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"European Civil Engineering Management (ECEM)"

- Example for an Integrated International Curriculum -

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Summary

The curriculum „European Civil Engineering Management (ECEM)" has been launched by the first author in 1992 with four senior partners of higher education, three of them from EU-member states and one from a MOE-country (MOE stands for the German wording of middle and east Europe). This year ECEM discharges into the international market the 8th generation of graduated managerially skilled civil - and construction - engineers (about 400 graduates in all eight years after the 1st graduation in 1996).

Now an international group of 12 European institutions of higher education from 12 different countries (including Russia) are running this integrated programme [1 - 12]. Even students from a Chinese partner university [13] are studying the „part abroad" of the curriculum and vice versa some of our students study in China. The education profile normally includes the „Construction" part, too.

ECEM is an eight semester (four years) full time study program and contains a compulsory „foreign part" of three semesters. It is based on a three semester study time in civil (and construction) engineering at home in the very beginning. Then follows a study abroad period at a partner university. This takes place in the 4th, 5th and 6th semester and includes a practical placement semester. The education is finished by the final two semesters at home to complete the more national oriented management studies and to write the thesis.

Thus, students of ECEM are best prepared to meet the European and international demands in the field of management in civil and construction engineering. They do have excellent language abilities in at least two foreign languages and they also have a very deep insight in the culture, socio-economic conditions and in the working conditions in a foreign country and in a foreign company.

By this they gained the ability of being mobile - personally and related to their education and knowledge - to work also in other countries and, thus, worldwide.

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1. Time Schedule of the ECEM-program

The eight semester or four years study program consists of three semesters of basic studies in civil and construction engineering at the home university - and of at least two foreign languages. The following five semesters are forming the main study period for deepening the engineering knowledge but always in connection with managerial, soft or additional skills. During the last two semesters of the advanced studies the students are back home to have one theoretical semester and in the 8th and last semester a second practical placement in connection with their diploma thesis.

In the 4th, 5th and 6th semester the students are studying at one - and only one - of the partner institutions. This period consists of two theoretical and one practical semester. The sequence of these semesters depends on the education conditions at the partner universities. Normally the students start with their practical placement - to get to know people and language - and then have their two theoretical semesters as table 1 shows it.

<table>
<tr><td>1. sem.</td><td>2. sem.</td><td>3. sem.</td><td>4. sem.</td><td>5. sem.</td><td>6. sem.</td><td>7. sem.</td><td>8. sem.</td></tr>
<tr><td>WS</td><td>SS</td><td>WS</td><td>SS</td><td>WS</td><td>SS</td><td>WS</td><td>SS</td></tr>
<tr><td colspan="3">basic studies
civil and construction engineering
two foreign languages</td><td>1. practical placement</td><td colspan="3">main studies
managerial skills
law, construction management, site management, project management, economics, financing, turn key projects, rhetoric, languages etc.</td><td>2. practical placement and thesis</td></tr>
<tr><td colspan="3">at home institution</td><td colspan="3">at partner institution/
in host country</td><td>at home institution</td></tr>
</table>

Table 1. Time schedule of the ECEM-program at FH OOW

2. Educational Profile

The basic studies at FH OOW in Oldenburg contain all the modules of mathematics, physics and basic engineering topics as “normal” civil engineers have to learn them. These first three semesters are compulsory for all students of the department whether they choose the “normal” civil engineering or managerial or economic education branch. The students can switch between these branches during the first three semesters. So, also the ECEM-students have the necessary orientation and sound civil engineering background for their future work and by this can understand “pure” civil engineering colleagues then. - In addition the ECEM-students have to learn English and as a second foreign language that of the later host country.

Normally the partner universities educate in a similar or at least equivalent way. But the “how” is left to the single partner. The education content of these first three study semesters is not part of the commonly regulated ECEM-program.

The commonly regulated ECEM-study program starts with the beginning of the 4th semester and normally ends after three semesters with the successful completion of the 6th semester. Within these three semesters the students undergo a practical placement semester and two theoretical semesters. The sequence of these semesters may differ from university to university.

During the practical placement the students shall gain in-depth knowledge of the host country as well as of the socio-cultural surroundings and especially of the working conditions in a foreign company or office.

During the two theoretical semesters all ECEM-partner universities follow the educational frame which has been fixed during a number of common planning and organizing meetings The topics or contents of all these modules are similarly oriented to the education of managerial skills in the very civil engineering context. They are not necessarily the same but they are similar or at least equivalent. The contents of the modules are clearly described at each partner university and have been agreed to by all involved partners during the regular meetings and by the respective academic boards. The written descriptions are part of the respective examination rules.

The common educational consensus is to speak of equivalence. By this consensus each partner university may teach a number of their specific and acknowledged topics. And this consensus also includes the complete acknowledgement of a successful study by judging the study load of the students in the same way: 30 ECTS-credits for each semester [14]. Even if the partners have different accreditation systems ECTS is the conversion of earned "student money" at the partner universities.

- In brief: ECTS is the European Credit Transfer (and Accumulation) System that describes the "workload" of students. Students earn the equivalent of 60 ECTS credits per year by successfully studying the modules of their curriculum. The workload for an average student is about 1.800 working hours per year and includes all contact hours (about 50%) at the university and another 50% for "free" work. Even if not used in all European universities ECTS will become the single accreditation system in the whole Bologna region very soon. -

The last two semesters at home are used to focus and to transfer the managerial education to "home conditions" and to prepare and finish the thesis during the second practical placement.

This second practical placement - at home - has three aspects: The thesis is elaborated in close co-operation with a building company or project office etc. It picks up a "practically oriented" problem and by this may include the company in a closer way to the university and by giving it the chance to be one of the examiners of the thesis. The second aspect is the possibility for both sides to get in close contact to judge an employment there - without costly efforts for public advertisement. And thirdly the student has the possibility to compare two different working conditions - that of the host and the home country or building company.

The whole ECEM-program from all partner institutions of higher education can be found in the websites of FH OOW [1] (www.fh-oow.de/fbb/ecem/ , up to now in German language only, but very soon also in English). The addresses of all other partners are given in the bibliographic list [2 - 13].

3. Educational Aims and Fields of Employment

The development in the construction economy has shown that classically educated civil/construction engineers cannot always fulfill the many facetted duties and demands of bigger building sites and projects. The technical control of problems alone does not seem to be sufficient any longer. The market also needs managers who are able to coordinate, guide,

supervise and steer huge building projects in planning and execution - and to communicate efficiently with people internationally.

With this idea the educational aims of ECEM are roughly described. In general the future employers are to be found

- in engineering and architectural planning offices;
- in consulting companies;
- in public supervising and projecting offices;
- in the building industry;
- in project development and real estate companies;
- in internationally active planning and building companies;
- in big companies with international building activities (banks, commercial groups, industry, insurances).

The professional skills of an ECEM-absolvent target to work with

- acquisition of contracts;
- planning and supervision of buildings;
- project management and steering;
- personnel management;
- cost management;
- quality management;
- project development;
- turn key construction.

Their special strengths are

- organizational ability;
- strong and careful treatment of costs;
- profound knowledge in contracting law and economics;
- lingual and intercultural competence;
- personal mobility;
- teamwork orientation.

Even in these times of actual decline of the German and partly the European building industry ECEM-students still find an attractive employment. Very often these are building companies or projecting offices with dependences in or having joint ventures with foreign countries in Europe or abroad. Even companies like Siemens, not known as an active building company but as a global player, has “bought” and employed five absolvent of just one single cohort.

4. Partner Universities

The following table 2. shows the ECEM-partner universities. There is no restriction and no pretension to a special partner university. But the amount of receiving students depends on the capacity of the host university.

Another most interesting point of view is that ECEM-partners do not charge the foreign students to pay tuition fees. The acceptance of students as based on this financial platform is

again ruled by equivalence, which in this case means that on a long range the number of incoming and outgoing students is balanced for each partner university

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ECEM-partner Universities
University of Applied Sciences, FH OOW, Oldenburg, Germany
Czech Technical University of Prague, CVUT Prag, Czech Republic
Ecole Supérieure d'Ingénieurs des Travaux de la Construction de Cachan/Paris, ESITC Cachan, France
Technical University of Szczecin, TUoS Sczcecin, Poland
Hanze University (former Hogeschool) Groningen, HvG Groningen, The Netherlands
University of Wolverhampton, UoW Wolverhampton, United Kingdom
Tampere Polytecnic, TT Tampere, Finland (future co-operation has to be revised)
Högskolan Halmstad, HH Halmstad, Sweden
Universidad Politecnica de Valencia, Escuela de Arquitectura Tecnica EUAT Valencia, Spain
Szent Istvan University, Ybl Miklos School of Built Environment YMMF Budapest, Hungary
Galway Mayo Institute of Technology, GMIT Galway, Ireland
State University of Management / Institute of Business in Construction and Project Management, SUM Moskau, Russia
In the near future: Zheijang University of Science and Technology, ZUST Hangzhou, PR China

Table 2.: ECEM-partner universities

The teaching languages of the partners are differently fixed. In Sweden, The Netherlands, Czech Republic and Poland offer their courses in English; the host country's language is necessary to "live" there. The teaching languages in UK, Ireland, France, Spain, Russia, China and Germany are the respective home languages. According to that the language preparation is of rather high importance at home.

There are a number of ECEM-contacts to a lot of other universities in Europe and abroad.

5. Certificates and Dual Diploma

The students receive their diploma/certificate/bachelor degree/baccalaureus of .../etc. by the respective home universities. All marks which have been received at the home and the host university enter into the final mark of the certificate. This conversion takes into account the different study workloads of the students at the host universities and their special marking system.

In addtition the certificates describe the study at the partner university and all the study modules and the received credits and marks of these single modules. This is done very similar to the diploma supplement as requested more and more in the Bologna region of higher education in Europe [15].

The work load of students will be judged in a relative easy way by the percentage rate of modules compared to the study load which in each case has to be converted to a total sum of 30 ECTS-credits per semester. It is a much more difficult task to transfer or convert the marks. The following table 3. may give a an overview over the different marking systems of the officially involved ECEM-partner institutions (ZUST is missing up to now):

FHOOW	UoW	HvG	TUoS	CVUT	TT **	YMMF	ESITC	HH	EUAT	GMIT	SUM	ECTS *
1,0	A 16	10	5	1		5	19,5 / 20,0	6	10,0	100	5	A
1,0	A 15						19,0	5,7 - 5,9		67	5	A
1,3	A 14	9,5					17,0 - 18,5	5,4 - 5,6	9,5/9,0	64	5	B
1,7	B 13	9,0	4,5				16,0 / 16,5	5,1 - 5,3	8,5	61	5	B
2,0	B 12	8,5		2		4	15,0 / 15,5	4,8 - 5,0	8,0	58	4	C
2,3	B 11	8,0	4				14,5	4,5 - 4,7	7,5	55	4	C
2,7	C 10	7,5					14,0	4,3 - 4,4	7,0	52	4	D
3,0	C 9	7,0	3,5	3		3	13,5	4,1 - 4,2	6,5	49	3	D
3,3	C 8	6,5					13,0	3,8 - 4,0	6,0	46	3	D
3,7	D 7	6,0	3				12,5	3,5 - 3,7	5,5	43	3	E
4,0	D 6, D5	5,5				2	12,0	3,0 - 3,4	5,0	40	3	E
5,0	E 4	5,0	2	4		1	0,0 - 11,5	none	<5,0	fail	2	FX
5,0	E 3	4,5									2	F
5,0	F 2	4,0									2	F
5,0	F 1	3,5									2	F

* A = Excellent
B = Very good
C = Good
D = Satisfactory
E = Sufficient
FX = Failure with exception (only UoW)
F = Failure
** data have to be renewed

Table 3.: Conversion matrix of ECEM-partner universities (without ZUST)

A lot of students now have also the possibility to award two diplomas or as we say a double diploma: one from the home and the other one from the host university. Up to now there is no automatism in it but with a very small amount of additional work e.g. translation of the thesis and/or some additional modules students may receive it.

The biggest cohort of such interested students are the Polish students who study in Oldenburg because they have a great advantage as close neighbors to get employment in German companies or even better in joint venture companies in Poland and in Germany.

The language of the diploma thesis is fixed according to the language of the host university, but most universities also offer English. The Polish partner offers German as a third language, wheras the French partner has the restriction just to French.

6. Exchange Programmes

The EU aims to create a highly attractive education region. Especially the ERASMUS-program as one part of the SOCRATES-program and the LEONARDO-DA-VINCI-programme [16] are examples of strong and rather efficient programmes in the tertiary education field in Europe. They support both the mobility of students and academic staff and, in addtion, foster the co-operation with industry .

All ECEM-students of the EU-partner universities have high profits from it. Most students receive scholarships from this program; the amount is not too high to cover the normal living costs, but it covers all the tuition fees, which are really not negligible.

In Germany the ECEM-program has got special and additional benefits from the powerful German Academic Exchange Service (DAAD) especially by the two programmes

- GO EAST that fosters German students to study in east, south-east and the former GUS-states [17] and/or
- ISAP (International Study and Education Partnership [18]).

The GO EAST-program gives financial support to all outgoing students from Oldenburg, GER, to Poland and the Czech Republic.

The ISAP-program pays nearly all living and studying costs for the German students going to SUM, Moscow, and to ZUST, Hangzhou, and vice versa. The conditions are: the students have to stay at least one year in the foreign country, having one semester of theory and one of practical placement. They have to study successfully - and they have to come or go in a cohort of at least three students and that with different cohorts along a stretch of three years.

7. EU-internal and International Markets

With the growing European and global market new demands on professional qualifications and new working possibilities are seen to develop and to be developed. Today Europe envisages the situation of cross border mobility of students and professionals.

The Bologna process fosters the cooperation and even the integration of study curricula within the EU-member states. And the new “Directive of the European Parliament and of the Council on the Recognition of Professional Qualifications (COM (2002) 119)” fosters the cross border working possibilities by settlement and/or delivering services by professionals [19].

Thus, students of ECEM are best prepared to meet the European and international demands in the field of civil/construction engineering. They not only have excellent language abilities in at least two foreign languages, but they also have a deep insight in the culture, socio-economic conditions and in the working conditions in a foreign country and in a foreign company.

By this they also gained the ability of being mobile world wide and, thus, working on international platforms.

8. Remarks

The common ECEM-programme is insofar a unique programme as it is an undergraduate curriculum but

- offers a variety of different host countries;
- integrates 1 ½ year of study abroad;
- includes 1 semester practical experience;
- gives the possibility of double diploma certificates.

Normal exchange programmes have a much shorter study period abroad.

The organisation of the curriculum development and its changes, as well as the exchange programme itself is very much time consuming and not easy to handle. Each year all partner universities are coming together to have at least one meeting.

The curriculum is part of the normal academic education programme of each involved university and, thus, accredited by the respective accreditation boards. In the future – at least till 2008 - all study programmes in Europe have to be changed according to the two-tier system within the Bologna process. It is open whether and how a changed ECEM-course will be accredited by the respective national boards or by a "European" board.

In Germany there are different accreditation agencies now. ASIIN, the accreditation agency for study programmes in engineering, informatics and natural sciences od the German Society of Engineers (VDI), seems to be the most appropriate accreditation agency in this field [20]. Like others ASIIN co-operates with other national and international bodies to cope with international standards. By this ASIIN recently made contacts with ABET and the Washington Accord.

In Europe a number of agencies are loosely co-operating in the "European Standing Observatory for the Engineering Profession and Education (ESOEPE)"[21]. There is a discussion if ESOEPE could become a European "brother" of ABET, but up to now such a way is not too close to become realitiy.

The accreditation of the practice semester then will be a major problem. Today the practical placement is regulated and supervised by a practical placement office and by a member of the academic staff. The students get an official contract between university, company and themselves. The students have to deliver a number of working papers. At the end they have to give complete written and an oral report - using multimedia – about the company, their work, a judgement of the practice etc. Even if there is no real academic output the work experience of the students is remarkable and fully accredited by the universities.

Within the ECTS-world and due to a shortening of the undergraduate education the solution how to accredit the workload of practical placement is open. A variety of different models are on the market.

Keywords: European Curriculum, (European) Civil Engineering Management, ECEM, FH OOW

Bibliographic Information

1. www.fh-oow.de/fbb/ecem/
2. www.tpu.fi/servlet/sivu/0/250343
3. www.esitc-cachan.fr/56k/56k.htm
4. www.hanze.nl/
5. www.gmti.ie/prospective_students/engineering
6. www.tuniv.szczecin.pl/eng_index1.htm/
7. www.guu.ru/navigate_eng.asp
8. www.hh.se/english/education.htm
9. www.upv.es/perfiles/estudiantes.html
10. web.cvut.cz/en/education.html
11. www.ymmf.hu/kulkaps/courses.html
12. www.wlv.ac.uk
13. www.zust.cn
14. www.europa.eu.int/comm/education/programmes/socrates/erasmus/ects
15. www.europa.eu.int/comm/education/programmes/socrates/erasmus/erasmus_en.html
16. www.ntb.ch/SEFI/bolognadec.html
17. www.daad.de or http://go-east.daad.de/
18. www.daad.de/hochschulen/de/5.3.2.1html
19. www.europarl.eu.int/activities/default_en.htm
20. www.asiin.de
21. www.feani.org/esoepe

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