

CIVIL ENGINEERING EDUCATION, 12 YEARS AFTER BOLOGNA – A CASE STUDY: ROMANIA

I. MANOLIU¹

¹ Technical University of Civil Engineering Bucharest, Bul. Lacul Tei 124,
020396 Bucharest, Romania
e-mail: manoliu@utcb.ro

EXTENDED ABSTRACT

The paper updates the one written in 2004 by the author and published in the 4th EUCEET Volume dedicated to national reports on civil engineering education in Europe.

In the academic year 2011 - 2012 there are 112 universities in Romania, of which 56 public universities, 35 private accredited universities and 21 private authorized universities. From the 56 public universities, 12 are offering programmes in civil engineering and related fields. As related fields are considered: Installation engineering, Engineering Geodesy, Environmental Engineering, Mechanical Engineering, Engineering and Management.

Each year, the Ministry of Education submits for approval by the government a "Nomenclator" of fields and specializations. For the academic year 2011-2012, the "Nomenclator" lists 27 engineering fields. For the 27 fields, there are a total of 148 specializations, from which 13 belong to civil engineering field and 8 to related fields.

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 (three-year) programme leading to the degree of "inginer colegiu"; and a long (five-year) programme leading to the degree of "inginer diploma". The single-tier programmes of long duration (five-year) were predominant.

The implementation of the Bologna Process in Romania was set in motion by the "Law on the organisation of university studies" (Law 288/2004) and produced the following major changes in engineering education: the short 3-year programmes were dismantled and the long 5-year programmes were replaced by a two-tier type of education, with a first cycle of 4 years (240 ECTS) and a second cycle of 1,5 – 2 years (90 – 120 ECTS). Graduates of the first cycle degree programmes ("licența") receive a diploma of engineer, while the graduates of the second cycle degree programmes receive a diploma of Master.

The paper presents the structure of the study plan for a new 4-year programme, in which $\frac{3}{4}$ of the contact hours relate to core material and $\frac{1}{4}$ to specialisation.

A section of the paper is devoted to the Master programmes which were first offered in 2009 – 2010.

The last part of the paper is devoted to the implementation in Romania of the European system of accreditation in engineering EUR-ACE.

KEYWORDS

Bologna Process, Civil engineering education, European Higher Education Area, Integrated programmes, Two-tier system, Accreditation

1. INTRODUCTION

The syntagme "*European Higher Education Area*" appeared in the title of the Bologna Declaration, June 19, 1999. Two years later, at the meeting in Prague, on May 19th 2001, Ministers in charge of higher education affirmed their commitment to the objective of establishing the "*European Higher Education Area*" by 2010.

On March 11 and 12, 2010, Ministers responsible for higher education in 47 countries participating in the Bologna Process, met in Budapest and Vienne and launched the *European Higher Education Area* (EHEA).

Romania, which was admitted in the European Union on 1st January 2007, is part of the EHEA. The Law 288/2004 on the organization of university studies paved the way for the implementation of the Bologna process in Romania. The "Law on national education", of January 2011, creates the framework for the participation of Romanian system of higher education to the accomplishment of the objectives for the next decade of EHEA, as defined on 28 – 29 April 2009 in Leuven and Louvain-la-Neuve by the Ministers responsible for higher education.

12 years after Bologna Declaration, at the beginning of the new decade and a few months before the next Ministerial meeting to be hosted by Romania and to take place in Bucharest, on 26 – 27 April 2012, the moment seems appropriate to have a look at the civil engineering education in Romania in the context of the Bologna process.

2. CIVIL ENGINEERING EDUCATION IN ROMANIA – AN OVERVIEW

2.1 Brief historical outline

As in most countries, in Romania, too, engineering education started with civil engineering. Thus, in 1818 Gheorghe Lazăr founded in Bucharest a School for Land Surveyors which was followed by the creation in 1867 of a School of Bridges and Roads, transformed in 1888 into "The National School of Bridges and Roads". In 1921 it became the Polytechnic School of Bucharest. As a result of the Education Reform in 1948, the Faculty of Civil Engineering separated from the Polytechnic School and became an independent higher education establishment called the Civil Engineering Institute of Bucharest, while other faculties of the former Polytechnic School (in the field of mechanical engineering, electrical engineering, chemical engineering) formed the Polytechnic Institute of Bucharest. In 1994, the Civil Engineering institute adopted its present name: The Technical University of Civil Engineering of Bucharest, while the Polytechnic Institute was renamed University "Politehnica" of Bucharest.

Besides the two Technical Universities in Bucharest, other major institutions offering engineering education in Romania are the University "Politehnica" of Timisoara, founded in 1921, the Technical University "Gheorghe Asachi" Iasi, founded in 1946, the Technical University of Cluj-Napoca, founded in 1953.

2.2 Providers of programmes in civil engineering and related fields in the academic year 2011-2012

In the academic year 2011 - 2012 there are 112 universities in Romania, of which 56 public universities, 35 private accredited universities and 21 private authorized universities.

Of the 56 public universities, 12 offer programmes in civil engineering and related fields, which include: Installation engineering, Engineering Geodesy, Environmental Engineering, Mechanical Engineering, Engineering and Management.

Figure 1 shows the distribution of universities offering programmes in civil engineering and related fields in the academic year 2011-2012.

Each year, the Ministry of Education submits for approval by the government a "Nomenclator" of fields and specializations. For the academic year 2011-2012, the "Nomenclator" lists 27 engineering fields. For the 27 fields, there are a total of 148 specializations.

From the 148 specializations, 13 belong to civil engineering field and 8 to related fields previously mentioned. In table 1 are given names and codes of the first cycle degree courses for the specializations belonging to civil engineering and related fields.

The distribution of the first cycle degree courses (specializations) among the 12 universities is given in table 2. As one would expect, the largest number, 13 first cycle degree courses, are offered by the Technical University of Civil Engineering Bucharest which is the only Romanian university entirely devoted to higher education in civil engineering and related fields. T.U.C.E.B. is followed by the Technical University "Gheorghe Asachi" Iasi with 10 specializations, University "Politehnica" Timisoara with 9 specializations and Technical University Cluj-Napoca with 8 specializations.

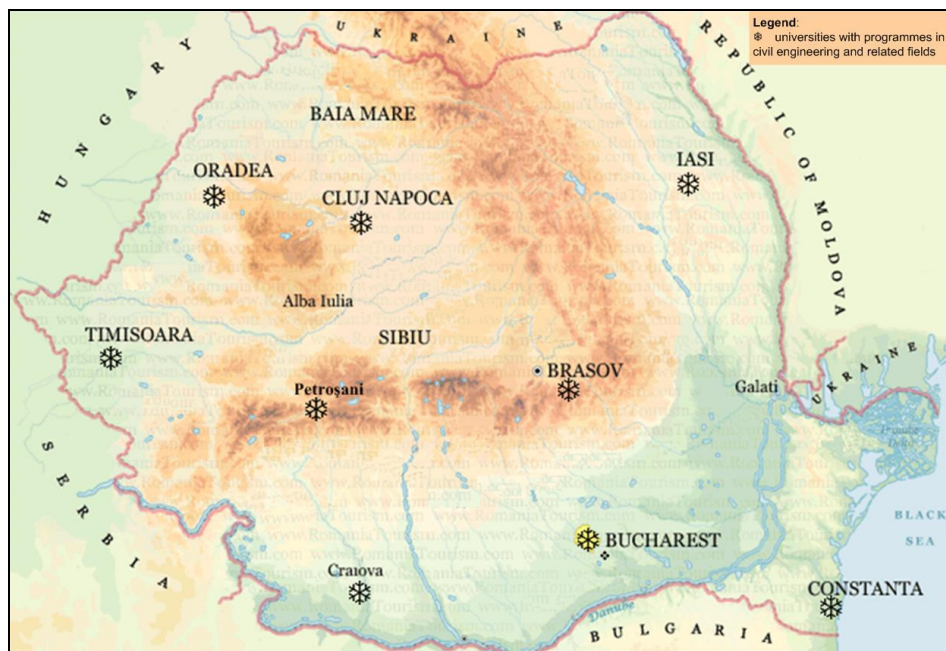


Figure 1: Map of Romania with the location of universities offering programmes in civil engineering and related fields in the academic year 2011-2012.

Table 1: Names and codes of the first cycle degree courses for various fields (profiles) 2011-2012.

Field	Code	Name of the degree course (specialization)	Code
Civil Engineering	CE	Civil, Industrial and Agricultural Buildings	CIAB
Civil Engineering	CE	Railways, Roads and Bridges	RRB
Civil Engineering	CE	Constructions and fortifications	CF
Civil Engineering	CE	Hydraulic Structures	HS
Civil Engineering	CE	Mining Construction	Min
Civil Engineering	CE	Sanitary Engineering and Environmental Protection	SANEP
Civil Engineering	CE	Land Reclamation and Rural Development	LRRD
Civil Engineering	CE	Civil Engineering	CE
Civil Engineering	CE	Urban Engineering and Regional Development	UERD
Civil Engineering	CE	Infrastructure of Metropolitan Transport	IMT
Civil Engineering	CE	Civil Engineering (in English)	CEEn
Civil Engineering	CE	Civil Engineering (in French)	CEFr
Civil Engineering	CE	Civil Engineering (in German)	CEGe
Installation Engineering	IE	Building Services	BS
Installation Engineering	IE	Installations and Equipment for Atmospheric Protection	IEAP
Installation Engineering	IE	Building Services for fire protection	BSFP
Installation Engineering	IE	Building Services (in French)	BSFr
Geodesy Engineering	GE	Geodesy and Land Cadastre	GLC
Environmental Engineering	EE	Environmental Engineering	EE
Mechanical Engineering	ME	Engineering and Management of Technological Resources in Construction	EMTRC
Engineering and Management	EM	Engineering Economics in Constructions	EEC

2.3 Study programmes before Bologna

In the academic year 2004-2005, the last year before the implementation of the two-tier system following Bologna, there were two types of undergraduate programmes in all fields of engineering education in Romania.

The long (five years) programme, leading to the degree of "*Inginer Diploma*" was considered to be the equivalent of an MSc degree in the Anglo-Saxon or two-tier system. This was an integrated programme, with no intermediate step.

The short (three years) programme, leading to the degree of "*Inginer Colegiu*", was considered to be the equivalent of a BSc degree in the Anglo-Saxon or two-tier system.

The five-year programmes were intended to produce graduates with extensive knowledge and understanding of mathematics, science and engineering, able to solve complex civil engineering problems and to use the techniques, skills and modern engineering tools necessary for civil engineering practice.

The short three-year programmes were intended to produce graduates possessing relevant know-how in civil engineering and construction engineering technology, able to demonstrate independent judgment within the field of activity and to apply up-to-date knowledge in the construction and operation of civil engineering works. The curricula of the short engineering programmes were oriented toward practice.

As one can understand, 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 (three-year) programme leading to the degree of "*inginer colegiu*"; and a long (five-year) programme leading to the degree of "*inginer diplomat*". The single-tier programmes of long duration (five-year) were predominant.

2.4 Study programmes after Bologna

The implementation of the Bologna Process in Romania was set in motion by the "*Law on the organisation of university studies*" (Law 288/2004).

Main provisions of Law 288/2004

- University studies in Romanian are organised in three cycles.
- The first cycle, with a duration of 3-4 years (180-240 ECTS Credits), is called "*Licența*" (synonymous with "*Licence*" in French). *The Law stipulates that for engineering education the first cycle is of 4 years duration. The qualification level acquired by graduates from the first cycle should be sufficient to assure employability.*
- The second cycle, with a duration of 1-2 years (60-120 ECTS Credits), is called "*Master*". The *cumulative duration* of the first, Licence, cycle, plus the second, Master, cycle, should correspond to **at least** 300 ECTS or 5 years.
- The third cycle corresponds to *doctorate studies* having, normally, a duration of 3 years which, in justified cases (for instance experimental studies), can be extended by 1-2 additional years, pending the approval of the Senate of the university.
- The existing short 3-year programmes are to be discontinued, unless they can be converted into programmes corresponding to the licence.

The provisions of the law came into force in academic year 2005 – 2006 and led to the two-tier system illustrated in figure 2.

Table 2: Degree courses in civil engineering and engineering related fields offered by the Romanian universities 2011-2012.

Field	Degree course	UNIVERSITY																	
		TUCEB	TUI	UPT	TUCN	UOC	UTB	UO	UP	UC	UDJG	UAI	NUBM	UAVMB	UAVMI	UAVMT	UAVMCN	MTA	PA
First cycle degree courses in civil engineering field																			
CE	CIAB	x	x	x	x	x		x		x				X					
CE	RRB	x	x	x	x			x											
CE	CF																	x	
CE	HS	x	x	x	x	x													
CE	Min								x										
CE	SANEP	x	x							x									
CE	LRRD		x	x			x												
CE	CE			x				x											
CE	UERD	x	x		x	x													
CE	IMT	x																	
CE	CEEn	x	x	x	x														
CE	CEFr	x	x																
CE	CEGe			x															
First cycle degree courses in other related engineering fields																			
IE	BS	x	x	x				x											
IE	IEAP	x																	
IE	BSFP																		x
IE	BSFr	x																	
GE	GLC	x	x	x	x			x	x	X ^{1*}	x	x	x	X		X ^{1*}	X ^{1*}		
EE	EE						x									x			
ME	EMTRC	x																	
EM	EEC				x	x													

Legend: TUCEB - Technical University of Civil Engineering Bucharest; TUI - Technical University "Gheorghe Asachi" Iași; UPT - University Politehnica Timișoara; TUCN - Technical University Cluj-Napoca; UOC - University "Ovidius" Constantza; UTB - University "Transilvania" Brașov; UO - University Oradea; UP - University Petroșani; UAVMB - University for Agricultural and Veterinary Medicine Bucharest; UC - University Craiova; MTA - Military Technical Academy Bucharest; PA - Police Academy "Alexandru Ioan Cuza" Bucharest; UAI - University „I DECEMBRIE 1918" ALBA IULIA; NUBM – North University BAI A MARE; UAVMCN - University for Agricultural and Veterinary Medicine Cluj Napoca; UDJG - University „DUNĂREA DE JOS" GALAȚI; UAVMT - University for Agricultural and Veterinary Medicine TIMIȘOARA; UAVMI - University for Agricultural and Veterinary „ION IONESCU DE LA BRAD" IASI

^{1*} - provisional authorization

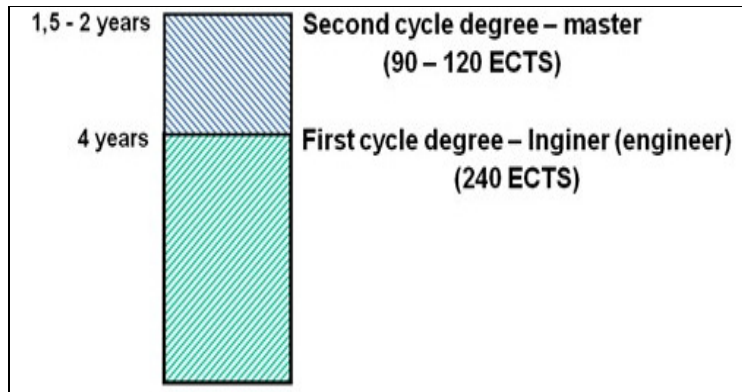


Figure 2: Engineering education in Romania after the implementation of Bologna process, starting with the academic year 2005 - 2006

Some considerations concerning the need for a reform in engineering education are necessary.

Although the system of engineering education existing in Romania in 2004 - 2005 was compatible with the spirit of Bologna, there was nevertheless room for improvement, in the light of the positive and negative features of the programmes on offer. In reality, the 3-year programmes delivered by the university colleges were very unpopular; many colleges failed to fill the places offered at the entrance examinations, and even when they did, the level of the students recruited was low. At the same time, industry showed little interest in the graduates from the colleges. On the other hand, the year of "*Advanced studies*", a kind of *post-Master programme* (the 5-year degree being assimilated to a Master), which was created mainly as a gateway or as access to Doctoral studies, proved not to do so in most cases, since very few of the graduates of the programme eventually enrolled for the doctorate.

With the 3-year programmes now out of the picture, it was legitimate to ask: is it reasonable and necessary to educate **all** students through 5-year integrated programmes, which have a strongly design/research character, when it is well known that only a minority will actually find employment after graduation in design/research/consultancy activities, and while the others will work as contractors or in areas such as public administration, banking, insurance, IT, and so on? The need of a "*generalist*" type of engineer, trained in a shorter period of time, was quite obvious.

3. SHIFT FROM THE CONTINENTAL SYSTEM TO THE TWO-TIER SYSTEM

The shift from the continental system to the two-tier system in civil engineering education in Romania was done according to the provisions of the Law 288/2004 summarized at p.2.4. Although this shift was seen by many as a result of a top-bottom approach undertaken by Romanian authorities in order to implement the Bologna Declaration, it is fair to admit that, in fact, it responded to a real need for a reform.

3.1 First cycle degree

According to the Law 188/2004, the study duration for the first cycle degree programmes ("*Licenta*") in engineering is of 4 years (240 ECTS credits). As a consequence, the former programmes of short duration (3 years) offered by the university colleges ceased to be offered "beginning with 2005/2006".

As one can see from table 1, in the "nomenclator" of specializations approved for the academic year 2011 – 2012 there are 13 specializations pertaining to the civil engineering fields and 8 specializations related in some part to the civil engineering field but belonging to other fields. It is important to observe that all these specializations existed in the "nomenclator" before 2005 - 2006 when the two-tier system was introduced. However, changes occurred in the number of institutions offering various programmes. The most significant increase was noted for the specialization "Geodesy and Land Cadastre": from 4 programmes offered in 2004 – 2005 to 13 programmes offered in 2011 – 2012. As shown in the table 2, 3 such programmes have for the time being only provisional authorization, while all others are accredited.

Curricular issues were of paramount importance when moving from integrated 5-year programmes to two-tier programmes. In what follows, steps undertaken in this respect at the Technical University of Civil Engineering Bucharest will be described. More details can be found elsewhere. [3]

In quantitative terms, the change from the integrated 5-year programme to the new 4-year programme, introduced in the academic year 2005/2006 is summarized in table 3.

Table 3

Programmes	5-year	4-year
Item		
Duration	10 semesters	8 semesters
Contact hours	251 hours	236 hours
Diploma project	In the 10 th semester	In summer, following the 8th semester
Final examination	End of June	End of September

The difference of only 15 contact hours between the two programmes was due to the fact that the eight semesters of the new programme were fully used for contact hours, while the elaboration of the diploma projects and the final examination were placed after the completion of the eight semesters. After only one year, a new change was operated, by reducing the number of contact hours from 236 to 218. A third and final change (so far!) was made in the academic year 2010/2011, following the decision to reserve 4 of the 14 weeks of the 8th semester for the diploma project and to have the final examination at the end of July. However, the number of contact hours was kept as before, 218.

In all variants, the structure of the study plan, expressed in % of the contact hours for various groups of subjects from the total number of contact hours remained practically unchanged and is shown in the table 4.

Table 4

No	Group of subjects <i>The "backbone"</i>	Contact hours/ % from total	
		2005 - 2006	2006 - 2007
1.	Basic subjects	42 h (17.8 %)	38 h (17.4 %)
2.	General technical education	53 h (22.5 %)	55 h (25.2 %)
3.	General engineering education	52 h (22 %)	46 h (21.1 %)
4.	General economic and technological education	16h (7.2 %)	10h (4.6 %)
5.	Foreign languages, social sciences, humanities	12 h (5.1 %)	14 h (6.4 %)
	Total	175 h / 74%	163 h / 74.7%
6.	The specialization	61 h (26 %)	55h (25.3 %)
	Grand total	236 h (100 %)	218 h (100%)

A conclusion to be drawn from examining the relative weight of different groups of subjects shown in the table 4 is that the degree awarded after the completion of the 4-year programme has all chances to be relevant for the labour market on appropriate level

of qualifications. A programme in which $\frac{3}{4}$ of the contact hours is reserved to "core subjects", i.e. subjects common to the entire field, regardless of specialization, is aimed at educating a "generalist" type of civil engineer.

A relevant fact to be stressed before concluding this paragraph devoted to the first cycle degree programmes is that the qualification inginer (engineer) is the designation written on the diploma received by the graduates .

3.2 Second cycle degree programmes

Second cycle programmes, leading to the diploma of Master, could correspond, according to the Law 188/2004, to 90 ECTS (1.5 year) or 120 ECTS (2 years). They have been offered for the first time in 2009/2010, open for the first cohort of graduates of the "licenta" programmes.

Table 5 shows the number of Master programme offered by various universities in civil engineering and related fields for the academic year 2011 – 2012. All of these programmes are "consecutive master", for which the access requires successful completion of First Cycle Degree studies [2].

As expected, the largest offer comes from the "four big" from Bucharest, Iasi, Timisoara and Cluj-Napoca.

Table 5

Field	Universities				
	TUCEB	TUI	UPT	TUCN	UOC
CE	9	9	6	7	2
IE	3	1	1	1	
GE	3		1		
EM	1			1	2
Total	16	10	8	9	4

There is a rather large diversity in the offer of these universities. Most of the Masters are of "vertical" type, representing a continuation at higher level of the "licenta" programme for a given specialization. Example of programmes of this kind are Urban Engineering and Regional Development (TUCEB), Transport Infrastructure (TUCEB, UTI, UPT), Hydraulic structures (TUCEB).

Broader specializations at "licenta" level, such as Civil, Industrial and Agricultural Buildings lead to several masters of "vertical" type: 4 at TUCEB and UTI, 3 at UPT and UTCN.

Similarly, the "licenta" specialization Building Services at TUCEB is followed by 3 Master programmes.

There are also Masters of "transversal" type, offered to graduates of all civil engineering specializations. The best example is Geotechnical engineering (at TUCEB, UTI, UPT and UTCN).

The appearance of this programme at all major universities is of particular relevance: for the first time Romanian universities confer degrees in "Geotechnical Engineering", joining thus most of the universities world wide with civil engineering programmes.

Another type of master programmes could be included in the category of "professional masters". An example in this respect is a master on "Real estate evaluation and management" offered at UTI.

At TUCEB, UTCN and UOC master programmes are of 3 semesters, while UTI and UPT have chosen a 4-semester duration, which seems to be a better solution.

It is the opinion of the author that, at present, the number of the Master programmes is too large, corresponding merely to the desires of the teaching staff and/or to excessive preoccupation with compensating through these programmes for the contact-hours lost from the integrated 5-year programme, rather than being based on a study of the needs of the labour market. It is highly probable that in the near future a reduction in the number of programmes, together with a strengthening of the remaining ones (also by an extension of all programmes to 4 semesters, when the case) will occur.

4. BOLOGNA PROCESS MEANS MORE THAN THE ACTION LINE 2

Let's remind ourselves of the action line 2 of the Bologna Declaration:

"Adoption of a system essentially based on two main cycles, undergraduate and graduate. Access to the second cycle shall require successful completion of first cycle studies, lasting a minimum of three years. The degree awarded after the first cycle shall also be relevant to the European labour market as an appropriate level of qualification. The second cycle should lead to the master and/or doctorate degree as in many European countries."

This was, no doubt, the most famous (and controversial) action line of the Bologna process and the one which had the strongest impact, not always very favourable, on engineering education in Europe.

There are, however, other actions defined either in the document signed in Bologna on June 19th, 1999 by the ministers of education from 29 European countries or in the documents of the ministerial meetings which followed, with a 2-year pace, in Prague, Berlin, Bergen, London, Leuven, Louvain-la-Neuve.

The following section will tackle some of these actions and their impact so far on civil engineering education in Romania.

4.1 Student mobility and Bologna

"Mobility of students and academic and administrative staff is the basis for establishing a European Higher Education Area" showed the communiqué of the Conference of Ministers responsible for Higher Education in Berlin on 19 September 2003.

The mobility of students will be tackled in this paragraph, under a peculiar aspect: the impact of Bologna-based study programmes on the agreements/ conventions under which student mobility operates. Two examples from the recent practice of TUCEB will illustrate the case.

First example

A double-diploma convention was concluded between Ecole Nationale des Ponts et Chaussées Paris and the Technical University of Civil Engineering Bucharest in 2001. The 5-year integrated programme offered by that time by TUCEB was compatible with the 3-year programme of ENPC following two preparatory years (in fact also a 5-year

programme). The students of TUCHEB were admitted to the 2nd year of study at ENPC (equivalent of the 4th year of study in Bucharest). After successfully completing the last two years of study at ENPC, including the final project, they presented and defended their project in Bucharest, in front of a commission in which both institutions were represented. Conditions to be awarded a diploma by each of the two schools were thus met.

The provisions of the convention concluded in 2011 had to be revised when TUCHEB adopted the two-tier system, with the first-cycle degree ("licența") awarded after 4 years of study.

According to the new agreement, TUCHEB, students are admitted also in the 2nd year of study of ENPC, but only after completing the "*licența*" programme (4 years) and being admitted at the Master programme at TUCHEB. They then complete two years of study at ENPC, after which they return to TUCHEB for the last semester of the 1.5 year master programme. The final project, prepared at ENPC, serves as a basis for the dissertation at the end of the master programme in Bucharest. As compared with their colleagues, who have to study 5.5 years to obtain two diplomas ("licența" – 4 years, master - 1.5 years) students beneficiaries of the double-diploma convention with ENPC study 6.5 years (4+2+0.5) but receive in addition the diploma of ENPC. The two years which passed since the new agreement was implemented showed no decrease in the interest of students for the chances offered by the double-diploma agreement TUCHEB-ENPC.

Second example

Since the very beginning of the participation of TUCHEB in the Erasmus programme, by the end of 90's, a bilateral agreement was concluded between TUCHEB and the Technical University of Hannover, to facilitate mobility of the students of the faculties of Geodesy of both universities. Like in the previous example, the similarity in the programmes, both of them of integrated type (5-year programmes) made things rather easy. TUCHEB students were admitted to TUH in the last (10th) semester, to work together with their German colleagues at the final project. The character of the activity and the fact that TUCHEB students did not have to attend courses and to take exams, but only to work for the final project, made it possible to have English instead of German as a language prerequisite. Bologna brought changes in both universities when they adopted the two-tier system: 3+2 at Hannover, 4+1.5 at Bucharest. A final semester reserved for the diploma project at T.U. Hannover and TUCHEB no longer coincided. To enable the fulfilment of the bilateral agreement, TUCHEB students had to leave for the 5-months study period at TUH at the beginning of January, before end of the final examination session, then prepare the Master dissertation in Hannover and present and defend it after returning in Bucharest. The study duration was de facto extended by one semester, which was considered a worthwhile change.

4.2 The EUR-ACE system is implemented in Romania

"Ministers recognized the vital role that quality assurance systems play in ensuring high quality standards and in facilitating the comparability of qualifications throughout Europe. ... They encouraged universities and other higher education institutions to disseminate examples of best practice and to design scenarios for mutual acceptance of evaluation and accreditation/ certification mechanisms ..." said the Communiqué of the meeting of European Ministers in charge of the Higher Education in Prague, on May 19th, 2001.

This was for the first and only time when the word *accreditation* appeared in the Declarations/Communiqués issued at the meetings which followed Bologna. However, it was put under the heading "*Promotion of European cooperation in quality assurance*"

which means an implicit recognition that accreditation is an intrinsic part of the quality assurance process. This reality is proved also by the fact that, in some countries, quality assurance and accreditation are made by the same agency. This is the case in Romania with ARACIS (Romanian Agency for Quality Assurance in Higher Education) which is an autonomous and independent public institution, founded on the basis of Law 87/2006.

ARACIS is a general agency, i.e. covering all fields of higher education, and has two strands:

- quality assurance
- accreditation

ARACIS is currently implementing the EUR-ACE system.

Steps which led to the development of EUR-ACE system are presented elsewhere, as well as the EUR-ACE project (2004 – 2006) supported by the European Commission. [4]

The EUR-ACE project, in which the author participated as representative of UAICR (Union of Associations of Civil Engineers of Romania) produced the EUR-ACE Framework Standards finalized in 2006 and revised in 2008.

The EUR-ACE Framework Standards define and require learning outcomes, that is to say, the specific knowledge, skills and/or competences to be acquired during the successful completion of a programme of study. The learning outcomes to be achieved by first and second cycle graduates in the three specific engineering components ("*Engineering Analysis*", "*Engineering Design*" and "*Research*") are qualified by the phrase "*consistent with their level of knowledge and understanding*". For first cycle graduates this level is defined as a "*coherent knowledge of their branch of engineering, including some knowledge at the cutting edge*"; for second cycle graduates the level requires "*a critical awareness of the knowledge located at the cutting edge of their branch of engineering*".

Another very important outcome of the EUR-ACE project was the foundation of an international not-for-profit association, the "European Network for the Accreditation of Engineering Education" (ENAAE).

The association was founded in Brussels in February 2006 by 14 Associations and Agencies active in engineering education throughout Europe, including UAICR from Romania. In November 2009 ARACIS became member of ENAAE.

ENAAE has registered the EUR-ACE® Trademark and authorises National Agencies to add the EUR-ACE label to their accreditation. This authorisation may be defined as a "*meta-accreditation*".

Two EU-funded projects (EUR-ACE IMPLEMENTATION and PRO-EAST) ran between 2006 and 2008 and made a significant contribution to the launch of the EUR-ACE system, the first in the EU, the second in Russia.

In November 2006, ENAAE came to the view that six Accreditation Agencies (CTI in France, ASIIN in Germany, Engineers Ireland, the *Ordem dos Engenheiros* in Portugal, RAEE in Russia, and the 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 authorised to award the EUR-ACE label for a period of two years.

Between November 2008 and October 2010 ENAEE coordinated another EU-funded project, called EUR-ACE SPREAD, which principally targeted Turkey, Romania, Lithuania, Italy and Switzerland. The first concrete achievement of EUR-ACE SPREAD was the addition of the Turkish "Association for Evaluation and Accreditation of Engineering Programs" (MÜDEK) to the initial six EUR-ACE Agencies.

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

In October 2010, ARACIS applied to ENAEE for authorisation to award the EUR-ACE Label, thus fulfilling the objective set by the EUR-ACE SPREAD project for Romania.

5. CONCLUSIONS

The Bologna process led to profound changes in the Romanian system of higher education, including civil engineering education. The former 5-year integrated programmes were split in two-tier programmes, with a First cycle degree of 4 year (240 ECTS) and a Second cycle degree of 1.5 – 2 years (90 – 120 ECTS). The former 3-year programmes more practically oriented were dismantled.

The concept of "learning outcomes" is gradually gaining territory, as reflected in activities related to the development of the National Framework for Qualifications in Higher Education or to the accreditation of engineering programmes.

Only 2 years have passed since the first cohort graduated from the new 4-year (Licenta) programmes and 6 months since the fist cohort graduated at TUCEB from the new 1.5 year master programmes. This is too short a period to judge the results of the reform but sufficient to appreciate that the potentiality of the Bologna process has not yet been fully exploited. New actions and more efforts are needed, with the participation of all stakeholders. EUCEET Association, well represented in Romania, has an important role to play in this process.

REFERENCES

1. 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
2. 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
3. Stematiu, D., Manoliu, I. (2010), *The transition from the integrated to a two-tier study programme at the Technical University of Civil Engineering Bucharest – an iterative process*, in *Inquires into European Higher Education in Civil Engineering*, 7th EUCEET Volume (I. Manoliu editor), 117 – 11
4. Manoliu I. (2011): *Implementation in Romania of the European Framework Standards for the Accreditation of Engineering Programmes*, Quality Assurance Review, Vol. 3, Nr. 1, April 2011, p 45 - 54.
5. 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