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Implementation in Romania of the European Framework Standards for the Accreditation of Engineering Programmes

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Implementation in Romania of the European Framework Standards for the Accreditation of Engineering Programmes

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Abstract: *The paper presents the EUR-ACE system, a decentralized accreditation system of engineering education programmes, in which a common European quality label (the EUR-ACE® label) is added to the accreditation awarded by a national Agency, under the condition that EUR-ACE Framework Standards are satisfied. As partner in an EU- funded project EUR-ACE SPREAD, the Romanian Agency for Quality Assurance in Higher Education (ARACIS) became member of the European Network for Accreditation in Engineering Education (ENAEE) and adopted the EUR-ACE Framework Standards. A process of authorization of ARACIS to award EUR-ACE® label is under way.*

Key-words: *accreditation, framework standards, label*

Introduction

While spending, as a Fulbright scholar, the year 1968 at the Department of Civil Engineering of the University of Texas at Austin, the author observed one day a certain state of nervosity among the members of the teaching staff. Asking about the reasons, he was told that an accreditation visit of a team of evaluators from the "*Engineers Council for Professional Development – ECPD*" is going to take place. The late Professor Lymon C. Reese, Head of the Department, explained him that the visit was aimed to reconfirm that the Bachelor programme offered by the Department gave the graduate the preparation needed to start a career as a professional engineer.

Coming from a country where a hypercentralised system prevailed in all sectors, no wonder that for the author the term of "*accreditation*" was new. In Romania, all educational programmes were at that time approved by the Ministry of Education and there was no need for accreditation. Becoming interested in the matter and willing to share the discoveries when returning home, the author learned that ECPD started to function in 1932 and was the only agency recognized at national scale for the accreditation of engineering and engineering technology programmes.[1] Eventually, the name of the agency was changed in "*Accreditation Board for Engineering and Technology – ABET*" but its mission remained, essentially, the same.

Europe knew, also, in the 30's the first accreditation agency for engineering programmes. The "*Commission des titres d'Ingénieur – CTI*" was founded by law in France in 1934. CTI is to decide at first request of the legal qualification of a higher engineering education institution to deliver the "*ingénieur*" diploma.

Participating in several European projects developed in the last 15 years, the author witnessed the main steps towards the creation of a European system of accreditation of engineering programmes.

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[1]   Manoliu I. (1969) Note asupra învățământului tehnic superior de construcții din Statele Unite, Buletinul Științific Institutul de Construcții București Nr. 4, 1969.

An important moment can be considered the "*First-European Workshop on Accreditation of Engineering Programmes – EWAEP*", which took place in December 1998 in The Hague, organized by a Working Group of the *Thematic Network H3E (Higher Engineering Education for Europe)* chaired by Professor Giuliano Augusti. The same Working Group organized the following EWAEP in Paris, in June 1999. The activity of this Working Group and the results of the two Workshops paved the way for the foundation in September 2000 in Paris of "*ESOEPE- European Standing Observatory for the Engineering Profession and Education*". Among the founding members of the ESOEPE was the *Thematic Network E4 (Enhancing Engineering Education in Europe)*, coordinated by the University of Florence, which ran between 2000 and 2004 a EU- supported Project. Matters of the accreditation and recognition in engineering education were at the centre of preoccupations within the Activity 2 of the E4 Project, whose Promoter was Professor Giuliano Augusti.

One can consider that a "*critical mass*" already existed for the launching of a new project, aimed at establishing a European system of accreditation of first and second cycle engineering degree programmes. Together with other stakeholders, the author, representing both the civil engineering profession, as Vice-President of the *Union of Associations of Civil Engineers of Romania*, UAICR, but also the academic community as Chairman of the Management Committee of the *Thematic Network EUCEET (European Civil Engineering Education and Training)*, was invited in the spring of 2003 to a meeting at EC where two distinguished representatives of the Directorate General of Education and Culture, Peter Van den Hijden and Guy Haug, expressed the high interest of the Commission for the creation of a decentralized system based on a common set of standards to be applied by national agencies involved in accreditation of engineering programmes. Following the meeting, University of Florence prepared an application for a project named EUR-ACE (*European Accreditation for Engineering*) having 10 partners among which one from Romania: UAICR. A 2-year duration project (2004 – 2006) was approved by the EC. One can consider that the start of this project triggered the process which led to the development of the EUR-ACE system.

1. The EUR-ACE Framework Standards

The first important activity within the EUR-ACE project was to undertake a detailed survey of the standards used by agencies in Europe involved in the accreditation of engineering programmes. The survey put into evidence that various standards have many points in common. On that basis, a first draft of a document named "*EUR-ACE Framework Standards*" was prepared. To better realize the compliance of standards used by different agencies and the draft of the EUR-ACE Framework Standards", the Project Board decided to send observers in regular accreditation procedures. The author participated, as EUR-ACE observer, to two such accreditation missions:

· on 18 – 20 October 2005, an accreditation mission organized by RAEE (Russian Association for Engineering Education) at the Tomsk Polytechnic University, for the degree programme "*Geology and mineral prospecting*"

· on 4 – 5 October 2005, an accreditation mission organized by CTI –Commission des Titres d'Ingénieur, at Ecole Speciale des Travaux Publics, du Bâtiment et de l'Industrie - ESTP Paris, for integrated degree programmes in civil engineering leading straight to a 2nd cycle degree.

In total, observers took part to 22 such mission in France, Germany, Ireland, Portugal, U.K. and Russian Federation.

In addition to sending observers in regular accreditation procedures organized by the agencies partners in the project, the project organized also a number of trial accreditations based on EUR-ACE standards in three countries: Turkey, Lithuania and Croatia.

Reports from the observers and from the trial accreditations, served as a basis for finalizing in March 2006 the EUR-ACE Framework Standards, which were eventually revised in 2008.[2]

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[2] ENAEE (2008): EUR-ACE Framework Standards for the Accreditation of Engineering Programmes, www.enaee.eu; ENAEE (2008): Commentary on EUR-ACE Framework Standards, www.enaee.eu.

In accord with European Qualification Frameworks QF-EHEA[3] and High Level Qualifications Framework for Lifelong Learning (EQF – LLL)[4], the EUR-ACE Standards distinguish between First and Second Cycle Degrees and identify 21 programme outcomes for First Cycle Degrees (FCD) and 23 for Second Cycle Degrees (SCD), grouped under six headings:

1) Knowledge and understanding;
2) Engineering analysis;
3) Engineering design;
4) Investigations;
5) Engineering practice;
6) Transferable skills.

The EUR-ACE Standards contain guidelines and procedures that include the assessment, among other requirements, of the human resources and facilities available for the programme.

The EUR-ACE Standards encompass all engineering disciplines and profiles, distinguishing only between First and Second Cycle degrees. Also, the Standards are applicable to the accreditation of programmes leading directly to a degree equivalent to a Second Cycle Degree, named "*integrated programmes*", such as those offered by the Grandes Ecoles in France and by the Greek universities.

The EUR-ACE Framework Standards define and require learning outcomes, that is the specific knowledge, skills and/or abilities gained by the successful completion of a programme of study. The learning outcomes to be achieved by first cycle and second cycle degree graduates in the three direct engineering requirements ("*Engineering Analysis", "Engineering Design" and "Investigations*") are expressed by the phrase "*consistent with their level of knowledge and understanding*", and this level is described using the concepts "*coherent knowledge of their branch of engineering including some at the forefront of the branch*" for First Cycle graduates and "*a critical awareness of the forefront of their branch*" for Second Cycle graduates. The identification of the forefront of the branch is the responsibility of the members of the accrediting panel who are experts in that particular branch of engineering, while the body responsible for the final accreditation verdict will review and assess the rationale for their decision.[5]

Presentations and debates on the EUR-ACE Framework Standards took place in various countries represented in the consortium of partners. One such event was organized on 5th March 2005 by UAICR at the University of Bucharest, with the support of the *National Council for Academic Assessment and Accreditations* (NCAAA). The Workshop "*Towards a European accreditation system in engineering education*" was attended by rectors of Technical Universities, deans of engineering faculties and members of the two engineering committees of NCAAA.

A recognition at global scale of the soundness of the EUR-ACE Framework Standards came when it has been taken, together with ABET criteria[6], as the basis of a "*Conceptual Framework of Expected/ Desired Learning Outcomes in Engineering*" developed by the OECD – sponsored Tuning-AHELO project.[7] The author joined Prof. Giuliano Augusti and other 12 experts from 5 continents who participated to the AHELO-Tuning project.

A very important outcome of the EUR-ACE project was the transformation of ESOEPE into the international non-for-profit association "*European Network for Accreditation of Engineering Education*" (ENAEE). The association was founded in Brussels in February 2006 by 14 Associations and Agencies interested in engineering education throughout Europe, including UAICR from Romania.

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[3] Bologna Working Group on Qualifications Frameworks (2005): A Framework for Qualifications of the European Higher Education Area (QF-EHEA).

[4] European Union (2008): High Level Qualifications Framework for Lifelong Learning (EQF-LLL), Recommendation of the European Parliament and of the Council.

[5] Augusti G. (2010): The EUR-ACE Accreditation System of Engineering Education: Origins and Current Status, In
Inquires into European Higher Education in Civil Engineering, 9th EUCEET Volume (I. Manoliu editor) 265 – 279.

[6] ABET (2009): The ABET criteria for accrediting engineering programmes, www.abet.org.

[7] Tuning Association, on behalf of a Group of Experts (2009): A Tuning – AHELO Conceptual Framework of Expected Desired Learning Outcomes in Engineering.

2. The EUR-ACE System

ENAEE has registered the EUR-ACE® Trademark and Authorizes National Agencies to add the EUR-ACE label to their accreditation. This authorization may be defined as "*meta-accreditation*". Regarding the significance of the EUR-ACE system and of the EUR-ACE label, it is worth to quote from a paper presented at ISQM 2010:

"*The EUR-ACE Framework does not intend to substitute for national standards, but to provide a common reference framework as the basis for the award of a common European quality label.*

Consequently, the EUR-ACE accreditation system was envisaged as based on a bottom-up approach involving the active participation of national accreditation agencies and leading at the end to a multilateral mutual recognition agreement. A supra-national European Engineering Accreditation Board was considered, but soon discarded and never proposed: accreditation is and will remain the task of national (or regional) agencies; the EUR-ACE label will be a complement to the national accreditation, aimed at giving them an international value. This decentralized approach appears to be rather novel in the world-wide panorama of programme accreditation systems. Indeed, the variety of educational situations and of degrees awarded in Europe makes trans-national recognition of academic and professional qualifications still rather difficult. The already quoted "Bologna Process" is working towards the creation of a transparent system of easily readable and comparable degrees in the European Higher Education Area (EHEA), but as far as professional accreditation and recognition are concerned, no generally accepted system or agreement exists on a continental scale: notwithstanding the prestige of national systems and academic titles, this deficiency weakens the position of the European engineer in the global employment market."[8]

Two EC-supported projects (EUR-ACE IMPLEMENTATION and PRO-EAST) have been active between 2006 and 2008 and greatly helped to start up the EUR-ACE system, respectively in the EU and Russia.

In November 2006, ENAEE assessed that six Accreditation Agencies (CTI in France, ASIIN in Germany, Engineers Ireland, Ordem dos Engenheiros in Portugal, RAEE in Russia, Engineering Council in UK), all active partners in the EUR-ACE project, already fulfilled the requirements set by the Framework Standards and, as a consequence, were authorized to award the EUR-ACE label for a period of two years. Their meta-accreditation has been renewed in December 2008 after a rigorous re-assessment process including site visits by multi-agency teams.

ENAEE is committed not only to strengthen the EUR-ACE system in the six countries constituting the initial core but also to spread it into other countries of the European Higher Education Area. A document indicating the condition to be fulfilled and the procedure to be followed by an Agency in order to join the EUR-ACE system and the relevant application form has been elaborated.[9]

Between 1st November 2008 and 31st October 2010 developed another EU-supported project coordinated by ENAEE called EUR-ACE SPREAD, targeted mainly to Turkey, Romania, Lithuania, Italy and Switzerland. A first concrete achievement of EUR-ACE SPREAD has been the addition of the Turkish "*Association for Evaluation and Accreditation of Engineering Programs*" (MÛDEK) to the initial six EUR-ACE Agencies. MÛDEK had begun accrediting programmes on behalf of the Turkish Engineering Deans Council in 2003, joined ENAEE in 2006, became an independent Association in 2007 and in 2008 applied to be EUR-ACE accredited. After a careful evaluation of the application and site visits by ENAEE appointed panels, on 25 January 2009 MÛDEK became the seventh Agency authorized to award EUR-ACE label.

[8] Augusti G., Borri C., Guberti E., Manoliu I, Valdisseri, J. (2007): EUR-ACE: The European accreditation system of first and second-cycle engineering degree programmes, In Proc. 2nd
      ISQM 2010, Sinaia, Romania, 13 – 20.

[9] Augusti G., Borri C., Guberti E., Manoliu I, Valdisseri, J. (2007): EUR-ACE: The European accreditation system of first and second-cycle engineering degree programmes, In Proc. 2nd
      ISQM 2010, Sinaia, Romania, 13 – 20.

ARACIS, the Romanian Agency for Quality Assurance in Higher Education, was partner in the project EUR-ACE SPREAD. To better appreciate the importance of the involvement of ARACIS in the project, is necessary, first, to briefly present the Romanian system of engineering education.

## 3. Engineering Education in Romania

The Romanian system of engineering education, built over a period of almost 150 years, is strong and diverse. In the academic year 2010 – 2011, there are 39 higher education institutions offering engineering programmes in 22 centres (fig. 1). These are:

- **7 technical universities** (*Bucharest*: University "Politehnica", Technical University of Civil Engineering, Military Technical Academy; *Iasi*: Technical University "Gheorghe Asachi"; *Cluj:* Technical University; *Timișoara*: Politehnica University; *Constanța:* Naval academy "Mircea cel Bătrân", Maritime Academy.)
- **6 universities with engineering programmes in majority** (Universities from Brașov, Craiova, Galați, Oradea, Ploiești, Petroșani)
- **12 universities with engineering programmes in minority** (Universities from Alba Iulia, Arad, Bacău, Baia Mare, Constanța, Pitești, Reșița, Sibiu, Suceava, Târgoviște, Tg. Jiu, Tg. Mureș)
- **7 public universities with only one engineering programme**
  7 private institutions

Before the implementation of the Bologna process, the system of engineering education in Romania was a pure "**continental**" or "**binary**" system, with two types of programmes: a short duration (3-year) programme leading to the degree called "*inginer colegiu*", and a long duration (5-year) programme leading to a degree called "*inginer diplomat*" (figure 1). Prevalent were, of course, the one-tier programmes of long duration (5-year).
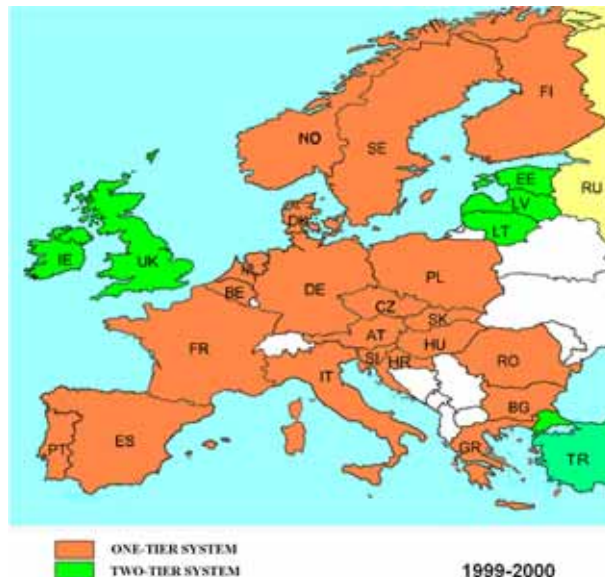
Figure 1

Engineering education in Romania before Bologna process
True "continental" or "binary" system
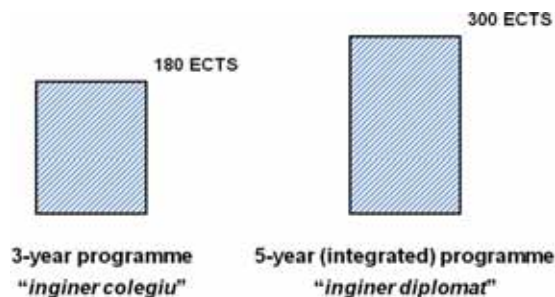
In figure 2 are represented, on the basis of findings within the Thematic Network Project EUCEET, initiated by the Technical University of Civil Engineering Bucharest, the distribution in Europe of one-tier (integrated) programmes and two-tier (Bachelor-Master) programmes, at the level of the academic year 1999 – 2000, i.e. before the implementation of the Bologna process.[10]

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[10] Manoliu I. (2004): Civil engineering education in Europe and the Bologna process – an overview in 2004, In Civil Engineering Education in Europe, 4th EUCEET Volume (I. Manoliu editor), 209 – 234.
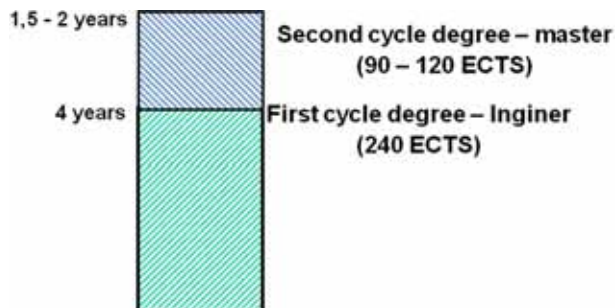
Figure 2

The implementation of the Bologna process in Romania by the introduction of two cycles started in the academic year 2005 – 2006 and lead for the engineering education to the two-tier system illustrated in figure 3.

Figure 3

Engineering education in Romania after the implementation of
Bologna process, starting with the academic year 2005-2006
Two-tier system

The figure 4 shows the distribution of one-tier and two-tier systems in Europe, at the level of the academic year 2009 – 2010, as revealed also by EUCEET.[11] As one can realize, with two exceptions (France and Greece), the two-tier system spread all over Europe.

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[11] Manoliu I. (2010): Implementation of the two-tier study programmes in civil engineering across Europe following the Bologna process, Report of the Working Group for the theme A, In Inquiries into European Higher Education in Civil Engineering, 7th EUCEET Volume (I. Manoliu editor) 3 – 49.

Figure 4

ONE-TIER SYSTEM
TWO-TIER SYSTEM

2009-2010
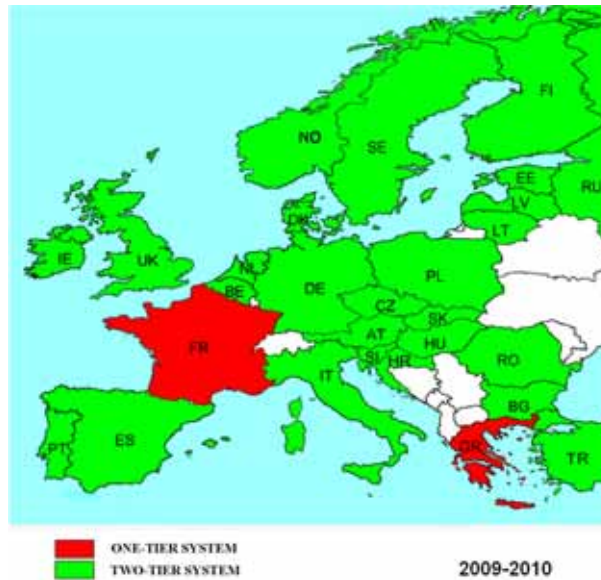
The dimension of the engineering education in Romania is illustrated not only by the number of providers but also by the number of fields and specializations (study programmes). The so-called "*Nomenclator*" of specializations for the first cycle degree is submitted each year by the Ministry of Education to the approval of the government. For the academic year 2010 – 2011, the *nomenclator* identifies 27 fields of engineering (civil engineering, mechanical engineering, electrical engineering, chemical engineering, etc) and a total of 148 specializations.

4. Romanian System of Accreditation

As shown in the **Introduction**, before 1990 no accreditation was needed, since all higher education institutions were public institutions. Programmes were approved by the Ministry of Education, based on strict requirements concerning duration, number of contact-hours, number of courses etc, being thus almost identical for a given specialization regardless the provider.

The situation changed drastically after 1990, due to a true "*explosion*" of the private sector in higher education but also of changes occurring in the public sector. One can assess the magnitude of the phenomenon from the figures in the table 1.

Table 1

Academic year	1988/1989	1993/1994
Number of public universities	44	56
Number of faculties in the public universities	101	237
Number of private universities	—	74
Number of faculties in the private universities	—	396
Number of students in the public universities	164.507	240.000
Number of students in the private universities	—	100.000

The academic year 1993/1994 was chosen as a reference on purpose. Indeed, due to the appearance and the expansion of the private sector, but also to the significant increase of degree programmes at the public universities, which occurred after 1990, the establishment of a legal basis for a system of accreditation and quality assurance of higher education institutions became a stringent necessity. This basis has been provided by the *Law on accreditation of higher education institutions and recognition of diploma* promulgated in 1993 and known as the Law 88/1993. Eventually, some amendments to the law were brought in 1999.

The main provision of the Law 88 was the foundation of a *National Council for Academic Assessment and Accreditation* (NCAAA), placed under the control of the Parliament.

NCAAA functioned under the authority of the Parliament until 2005, to be eventually replaced by ARACIS, which was founded on the basis of the Law 87/2006, as:

–   autonomous public institution of national interest;
–   legal entity, with its own income and expenditure budget;
–   independent agency, free from any political or other external influence

ARACIS is a *general* agency, i.e. covering all fields of higher education.

ARACIS has two strands:

Quality assurance

ARACIS became full member of ENQA in June 2009 and was listed in EQA Register in September 2009.

Accreditation

ARACIS became member of ENAEE on 3 November 2009. Accreditation of engineering programmes by ARACIS is based on general standards, common for the entire higher education system, and specific standards established by the two Engineering Sciences Committees.

Here is the record of evaluations done by the two Engineering Sciences Committees since 2006:

•   Engineering programmes provisional authorization: 137
•   Engineering programmes accreditation: 117
•   Periodical evaluation (5 year) for Engineering Programmes: 184
•   Engineering master programmes accreditation: 435

5. ARACIS in EUR-ACE Spread

ARACIS was partner in the Project Workpackage 6 – Spread of the EUR-ACE system in Romania.

On 18 – 19 February 2009, a ENAEE/ EUR-ACE delegation composed of three "mentors" visited ARACIS. "Mentors" were: Giuliano Augusti (ENAEE President), Pierre Compte (Eurocadres) and Jana Moehren (ASIIN). The delegation met on 18th February 2009 with ARACIS President Professor Ioan Curtu, members of the ARACIS Board and the President and the General Secretary of the General Association of Engineers of Romania. On 19th February 2009 the delegation met with the representatives of 10 Romanian universities offering engineering programmes.

For the fulfillment of the objectives for Romania of the EUR-ACE SPREAD project, the ARACIS Council decided in November 2009 the foundation of a "*Committee of employers*" to ensure the involvement of the representatives of the professional world in the accreditation teams, as well as the opening of a "*Register for evaluators coming from the professional world*". In July 2010, an intensive training course for evaluators coming from the professional world was organized by ARACIS.

A second visit to ARACIS of the ENAEE/ EUR-ACE delegation, having the same composition as in the first visit, took place on 14 – 15 July 2010. This time the three "mentors" met with the members of the ARACIS Board, with members of the two ARACIS Engineering Sciences Committees and with the members of the newly created ARACIS Committee for employers.

ARACIS proceeded to a revision of standards and procedures used by its two Engineering Sciences Committees, to make them fully compatible with EUR-ACE Framework Standards and, as a result, prepared "*Specific evaluation standards for granting the EUR-ACE label to study programmes in the fundamental field Engineering Sciences*".

On 25th October 2010, ARACIS sent to ENAEE an Application to get authorization to award the EUR-ACE Label, fulfilling thus the objectives for Romania of the EUR-ACE SPREAD project.

6. The Follow-up of the EUR-ACE Spread Project

As ENAEE statutes stipulates, the ENAEE Label Committee has to send observers to accreditation missions organized by Agencies which became candidate to be authorized to award the label. Two such missions took place in the period 1 – 4 March 2011 at the Faculty of Engineering in Foreign Languages at the University "Politehnica" of Bucharest for a first cycle degree programme in Chemical engineering and for a second cycle degree programme in Computers and Information technology.

ENAEE team of observers was lead by Dr. Erbil Payzin (Turkey), Chairman of the ENAEE Label Committee. The team is due to present to ENAEE & Label Committee a report after its chairman will attend also the meetings of the Engineering Science Committee 2 which organized the accreditation visits and of the ARACIS Council meeting where the final decision on accreditation will be taken.

The first implementation of EUR-ACE in Romania in the period to follow will be greatly supported by the new project designed by ENAEE and University of Florence, named "*EUR-ACE 14+: European Accreditation of Engineering Programmes: Towards a Global Dimension*", for which an application was sent to Brussels, on 30th March 2011. ARACIS was invited and accepted to be partner in this project, which has 21 partners from 14 countries, including U.S.A.

7. Conclusions

The European system of accreditation based on EUR-ACE Framework Standards is spreading across Europe. Romania, through ARACIS, is one of the first countries in which the system is implemented. As soon as the process of authorization will be completed, to the accreditation of engineering programmes awarded by ARACIS, the EUR-ACE quality label will be added, thus giving it an international value. The EUR-ACE Label will be a complement of the "Diploma Supplement". Graduates from EUR-ACE accredited programmes will be able to define themselves as either EUR-ACE Bachelor or EUR-ACE Master, respectively if the will have a first – cycle or second –cycle engineering degree.

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