Optativas 2º ciclo	ANÁLISIS MEDIOAMBIENTAL	4,5
	BIORREACTORES Y TECNOLOGÍA DE BIOPROCESOS	6
	CONTAMINACIÓN INDUSTRIAL Y TRATAMIENTO DE RESIDUOS	6
	DERECHO LABORAL E INDUSTRIAL	4,5
	GESTIÓN DEL MEDIO AMBIENTE EN LA INDUSTRIA	4,5
	INGENIERÍA ALIMENTARIA	4,5
	MICROBIOLOGÍA	4,5
	OPERACIONES CON SÓLIDOS	4,5
	PLANIFICACIÓN Y CONTROL DE LA PRODUCCIÓN	4,5
	SÍNTESIS DE PROCESOS	4,5
	TECNOLOGÍA PETROQUÍMICA Y DE POLÍMEROS	6

CURSO	INGENIERO TÉCNICO INDUSTRIAL: RAMA QUÍMICA INDUSTRIAL (plan 2000)	CRÉDITOS
1º	EXPERIMENTACIÓN EN QUÍMICA	9
	EXPRESIÓN GRÁFICA Y DISEÑO ASISTIDO POR ORDENADOR	7,5
	FISICO-QUÍMICA	7,5
	FUNDAMENTOS DE QUÍMICA	6
	FUNDAMENTOS FÍSICOS DE LA INGENIERÍA	12
	FUNDAMENTOS MATEMÁTICOS DE LA INGENIERÍA	15
	MÉTODOS MATEMÁTICOS DE LA INGENIERÍA	6
	QUÍMICA ANALÍTICA	6
	QUÍMICA ORGÁNICA	6
2º	ADMINISTRACIÓN DE EMPRESAS Y ORGANIZACIÓN DE LA PRODUCCIÓN	6
	FUNDAMENTOS DE CIENCIAS DE LOS MATERIALES	6
	FUNDAMENTOS DE INFORMÁTICA	6
	FUNDAMENTOS DE LOS PROCESOS QUÍMICOS	6
	INGENIERÍA DE LA REACCIÓN QUÍMICA	6
	INGENIERÍA MECÁNICA	4,5
	MÉTODOS ESTADÍSTICOS DE LA INGENIERÍA	6
	OPERACIONES BÁSICAS	6
	TECNOLOGÍA ELÉCTRICA	4,5
	TERMODINÁMICA APLICADA	6

3º	CONTROL E INSTRUMENTACIÓN DE PROCESOS QUÍMICOS	6
	EXPERIMENTACIÓN EN INGENIERÍA QUÍMICA	12
	OFICINA TÉCNICA	7,5
	PROYECTO FIN DE CARRERA	6
	QUÍMICA INDUSTRIAL	12
Optativas	ANÁLISIS INDUSTRIAL Y MEDIOAMBIENTAL (I.A.I.)	4,5
	ANÁLISIS INSTRUMENTAL (I.A.I)	9
	CINÉTICA QUÍMICA	4,5
	COMPLEMENTOS DE MATEMÁTICA APLICADA	4,5
	CONTROL Y TRATAMIENTO DE EFLUENTES GASEOSOS (I.T.M)	4,5
	DIBUJO ASISTIDO POR ORDENADOR I	4,5
	DIBUJO ASISTIDO POR ORDENADOR II	4,5
	DIBUJO INDUSTRIAL QUÍMICO	4,5
	DIRECCIÓN DE LA EMPRESA INDUSTRIAL	4,5
	DIRECCIÓN DE LOS PROCESOS PRODUCTIVOS	4,5
	DISEÑO DE COMPONENTES MECÁNICOS PARA PLANTAS DE PROCESOS	4,5
	DISEÑO DE PROCESOS AMBIENTALES (I.T.M)	4,5
	ELECTROQUÍMICA Y QUÍMICA DE SUPERFICIES	4,5
	FUNDAMENTOS ELECTRÓNICOS EN PROCESOS QUÍMICOS	4,5
	INGLÉS TÉCNICO QUÍMICO I	4,5
	INGLÉS TÉCNICO QUÍMICO II	4,5
	LABORATORIO DE ANÁLISIS INSTRUMENTAL (I.A.I.)	4,5
	LUMINOTÉCNIA	4,5
	MATEMÁTICA APLICADA POR ORDENADOR	4,5
	MATERIALES ADHESIVOS DE INGENIERÍA	4,5
	MATERIALES METÁLICOS	4,5
	MATERIALES NO METÁLICOS (I.M)	4,5
	METALURGIA EXTRACTIVA (I.M.)	4,5
	MÉTODOS AVANZADOS PARA CARACTERIZACIÓN ESTRUCTURAL DE MATERIALES	4,5
	OPERACIONES DE SEPARACIÓN EN LA INDUSTRÍA QUÍMICA	4,5
	REFRACTARIOS Y HORNOS (I.M)	4,5
	SIMULACIÓN DE PROCESOS QUÍMICOS	4,5
	TECNOLOGÍA DE LA FUNDICIÓN INYECTADA DE METALES Y POLÍMEROS	4,5
	TECNOLOGÍA DEL MEDIO AMBIENTE	4,5
	TRATAMIENTO DE AGUAS RESIDUALES E INDUSTRIALES (I.T.M.)	4,5
	TRATAMIENTO DE RESIDUOS SÓLIDOS E INDUSTRIALES (I.T.M)	4,5
	TRATAMIENTOS TÉRMICOS Y DE SUPERFICIE	4,5

CURSO	LICENCIADO EN BIOQUÍMICA (plan 1999) - SEGUNDO CICLO	CRÉDITOS
4º	BIOLOGÍA CELULAR	6
	ENZIMOLOGÍA	6
	ESTRUCTURA DE MACROMOLÉCULAS	7
	GENÉTICA MOLECULAR E INGENIERÍA GENÉTICA	7
	INMUNOLOGÍA	6
	METABOLISMO	7
	METODOLOGÍA Y EXPERIMENTACIÓN BIOQUÍMICA I	8
	MICROBIOLOGÍA INDUSTRIAL	5
5º	BIOFÍSICA	7
	BIOQUÍMICA CLÍNICA Y PATOLOGÍA MOLECULAR	7
	BIOSÍNTESIS DE MACROMOLÉCULAS	5
	INGENIERÍA BIOQUÍMICA	5
	METODOLOGÍA Y EXPERIMENTACIÓN BIOQUÍMICA II	8
Optativas	BASES MOLECULARES DE LA ENFERMEDAD	6
	BIOTECNOLOGÍA VEGETAL	6
	CRÉDITOS POR EQUIVALENCIA	24
	ENDOCRINOLOGÍA	6
	FISIOLOGÍA ANIMAL	4,5
	FISIOLOGÍA VEGETAL	4,5
	GENÉTICA	5
	INMUNOTECNOLOGÍA	6
	MICROBIOLOGÍA	4,5
	MICROBIOLOGÍA SANITARIA	4,5
	NUTRICIÓN	6
	PRODUCTOS NATURALES Y HETEROCICLOS DE INTERÉS BIOQUÍMICO	6
	QUÍMICA ANALÍTICA	6
	QUÍMICA ANALÍTICA DE LOS ALIMENTOS	6
	QUÍMICA FÍSICA	6
	QUÍMICA ORGÁNICA	8
	TOXICOGENÉTICA	4,5
	TRANSDUCCIÓN DE SEÑALES	6
	VIROLOGÍA	6

12.4. Annex IV: List of Master and specialized courses carried out by institutions different from University.

CENTRO	CURSO
Asturias Business School. Fundación Escuela de Negocios de Asturias	-Programa de dirección de empresas -Programa de desarrollo en gestión de la calidad -Master en gestión del medio ambiente
Escuela de Alta Gestión Empresarial	-Master en Prevención de Riesgos Laborales -Auditor del sistema de Prevención de Riesgos Laborales -Master en Gestión Integrada de la Empresa (prevención + calidad + medioambiente + auditorias) -Técnico en Sistemas de Gestión de Calidad y Auditorias -Técnico en Control de Calidad -Evaluación del Impacto Medioambiental -Técnico en Sistemas de Gestión Medioambiental -Master en Dirección de Empresas. MBA.
Laboratorio Interprofesional Lechero de Asturias	-Análisis microbiológico de alimentos
Colegio de Químicos de Asturias y León	-Curso de especialidades de prevención de riesgos laborales para técnicos superiores en prevención de riesgos laborales (colaboración EOI) -Curso: Técnico De Medio Ambiente Y Auditor De Sistemas De Gestión Ambiental ISO : 14001:2004 -Curso: técnico en calidad y auditor de sistemas de gestión de la calidad ISO : 9001 -Curso de Prevención de Riesgos Laborales -Curso, La Reactividad en Química Orgánica y Bioquímica: Una Propuesta Didáctica Talleres del CO2
Colegio de Ingenieros Superiores de Minas de Asturias	-Master en Prevención de Riesgos Laborales -Master de Calidad y Medio Ambiente
Colegio de Ingenieros Técnicos de Minas de Asturias	-Master en Sistemas Integrados -Master en Prevención de Riesgos Laborales (Nivel Intermedio) -Master en Prevención de Riesgos Laborales (Nivel Superior) -Curso de auditorias de los sistemas de prevención de riesgos laborales
Fundación ITMA. Instituto Tecnológico de Materiales	-Calidad en laboratorios de ensayo -Calibración en la empresa -Control y validación de métodos de ensayo -Incertidumbre en análisis químico -Calibración de balanzas y sistemas de volumen -Cualificación de procedimientos y soldadores -Ensayos mecánicos de materiales Interpretación metalográfica de aceros, fundiciones y uniones soldadas

Cursos programados a fecha Septiembre 2005

12.5. Annex V: Questionnaire.

Encuesta realizada a las empresas:

ESTUDIO DE LAS COMPETENCIAS EN MATERIA QUÍMICA DEL PRINCIPADO DE ASTURIAS.

1. Datos de la empresa:

Empresa	
Dirección	
CNAE	
Persona de contacto	
Cargo	
e-mail	
Teléfono	
Sector Tipos de productos	
Mercado al que van dirigidos	
N° trabajadores	
PYME (si/no)	
Facturación (M euros)	1..... 1-10..... 10-50..... 50-250..... >250….

2. Demanda de educación y entrenamiento:

1 Perfil de la empresa: N° Químicos..... I. Químicos..... Bioquímicos..... I. Industrial..... Biólogos.....

2 ¿Cuántos de ellos se han incorporado el último año? Perfil de ellos.

- Formación: Licenciados..... Master..... Doctores.....
- Idiomas y nivel:

3 ¿Proceden de la Universidad de Oviedo?

4 ¿En qué áreas trabajan? ¿Están relacionadas con la Química?

5 ¿Qué se les suele pedir a estos titulados para entrar en la empresa (experiencia, formación complementaria)?

6 ¿La empresa da formación a los titulados al entrar? (N° horas/año)

7 ¿Cómo valora la formación inicial de los titulados contratados?
   - Conocimientos teóricos: muy buena..... buena..... regular.....
   - Conocimientos prácticos: muy buena..... buena..... regular.....
   - Habilidades profesionales: muy buena..... buena..... regular.....
   - Conocimientos de la empresa: muy buena..... buena..... regular.....

8 Indique la característica que considera la fortaleza principal de la formación del titulado recién contratado:

9 Indique la característica que considera la debilidad principal de la formación del titulado recién contratado:

10 Indique la formación que incluiría en la formación de los titulados universitarios, antes de ser contratados por su empresa:

3. Actividad innovadora y transferencia de tecnología:

1 ¿Poseen Departamento de I+D+i? Perfil del personal.

2 ¿Colaboran en proyectos con la Universidad de Oviedo u otras, o con empresas privadas?

3 Tipo de relación laboral del proyecto anterior (contrato por servicio, contrato anual...).

4 Valoración del proyecto.

5 ¿Reciben subvenciones regionales para I+D+i?

6 ¿Han requerido algún servicio tecnológico externo a la Universidad de Oviedo o CPIs asturianos?

7 ¿Qué tipo de colaboración podría requerir su empresa de la Universidad o CPIs?

4. Estudio DAFO:

1 Debilidades:

2 Amenazas:

3 Fortalezas:

4 Oportunidades:

5. Tres campos de investigación del sector químico que considera importantes para su empresa:

1.
2.
3.

Encuesta realizada a la Universidad de Oviedo

1. Oferta de cursos de postgrado (breve descripción, número de matriculados, tendencia)
2. Oferta de cursos de doctorado (breve descripción, número de matriculados, tendencia)
3. ¿Qué porcentaje de alumnos provienen del extranjero?
4. ¿Existen estadísticas que reflejen el % de parados al cabo del año y se compare con el resto de las regiones de España?
5. ¿Qué cree usted que es lo más valorado desde el sector privado tanto de los licenciados como de los doctores de la Universidad de Oviedo?
6. ¿Qué tipo de ayuda reciben de las empresas del sector privado?
7. ¿Qué organizaciones promueven estas ayudas?
8. ¿Quién aporta el capital para los proyectos?
9. ¿Cuáles son las colaboraciones más importantes con el sector privado?
10. ¿Existen proyectos para transferencia de investigadores al sector privado? ¿En qué consisten?
11. ¿Hay acuerdos de colaboración para que los alumnos realicen estancias en empresas privadas? ¿Qué ventajas tiene esta colaboración? ¿Pueden participar alumnos del extranjero?
12. ¿Cuál cree que son los puntos fuertes de la gestión de proyectos de investigación realizados en la universidad y de los acuerdos con el sector privado?
13. ¿Qué cree que se podría mejorar en este tipo de colaboraciones?