Implementation of an International "Professional" Bachelor's Degree in Wireless Networks and Security in Grenoble

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Abstract— The 'Professional' Bachelor's Degree programmes "Networks and Telecommunications" specialising in "Wireless Networks and Security" has existed since 2005 in Grenoble. This programme is actually the 5th and 6th semesters of a three-year degree. In order to encourage international exchanges within this programme, in September 2007 we launched as part of it an "international" group of students (fourteen) with courses taught in English, in order to attract to France both/either non French-speaking European students within the framework of the ERASMUS exchanges, and/or non-European students.

This is an innovative pilot project in France since it is the first time a complete academic year of tuition has been available in English at Bachelor's degree level in the technological fields of study.

I. INTRODUCTION

The Professional Bachelor's Degree "Networks and Telecommunications" specialising in "wireless networks and security" started in Grenoble in September 2005 (French-speaking programme). In the French system, this programme concerns the last year at bachelor' degree level (3 years and 180 ECTS) which means the 5th and 6th semesters of the bachelor's degree programme.

The first group of students for this last year of the Bachelor's Degree programme (French-speaking class only) who left in June 2006 was composed of 32 students, and the second one in June 2007, of 25 students, which corresponded to our plans. In September 2007, an apprenticeship group started (part-time in a company and part-time in the university), so the figures for the French-speaking courses are 24 students in the initial traditional course and 19 in the apprenticeship one in 2007-2008.

The aim of the French Professional Bachelor's Degree is to give students a good level in scientific and technological skills. However another important part of the programme highlighted by French companies, is to prepare students to manage small projects with all the components: planning, customer/supplier relations, etc.

In order to develop international exchanges, especially with European countries where French is not so widespread in the technological fields, we decided to set up an international group, reduced in numbers, 14 students, with the same modules taught in English. This course began in September 2007, and concerns only, as mentioned before, the 5th and 6th semesters.

The purpose of this paper is to describe our experience concerning this international course. In the first part we describe how it is organised, the points which should be taken into account, some difficulties which have been encountered and some solutions or ideas, for colleagues who plan to organise such a degree programme.

The second part of the paper describes the targets of the project. In the third part how the course has been adapted to the international environment is discussed. The fourth part presents in particular the induction week. The fifth part describes the recruitment of students, based on a network of partners at European level. The sixth part presents the teacher mobility aspect of the project, since the Staff-Erasmus exchange programme is used in order to emphasise the international context of the programme. With Professional Bachelor Degrees, one of the main purposes is to give the students the opportunity to have a professional experience in a company or in a research laboratory. Therefore the seventh part presents this aspect. The eighth part is dedicated to the external communication strategy adopted - how to inform about or advertise the existence of our course. The ninth part points out some difficulties concerning particularly the problems of degree equivalence and recognition. The tenth and final part deals with propositions for the future…

II. TARGETS OF THE PROJECT

The idea of this international course came from the fact that today it is becoming increasingly difficult to attract foreign students onto our scientific and technical degree programmes and in particular Europeans, due to the difficulty of finding students in our disciplines who have good communication skills in French. Nevertheless, many European students are interested in France as such and would like to come to France to study.

It is important at this point to take into consideration the fact that traditionally, we succeed in attracting foreign students from French-speaking countries (*Francophonie*) mainly from Africa and the Middle-East, and also some

students from Latin America within the framework of exchange programmes between France and certain Latin American countries (2 students from Venezuela were in Grenoble in 2007-2008, for instance). This strategy which consists in being 'open' towards "*la Francophonie*" is very important for us and is adopted within our traditional French-speaking class.

To attract more European students the only option available to us is to lecture in English, since such students are not able to attend a course given in French, despite their willingness to come to France. It was thus decided to open an international class, composed ideally of more than one third ERASMUS-European students, one third students from other non French-speaking countries (Asia, America, English-speaking Africa), and one "small" third made up of French students who are keen to work in this international environment. It is important for us to have some French nationals in this group to provide the link between the international class and France, since the course is in France.

Even though the courses are actually taught in English, an introductory course on French language (FLE: *Français Langue Etrangère*, French as a Foreign Language) together with the French cultural and economic environment is offered to the foreign students; the idea is that these students, once back home in their respective countries, will want to look further into their partnership with France. Proposing our course to French students as well as foreigners enables us to give it a truly international dimension. This is essential if we wish to initiate the non-French speakers to French culture and the French students to European mobility, and also intercultural partnerships… The French students in the international group have the opportunity to carry out their industrial placement (in a company or in a research laboratory) during the second semester in a foreign country.

III. ORGANISATION OF THE PROGRAMME

In order to internationalise our course, the first step was to define the contents, which sometimes required us to adapt the existing French course.

The strategy adopted is as follows:
- Concerning the "General courses", we adapted in the following way:
- The English course C1 was initially replaced by a course on *FLE* for the non-French-speaking students and by an introductory course to the language of the country where the student will carry out his/her industrial placement for the French-speaking students. Finally we decided later on to keep the English course, because the students needed to have some support in English, even if their level is quite good, in order to improve their skills.

Courses 1- 4 : General courses	hours	ECTS
C1: French language and civilisation and the French industrial environment	30	2
C2: Communication skills	20	2
C3: Introduction to Internet Legislation	20	2
C4: Project Management	20	2

Table. 1 General courses, with the number of hours per course and corresponding ECTS, for the 5th semester

This course also includes a course on the French and international economic environment, consisting of conferences organized by the ANPE (*Agence Nationale pour l'Emploi*, the National French Employment Agency) within the framework of a European project (EURES, European Network of Employment Agencies), with talks by participants from a variety of European member countries.
- The course C2 on French communication skills is replaced by a course on communication skills in English.
- The legislation course C3 is taught in English, with a European orientation. To this end, a partnership has been established with the "Legal framework for the information society" European thematic network. An Italian and a Greek colleague came to Grenoble this year, within the ERASMUS teaching mobility exchange programme, to lecture on internet legislation with a European dimension.
- The project management course C4 is also taught in English and is, as in the French course, closely linked to the academic project.

Courses 5/6 : Fundamental scientific and technological courses	hours	ECTS
C5 Interconnection of networks and their security	60	4
C6 Telecommunications engineering	40	2

Table. 2 Fundamental scientific and technological courses, with the number of hours per course and the corresponding ECTS, for the 5th semester

Concerning the "Fundamental scientific and technological courses" and "Specialised scientific and technological courses", the tutorials, lectures and practicals are taught in English. There is no specific aspect except for the fact that we use the English version of operating systems, both for server and client machines. Nevertheless we keep the use of "azerty" keyboards which has proved to be of no great difficulty for the students…

Courses 7- 10 : Specialised Scientific and technological courses	hours	ECTS
C7 Mobile communications (telephony)	60	4
C8 Mobile computer networks	60	4
C9 Security of communications	60	4
C10 Academic project		4

Table. 3 Specialised scientific and technological courses, with the number of hours per course and the corresponding ECTS, for the 5th semester

Concerning these courses, sections of the tutorials are taught by European lecturers within the framework of ERASMUS Staff exchanges, i.e. 5-hours of tuition over a period of 3 to 4 days in Grenoble. The courses in question relate to networks, wireless networks, security, telecommunications and mobile telephony.

The 6th semester is composed of three weeks of courses (roughly 60 hours for 4 ECTS) - courses C11 to C13, one course on database management systems, one introductory course on patent law and one languages course (English or, if

it is possible, the language of the host country for the training period).

Courses 11-14	hours	ECTS
C11 Database management systems	30	2
C12 Introduction to patent law	10	1
C13 Language	20	1
C14 Industrial placement in company or research laboratory		26

Table. 4 Programme of the 6th semester

The major part of the 6th semester is dedicated to an industrial placement, as an opportunity for the student to apply , in real practical situations, the skills and knowledge acquired during the course. This placement can be carried out in a company, or in a research laboratory; the normal duration is 16 weeks for a total of 26 ECTS credits. The industrial placement is described below, in particular concerning international exchanges.

Two possibilities (options) are open to the students:

- The first option consists in attending the courses in Grenoble only for the fifth semester of then going back to the home university in order to follow the sixth semester and pursue the syllabus there. In this case, they will follow the course in Grenoble for a semester within the framework of Erasmus exchanges but without being awarded the Professional Bachelor's Degree; they can however validate this semester as an "elective" as part of their course in their home institution.
- The second option consists in attending the complete year, which allows the student to obtain the French Professional Bachelor's Degree if he/she has the necessary grades.

IV. WELCOME TO THE STUDENT: AN INDUCTION WEEK

For this first experience of welcoming international students to Grenoble, we began the academic year with an induction week. The purpose was manifold:

- to assess the actual English level of the students, and the way they communicate,
- to create relationships among the students (group cohesion),
- to favour a good working partnership between students and lecturers,
- to favour relationships between French and foreign students,
- to organise a mentorship between French-speaking and non French-speaking students: the former helping the latter to resolve administrative problems (opening a bank account, finding accommodation, to getting possible additional grants for lodgings (*Caisse d'Allocations Familiales*)…).

This induction week was organised as follows:

- half a day for the "official welcome",
- half a day dedicated to administrative aspects,
- half a day dedicated to a social event: a walk up *La Bastille*, small hill with a beautiful panorama near Grenoble city centre,

- the remaining 3 days were dedicated for each student to the preparation of a presentation about themselves, their motivation, their country, their country's academic system (fig. 1),…
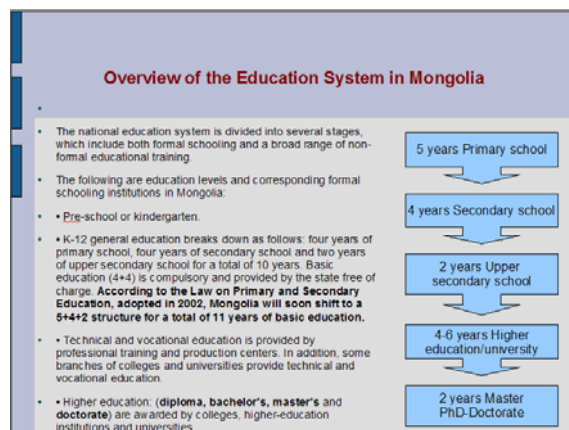

Fig1Example from a student presenting his academic system

V. RECRUITMENT OF STUDENTS

In 2007-2008, 5 French students and 9 foreign students were signed up for the programme.The French students and some foreigners (generally the French-speaking ones) came through the filter of the "normal" registration procedure and were required to fulfill one of the following criteria regarding their level in English:

- TOEFL 520 (paper-based exam) or 210 (computer-based exam),
- TOEIC 700,
- IELTS 5.5,
- BULATS 70.

They were also required to provide a letter of motivation explaining their reasons for wishing to attend the international course.

The European students were recruited through either the network of the "historical" partners of the Université Joseph Fourier, or the network of partners within the EAEEIE (European Association for Education in Electrical and Information Engineering, www.eaeeie.org) Association and the EIE-Surveyor (www.eie-surveyor.org) ERASMUS thematic network.

Of the 9 foreign students, among whom 5 originated from ERASMUS exchanges, in 2007-2008, there were:

- 3 from the Technical University of Košice (Slovakia),
- 1 from Stadia University in Helsinki (Finland),
- 1 from the University of Technology of Silesia (Poland).

The other foreign students included one Greek, one Canadian, one Chinese, one Mongolian registered through normal channels. All these students were also required to fit the level of English described above.

Fig. 2 The group of students in 2007-2008

Concerning the European partnerships, in addition to the three partners who sent us students within the framework of the Erasmus exchanges, twenty-eight other partners expressed an interest in our proposal. Hopefully they will be real partners in the future.

As far as their scientific and technological level is concerned, each student profile was analyzed, in order to see if he/she can follow the courses in good condition. We had in 2007-2008 some difficulties with one student (who had a good theoretical approach but no practical experience.

VI. MOBILITY OF LECTURERS

One of the interests of this programme is to provide the students with an international or at least a European dimension. One of the ways to do so is to invite colleagues, from European partner institutions within the Erasmus Staff-exchange programme, to come to Grenoble and teach part of the course to the students. The purpose of this Teacher mobility is twofold:
- to make the students aware of different viewpoints from a variety of European countries,
- to further exchanges between lecturers, in our case between the European colleagues and the Grenoble staff.

In 2007-2008, the exchanges which were realized are the following:
- *Universidade de Vigo*, Spain, and *Haute Ecole Hennequin Sualem*, Liège, Belgium with colleagues who came to lecture on the course on "security" (course C9).
- *Università degli Studi di Salerno*, Italy, with a colleague who came onto the "Internet legislation" (course C3) course; this part is particularly interesting in our specialised field of study since Internet legislation is nowadays still managed at national level, however the Internet is a globalised open tool which does not obey any state border. Having some colleagues in "Internet legislation" from other countries provides the students with another viewpoint, another legislation code, and gives them a better view of Internet legislation at a

higher level, which is strategically vital when we want to deal with the security of networks.
- Stadia University, Finland, with a colleague who came for a course on "Communication in an International Environment", within the course on "Communication Skills" (course C2). The Finnish colleague who came is a specialist in communication skills in an international environment, and her conference was very much appreciated since the students on the international programme are working in an international environment, and also because we want them to be taught about these aspects and to gain the corresponding skills.

The last aspect, outside of the ERASMUS Staff-exchange, is a partnership we have with EURES, which is a European network of employment agencies. The aim of this network is to emphasise the exchange of workers at European level, and particularly from the border countries, to give the possibility to people to cross the border in order to work in the neighbouring country. A French and a Czech colleague came to Grenoble for this purpose.

VII. PLACEMENTS IN COMPANIES OR RESEARCH LABORATORIES

For students interested (second option described at the end of section 3), the 6th semester of this programme provides the opportunity for the student to spend 16 weeks in a company, or possibly in a research laboratory.

Concerning the international programme, we encourage students to be mobile, in particular the French to go abroad and the foreigners either to stay in France or to go to another country, different from their own. Thanks to the network of partners in our University and the one of the EIE-Surveyor network, more than 20 placements were available for the 14 students for 2007-2008.

The students were in the following countries:
- 6 in France (in 6 companies),
- 3 in the Czech Republic (in a laboratory, CTU),
- 1 in Germany (in the Fraunhofer Institute),
- 1 in Greece (in a company),
- 1 in Denmark (in a company),
- 1 in Canada (in a company),
- 1 chose option 1 (and so is back in his home university, in Finland, for the 6th semester).

VIII. COMMUNICATION STRATEGY

In order to advertise this new syllabus, we contacted various European partners. The partners were contacted by e-mail but also directly during international open days or conferences. That made it possible to identify specific aspects to be taken into account to make the project a success. We would emphasize at this level the fact that the direct contact with and direct involvement of people, as a result of former partnerships, at the teaching or the research levels, are really important and helpful, at least in the "launching" phase…

The strategy also concerns the advertising of this new programme through specialized organizations at the French level, such as SFERE and EduFrance.

SFERE is an organization linked to the French Ministry (Department) for Foreign Affairs dedicated to setting up, managing and monitoring of bilateral agreements between France and foreign countries (generally outside Europe) in order to give the opportunity to foreign students to attend courses in France.

EduFrance advertises through its website and also an annual paper directory the various programmes available in France for international students. There is specific information about English-taught programmes available in France. Our programme is thus now in the catalogue of the English-taught programmes offered in France.

IX. Difficulties encountered

Certain difficulties however appeared. Some were simply related to logistics (late launching of the project, motivation of the students when it came to taking the decision) but others were more fundamental.

The more structural difficulties are various:

- the students at Bachelor's degree level are perhaps less inclined to go abroad than the Masters students, they are indeed younger and less mature: we think that we should incite them to be motivated, and help in relaying the information about our course by colleagues in the partner universities is crucial,
- problems with curricula compatibility (reintegration of the students into their original course at home after one semester spent in Grenoble) were raised by certain partners; this problem is a recurring problem raised by most teaching staff when there is a question of sending students abroad, or giving an equivalence when they return back home. It is important at this stage to consider that a student going abroad is benefitting from a highly interesting experience, as a student, in his field of competence, but also as a citizen; it is thus necessary to analyse the program as a whole and consider all the skills gained by the student abroad vs. the skills and knowledge required to follow the course, when the student is back in his/her home country; the preceding approach has more chance of success than an approach which consists in finding in the partner university an exact point-to-point equivalent course which is generally impossible to achieve. This point is discussed later on in the next part.
- the problem of compatibility of courses also stems from the fact that a Bachelor's degree, in compliance with the Bologna model, may take, depending on the country or the institution, three years, three and a half years or four years; this point must of course be taken into account when setting up exchanges,
- problems with diploma accreditation which prevent certain universities in certain countries from recognising semesters spent abroad,
- difficulty also in finding work placements in companies in France for non French-speaking students. Several companies in France work in an international environment, in particular in the Grenoble area;

nevertheless, when it comes to recruiting a non French-speaking student for a placement, most companies are generally reluctant to do so, arguing that it would be difficult for the student to interact with many people in the company in everyday life: this is due to the fact that English is not yet sufficiently widespread in France…

X. Synthesis and Discussion

Several problems have been highlighted in the previous part. The main problem is equivalence (credits) and also accreditation [1]. These problems are discussed in the following paragraphs with some concrete propositions.

X.1 Equivalence and credits

Concerning equivalence and credits, despite the interesting tool which ECTS (European Credit Transfer System) is [1] [2] [3], it is for the moment not easy to work with semesterial equivalence for mobility. First of all, we should remember that the ECTS is a tool which measures the actual workload of students, and the "grading" system which is used by ECTS is the following: A best 10%, B next 25%, C next 30%, D next 25%, and E next 10%. A distinction is made between the grades FX and F that are used for unsuccessful students. FX means: "fail- some more work required to pass" and F means: "fail – considerable further work required".

This method of giving levels (from A to E, and F et Fx) is statistically-based and relative. Its purpose is to be able to give the position of a student (who is in another institution) within a certain group -at least statistically representative - of students. It is not always the way ECTS credits are used … Consequently it is necessary to keep an actual grading system (such as the systems existing generally in HEIs, or a new standards to be invented [4]) and then to give ECTS correspondences. Another important aspect is that ECTS aims only at measuring the workload of the student, neither the time spent by the student with a teacher nor the level of qualifications obtained by the student is taken into consideration. These aspects should be emphasized in the future, for instance for the setting up of a Life Long Learning Accumulation system.

For our Professional Bachelor's degree, we used the workload in order to attribute ECTSs to the courses, these ECTSs are effectively used for ERASMUS exchange (option 1). The normal French grading system is used in order to deliver the French diploma, in the same conditions as for the students in the French-speaking programme.

X.2 Accreditation

The problem of accreditation should also be taken into account. In some countries and institutions and for some programmes, it is required to describe the complete syllabus, in detail, in order for the syllabus to be accredited. Under this assumption, it is really difficult to find the same courses in another institution and so to set up worthwhile international exchanges. A more pragmatic way is to base the accreditation on competence, this approach is strongly encouraged by the

European Commission, within the framework of the Tuning Project [5].

X.3 A network of partners

We have understood from previous discussions that a network of partners is very important in such projects, with strong bilateral relationships as relays of information in partner institutions, based administratively on Erasmus bilateral agreements.

In order to facilitate exchanges and also to ease the accreditation procedures, it could be interesting to develop a multilateral exchange model. The exchanges could indeed be facilitated by the fact that they would not be based on a bilateral agreement but more on a multilateral base, which would give more choice to the students. The accreditation procedures could be eased within this framework, if we could organize within this multilateral basis some "compatible" areas of the syllabus. By compatible, we mean the organization and scheduling of these areas of syllabus more than the content itself. The contents could actually be different, it is also one of the interesting aspects of mobility [6] [7].

An idea for the implementation of the above concept consists in taking as a starting point the model of major and minor courses. Minor is an "under-specialty" or second specialty or elective which is proposed in certain programmes. We could imagine offering our semester (at present the 5th semester of a Bachelor's degree programme) as an international semester within the syllabi of our European partners in similar fields of study. This approach is of interest for the following reasons:

- the semester could fit into any programme of study,
- the accreditation procedures could take this aspect into consideration,
- the problems of pre-requisites necessary for the students to follow courses when they go back to their home institution would be solved, since the semester proposed would be a minor.

If the same "architecture" is implemented for minors by several partner institutions (network of partners) at the 5th semester Bachelor level, these "international" minors could be proposed to students within the network, each student could then choose.

Proposing international semesters could thus solve certain remaining problems related to exchanges and thus encourage mobility. We could also imagine, with certain partners, standardizing and generalizing within a network the principle of the international semester minor, the students being able to choose from among the offers proposed….

Some points remain to be discussed, in order to generalize the approach: preparation of the students before mobility, the use of distant-based teaching resources, the possibility for students to follow some courses at a distance, once abroad, in order to have some complementary skills necessary to actually validate the semester. Nevertheless, this should be limited to perhaps a maximum of 4 ECTS credits in order to be realistic.

XI. CONCLUSIONS

This first year (2007-2008) was a good experience for our teaching staff on the programme. A good group of 14 students was recruited, among whom 9 foreigners, 5 of which did not speak French. Among the French students, 3 of them had been abroad in 2006-2007 on Erasmus exchange programmes and were particularly interested and motivated by the English-taught format of the proposed programme.

Two criteria were highlighted as requirements for the experience to be a success:

- the setting up of an international network of partners, in particular for student recruitment and industrial placements,
- the creation of a strong teaching team, with proactive colleagues who are keen to be involved in the experience. A minimum number of colleagues is required - ideally one colleague per course is necessary. For our experience in Grenoble everything was covered except Project Management and Databases, here we found colleagues from another department of the university, these colleagues are now active members of our team…

One difficulty which remains to be resolved, but on which we are at present working, is the fact that our final diploma is in French, as all official diplomas of the French Republic are. We are working on an accompanying document, with the translation of the Diploma and the Diploma Supplement.

ACKNOWLEDGMENTS

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