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BIOSYSTEMS ENGINEERING
IN EUROPE

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QUALITY ASSURANCE & ACCREDITATION IN VIEW OF RECENT DEVELOPMENTS IN EUROPEAN HIGHER EDUCATION AREA

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1. Developing a framework for the EHEA
Objectives for the development of a framework for the EHEA were set since the birth of the Bologna Process [1]. An action plan was set up in 1999 with goals (EHEA), time frame (2010) and activities (working groups; “Bologna follow-up seminars”; surveys and reports, etc.).

During this first period, following the initial objectives, there was a gradual development of “a framework for the EHEA” which included two basic components:

- Framework for qualifications in the EHEA (2005);
- Standards and guidelines for quality assurance in the EHEA (2005);

2. Implementation
Several steps were taken since the birth of the Bologna Process in the direction of the implementation of the framework for the EHEA [1]. After 2005, the Process was redirected from a track of conceptualising to a track of implementation. This proved to be a difficult task as it involves 46 countries – each of them responsible for its national HE system.

The strongest and the weakest point of the Bologna Process have been identified to coincide: the Bologna Process is a voluntary process.

A warning was issued through the Trends Report of 2005: the introduction of new cycles, leaves “ample room for different and at times conflicting interpretations”. Today, there are concerns regarding the implementation of the framework for the EHEA [1] but these concerns are not really new.

3. The development of quality assurance processes
Quality assurance culture at European level
There have been two Recommendations from the European Parliament and Council to promote a quality assurance culture in higher education [2]. The first one was the

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recommendation 98/561/EC of 1998[^1], that called for the support, and where necessary, the creation of, transparent quality assurance systems. The second one was published in February 2006, calling for further European cooperation in quality assurance in higher education[^2]. More specifically, the 2006 Recommendation was addressed to all stakeholders of the EHEA proposing specific actions, as follows:

**Calling the European HEIs to introduce or develop internal quality assurance systems**

**Calling the quality assurance or accreditation agencies to apply the European Standards and Guidelines on Quality Assurance[^3], in this area.**

**Calling the representatives of national authorities, the higher education sector, quality assurance and accreditation agencies, together with social partners to set up a 'European Register of Quality Assurance Agencies' allowing HEIs to choose, from amongst the agencies in the register, an agency meeting their needs and profile.**

The Recommendation also called for Member States to enable HEIs to seek accreditation from registered agencies outside their own country. Furthermore, it called for cooperation between quality assurance agencies in order to build mutual trust; and for public access to the assessments made by the agencies.

**Main developments at national level**

According to [2], “the European HEIs internal quality assurance systems aim to monitor and enhance quality and to develop a real “quality culture”. They often lack the independence and public accessibility required to inform stakeholders in a transparent and accountable way. Providing such information is the role of external quality assurance, which is carried out by independent quality assurance agencies.

This need has led to the establishment of the external quality assurance. The External quality assurance may consist of [2]:

- Evaluating (“auditing”) the quality of a given HEIs, its programmes or units.
- Comparing quality at different HEIs in a given area/discipline (“benchmarking”).
- Guaranteeing that certain pre-defined “standards” of quality are met (“accreditation”).
- Awarding various quality seals usually designed to signal high quality or “excellence”.

As far as the internal quality assurance is concerned, it has been reported that many HEIs in Europe have been building up their “quality culture” and internal quality assurance systems, mainly through inter-institutional cooperation, mutual assistance and benchmarking[^4]. On the other hand a trend for the establishment of quality assurance agencies that began after the 1998 Recommendation has spread and

accelerated in recent years. The emergence of new quality assurance agencies and networks is the most significant development in the European landscape [1].

Today there are quality assurance agencies in almost all countries of the EHEA even though they are quite heterogeneous in terms of size, scope, statute, focus and international capacity [2]. According to the report of [2], many of these quality assurance agencies are small, newly created with only limited experience and European/international exposure. With a few exceptions, their remit is limited to their country (and sometimes their region): only a very small number are active outside their own territory. Most agencies focus on programme evaluation, but a growing number are becoming involved in institutional accreditations or audits.

In a recent report [2], it is confirmed that HEIs in most countries are actively working to establish coherent internal quality assurance systems and align them with external assessment procedures. It is concluded that the main challenge for most countries is to design assessment procedures to measure learning outcomes.

Three indicators are used by the Stocktaking Report [2] to measure progress in QA. These indicators correspond to the stage of development, the level of student participation and the level of international participation as follows:

- **Stage of development of external quality assurance**: countries score best if they have an external system applying to all institutions working in accordance with the European Standards and Guidelines for Quality Assurance.

- **Level of student participation**: countries score best if students participate in the governance of national quality assurance bodies, in external reviews of HEIs and/or programmes, in internal quality assurance processes and in preparation of self-assessment reports.

- **Level of international participation**: countries score best if there is international participation within external reviews of institutions and/or programmes, in the governance of national quality assurance bodies and in external evaluations of national quality assurance agencies.

The European Standards and Guidelines on quality assurance

The European Standards and Guidelines on quality assurance, adopted in 2005, consist of three parts [2]:
- principles for HEIs’ own internal quality assurance system;
- standards for the external evaluation of HEIs and their programmes by agencies;
- standards applying to quality assurance agencies themselves a certain margin for interpretation in the context of different countries, disciplines and institutions.

They are meant as a “generic” common reference with a certain margin for interpretation in the context of different countries, disciplines and institutions. Despite

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1 Quality Procedures in the EHEA and Beyond, 2nd ENQA Survey, ENQA, 2008.
that fact that the 'European Standards and Guidelines' were developed in context of the Bologna Process, they do not refer to the importance of complying with the EHEA's basic requirements (e.g. concerning the Qualifications Framework or the use of ECTS) and main priorities (such as employability and mobility).

According to the report of [2], awareness of the quality standards varies between countries and constituencies while there is considerable experience with their application. In terms of statistics, it is reported that thousands of people (university staff, experts, students, representatives of business and society) have participated in self-evaluation procedures, served on evaluation panels or been interviewed during evaluation visits. The participation of students in quality assurance as a basic requirement in the EHEA has gained ground in recent years; this involvement often remains confined to certain aspects or procedures [1]. The involvement of business representatives and of non-nationals varies significantly in internal and external quality assurance; generally stronger in agencies' evaluation panels than in their decision making bodies.

The strong growth in Europe's quality assurance infrastructure has nurtured a strong development of quality assurance Networks. These networks created the European Association for Quality Assurance (ENQA) [2], also supported by the European Commission. ENQA has already 48 full members from different countries. ENQA is one of the four members of the so called- E4-Group [3], the other three being the European University Association (EUA) [4], the European Association of Institutions in Higher Education (EURASHE) [5] and the European Students' Union (ESU) [6].

It was the “E4 Group” that proposed the European Standards and Guidelines for quality assurance, adopted in 2005.

Another relevant legal body is the European Consortium for Accreditation (ECA) [7], which has 15 member organisations from 10 countries. The European Consortium for Accreditation, has actively pursued the mutual recognition of accreditation decisions between its members.

\[\text{1 Bologna with Student eyes, ESU, 2009.}\]
\[\text{2 www.enqa.eu.}\]
\[\text{3 E4 group (ENQA-EUA-EURASHE-ESU)}\]
\[\text{4 http://www.eua.be/Home.aspx}\]
\[\text{5 http://www.eurashe.eu/RunScript.asp?p=ASP\|Pq0.asp}\]
\[\text{6 http://www.esib.org/}\]
\[\text{7 www.ecaconsortium.net}\]
Main developments at European level

The strong growth in Europe’s Quality Assurance infrastructure

Lately (2008) one more legal European body relevant to QA was set up by the E4 Group, the European Quality Assurance Register (EQAR) [1]. The European Quality Assurance Register is the major new body in the European quality assurance architecture. EQAR is open to agencies operating in the EHEA on condition that they demonstrate their compliance with the European Standards and Guidelines. A simplified procedure has been established for admission to EQAR of full members of ENQA, who already satisfy this condition. Candidate agencies may also apply directly to EQAR. In addition, governments may become EQAR members but only with observer status in the Committee.

As reported in [2], the first two rounds of registrations in EQAR of December 2008 & April 2009 resulted in admission of nine ENQA members into EQAR. More are planned to follow soon.

A major concern that has been raised following the recent developments at European level relevant to Quality Assurance is that with multiple layers of agencies and networks, the system can be difficult to read and use [2]. As an example, some agencies are members in both ENQA and EQAR, but not all agencies do. According to [2], much more effort will be needed before the EHEA has a readable and user-friendly quality assurance system.

Based on the current situation [2], it is in many cases still unclear what being accredited in one country, even by a registered agency, means in another. Also it is unclear how the misuse of such an accreditation could be prevented, e.g. in the case of a higher education institution which operates in several countries without offering in all locations the guarantees that led to the initial accreditation.

According to the report of [2], stronger warranties are needed as the credibility of the European quality assurance system may hinge on the least trustworthy agency accepted or maintained in the Register and the weakest HEIs with accreditation from a registered agency.

The limited European dimension of Quality Assurance

Concerning the European dimension of the Quality Assurance implementation, the 2006 Recommendation encourages Member States to enable HEIs to seek accreditation (or other quality seals) from registered agencies outside their own country. This can become reality if several conditions co-exist [2]:

- HEIs need sufficient autonomy to apply for a foreign quality seal;
- Agencies need to be able, allowed and willing to operate beyond their national borders;
- National governments and quality assurance agencies must acknowledge registered agencies from other countries and recognise their conclusions.

[1] www.eqar.eu
According to the report of [2], there are only a few examples of HEIs seeking evaluations or accreditation from foreign agencies, apart from cases of subject-specific agencies and of some joint-degree courses. Only few governments have opened quality assurance in their country to other registered agencies. Universities of the EHEA seeking a quality seal in a given discipline still tend to turn to US agencies like ABET or AACSB.

Among the “Good Practice” examples reported in [2], included are the newer subject-based initiatives developed recently from thematic networks in chemistry & engineering. Of particular interest for the accreditation of Biosystems Engineering programs of studies is the EUR-ACE label [1]. The EUR-ACE label in engineering exists at the first two cycles or the integrated two-cycles level. Standards were defined at European level, but are applied through national quality assurance agencies that are authorised to issue EUR-ACE “labels” together with their national accreditation. Several hundred labels have already been awarded, but they are still available from only seven national agencies.

Overall cross-border quality assurance is still limited in Europe [2]. There is little comparable information for the stakeholders, in particular students, to make informed choices about where and what to study.

**Main developments at International level**

The new quality assurance networks developed or under development in various world regions have promoted a worldwide dialogue on quality assurance. This resulted in the establishment of the International Network for Quality Assurance Agencies in Higher Education (INQAAHE) [2].

Another major development at both European and global level [2] concerns the growing number of international university rankings. These rankings, usually contradictory, are very often criticised in the higher education community for their methodological shortfalls and their mono-dimensional approach. To deal with this problem, the European Commission has recently launched a feasibility study to develop a new multi-dimensional and customised approach to the global ranking of universities [3].

**Enhancement and accountability of the European quality assurance system**

The close link between enhancement and accountability of the European quality assurance system is presented in [4]. It is suggested that the cooperation in quality assurance and applying the ESG is the basis for mutual recognition of degrees.

The lesson from 10 years of cooperation in quality assurance is described as follows [4]:

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2. [http://www.inqaahe.org](http://www.inqaahe.org)
4. Bologna Ministerial Conference 2010, Degree and Curriculum Reform, Comments by Achim Hopbach, ENQA
although approaches and methodology converge to a certain extent, this will not, due to national context, lead to a uniform European quality assurance system.

- we shouldn’t aim at one-size-fits-all approaches which tend to turn into strait jackets and thus are inadequate for the Bologna Process.
- we should rather follow the approach of mutual trust on basis of common principles.

Besides the fact that the envisaged level of the implementation of internal and external quality assurance has not been reached in some countries, more challenges are ahead [4]. In particular, there is a danger that transparency tools, such as rankings or classifications, could foil the enhancement-driven aspect of quality assurance in higher education by stifling self-critical reflection [4].

According to [4], ENQA will continue to support the development of quality assurance processes that reflect the close link between enhancement and accountability.

4. Conclusions
The main conclusions derived from the report of [2] may be summarised as follows:

There is a risk that the agencies may have become too numerous while their size remains rather small.

There is a possibility that agency mergers might merit some consideration via the existing European quality assurance networks (ENQA, ECA), e.g. by regrouping agencies on the basis of regional or linguistic proximity and by broadening the scope of their activities.

Enhancing the efficiency of the European quality assurance infrastructure may be promoted by creating a clearer distinction of roles between ENQA, EQAR and the European Consortium for Accreditation (ECA), with a stronger focus on the benefit of quality assurance users.

Recognition of qualifications by providing an easy, online access to the European-wide list of evaluated institutions and programmes could be a priority of EQAR; this would require a close cooperation with the NARIC-ENIC network.

Another action recommend in the report of [2] is revisiting the European Standards and Guidelines. The aim of such a revision should be that the European Standards and Guidelines:

- comply with the main structure (three cycles) as a basic quality requirement in the EHEA: a clearer reference to the Diploma Supplement and the ECTS.
- encompass priorities such as employability and mobility

Concerning the internal quality assurance systems of HEIs it is recommended in [2] that other key dimensions may be included, such as: the quality of student services in general, career/employment guidance for students and alumni, development of financial management capacity and implementation of the European Charter for Researchers.
SYNOPSIS OF THE EUROPEAN QUALITY ASSURANCE & ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES

prepared by
WG3 leader J. Fehrmann

1. Tools for Quality Assurance and Assessment Frameworks

Main messages
• The growth of external quality assurance in higher education has been one of the most notable features of the Bologna decade.
• European cooperation in quality assurance is exemplified by agreement on European Standards and Guidelines and the creation of a European Quality Assurance Register.
• In the majority of EHEA countries, quality assurance is concerned with granting permission to higher education institutions or programmes to operate on the basis of threshold quality standards. Only a minority of countries exclusively follow an improvement oriented approach.

Introduction
This section gives an overview of the rapid rise of external quality assurance in Europe. Ensuring and improving quality of higher education and establishing quality assurance systems remains a high priority for many countries. However, measures taken to strengthen quality within institutions (i.e. internal quality assurance) are beyond the scope of the national level sources that inform this report. While it is a moot question whether quality in higher education has improved during the past Bologna decade, there is no doubt whatsoever that quality assurance has seen dramatic developments.

In higher education, quality assurance can be understood as policies, procedures and practices that are designed to achieve, maintain or enhance quality as it is understood in a specific context. During the Bologna period, quality assurance in higher education has been clearly linked to establishing stakeholder confidence. Indeed the following principles outlined in the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) adopted in May 2005 stress stakeholder interest, institutional autonomy and minimum burden on higher education institutions. Thus Quality Assurance should focus on:

• the interests of students as well as employers and the society more generally in good quality higher education;
• the central importance of institutional autonomy, tempered by a recognition that this brings with it heavy responsibilities;
• the need for external quality assurance to be fit for its purpose and to place only an appropriate and necessary burden on institutions for the achievement of its objectives.
Creation of Quality Assurance agencies in the last decade
Although nearly all Bologna countries now have a system of external quality assurance in place, usually with one or more independent agencies charged with prime responsibility, a quick glance through the dates of establishment of these bodies shows that this is a recent and fast-developing phenomenon. Indeed only a handful of countries had already established clear external quality assurance systems prior to the Bologna process. During the Bologna decade, 22 countries have established national agencies for quality assurance, with half of these being set up since 2005. In a few countries, such as Denmark and France, new agencies have replaced or built on existing agencies. Few countries have stayed outside this quality assurance revolution. Countries with a small higher education sector such as Cyprus, Liechtenstein, Luxembourg and Malta have not established agencies. However, Liechtenstein has developed strong cooperation with Switzerland to ensure that external quality assurance is fully implemented. Luxembourg has also developed a progressive approach of improvement-oriented evaluation that is both inclusive of stakeholders and extremely international.

Development of ENQA and creation of EQAR
Developments at national level have also been accompanied by major changes at European level. The European Association for Quality Assurance in Higher Education (ENQA) was established in 2004 after four years as a more informal network. It works to promote European co-operation in the field of quality assurance. The launch of the European Quality Assurance Register for Higher Education (EQAR) in March 2008 represents the culmination of efforts to promote European cooperation in quality assurance through the Bologna process. EQAR aims at enhancing trust and confidence in European higher education by listing quality assurance agencies that operate in Europe and have proven their credibility and reliability in a review against the Standards and Guidelines for Quality Assurance in the EHEA (ESG). After less than two years of existence, EQAR includes 17 quality assurance agencies based in ten European countries. EQAR is also notable for its governance structures, as it is governed and supported by an international non-profit association that comprises all major European higher education stakeholders and European governments. This inclusive approach to governance is a strong symbol of the close partnership that has developed through the Bologna process and offers a model for other world regions.

Independence of Quality Assurance agencies
The European debate on quality assurance during the last decade has emphasised the importance of establishing agencies that are able to perform their work in an independent manner. In most cases, this has led to the development of agencies that are legally and operationally independent from governments as well as from higher education institutions. Only six countries – Azerbaijan, Iceland, Moldova, Slovakia, Turkey and Ukraine – have maintained a system of central management for quality by ministries. Meanwhile, the situation for two countries – Bosnia and Herzegovina and Italy – is currently in a process of transition. In Bosnia and Herzegovina, an agency was established in law in 2006 but is not yet operational. In Italy, following legislation in 2008, considerable action has been undertaken to ensure that a new improvement-oriented
quality assurance agency should soon be fully functioning. Notwithstanding these exceptions, it is clear that the European Higher Education Area is now largely full of national external quality assurance systems with independent agencies.

**Orientation of Quality Assurance systems**

Although practically all Bologna countries have established some form of external quality assurance system, there are significant differences in the philosophy and approach behind systems. Common Standards and Guidelines have been agreed for the EHEA, yet systems are still quite diverse in their orientation. Two main distinctions are drawn in this overview and can be seen in Figure 7. The main element that distinguishes the orientation of systems in this representation is whether or not the QA agency or national body is invested with the power to grant permission for institutions or programmes to operate. Although certain national system features make this reality more complex (for example, whether or not governments retain the power to issue degrees at central level), these orientations give a good sense of the approach to quality assurance. In systems where responsible QA bodies/agencies have the power to permit or refuse programmes and/or institutions to operate, quality assurance can, in broad terms, be perceived as supervisory in character, and generally aims to ensure that minimum quality thresholds are met. Agencies may of course play other roles – including giving advice on the enhancement of quality. This is indeed specifically mentioned in a number of countries, but all these additional roles are likely to be subordinate to the decision of permitting programmes and/or institutions to operate. In other systems, QA agencies report on institutions' management of quality, and although having 'only' an advisory role, aim to support quality enhancement. In such a construction, the primary emphasis is thus on empowering higher education institutions with responsibility for quality improvement. These are systems that will be more likely to use 'light touch' external quality assurance processes, aiming to ensure that necessary measures to improve quality have been established within institutions, and interfering less in the decision making processes at institutional level. It is interesting to note that, despite the growing emphasis on autonomy for higher education institutions in European-level discourse on higher education, three-quarters of countries – including those that have most recently established their external quality assurance system – have constructed their QA systems in the logic of supervision and ensuring minimum standards, while only 14 higher education systems currently follow an improvement-oriented approach, placing the primary responsibility for improving quality at institutional level. This finding suggests that the development of external quality assurance systems has been a central feature of evolving governance structures in higher education. Whereas institutions were previously 'supervised' directly by the state, the steering mechanisms now are much more likely to involve quality assurance agencies. Moreover, just as there has been increasing convergence towards particular models of degree structures, so too there appears to have been convergence towards a particular model of external quality assurance. No doubt this has been facilitated by the increased communication between governments, agencies and other quality assurance actors throughout the Bologna period.
Main approach to Quality Assurance, 2009/10

2. National Qualification Frameworks: Moving forward, albeit slightly behind schedule

The third tool to have been introduced and developed in the Bologna process is the National Qualifications Framework (NQF). It is a tool for describing and clearly expressing the differences between qualifications in all cycles and levels of education. Ideally NQFs work in close conjunction with the aforementioned ECTS and Diploma Supplement.

The development of National Qualifications Frameworks has been encouraged in recent years by a range of initiatives and processes. In Bergen, in May 2005, European ministers of education adopted the overarching Framework for Qualifications of the European Higher Education Area (FQ-EHEA) and committed to the development of National Qualification Frameworks.

National Qualification Frameworks should include a reference to the three cycle structure and the use of generic descriptors based on learning outcomes, competences and credits for the first and second cycle.

This task was made more challenging by the later adoption in the context of the EU Lisbon strategy of the European Qualifications Framework for lifelong learning (EQF), which is structurally compatible to the FQ-EHEA, but has different descriptors. Thus the task for countries when developing or adapting their national qualifications frameworks is far from simple: not only should these new national instruments reflect the shift from traditional input-based approaches of categorising qualifications to a focus on learning outcomes, credits and the profile of qualifications, but care should also be taken to ensure that national developments are compatible with both overarching European frameworks.
Initially, the ministers foresaw the implementation of NQFs in all countries by 2010. But even the 2009 Stocktaking report called this deadline 'too ambitious' (Bologna Process Stocktaking Report 2009, p. 41) and identified the establishment of NQFs in all countries as one of the biggest challenges for the coming years. Eurydice data supports this assessment. Using a model adapted from the BFUG working group on Qualifications Frameworks, Figure 6 shows that eight higher education systems now have a fully self-certified NQF, while 11 are well advanced in the process of implementation. The other countries are still in the preparatory stages of defining purposes and structures. While at first sight this picture may not seem too positive, developments over time are promising. Indeed since the Ministerial Conference in Leuven/Louvain-la-Neuve in 2009, Denmark and Malta have self-certified their NQF (Malta is the first country to self certify against the FQ-EHEA and reference against the EQF in the same operation) and Albania, Cyprus, the former Yugoslav Republic of Macedonia, the Holy See, Norway and Portugal have all made progress towards establishing their NQF.

3. EUR-ACE academic accreditation procedure
The EUR-ACE® Label, property of ENAEE, was established in March 2006 following the successful completion of the EUR-ACE® programme funded by the European
Commission. It distinguishes between First Cycle and Second Cycle Degrees, in accordance with the definitions of the European Qualification Framework. The accreditation agencies presently (2010) authorized to award the EUR-ACE® Label are ASIIN (Germany), CTI (France), Engineering Council UK (United Kingdom), Engineers Ireland (Ireland), Ordem dos Engenheiros (Portugal), RAEE (Russia) and MÜDEK (Turkey).

4. Literature
Focus on Higher Education in Europe 2010; The Impact of the Bologna Process; Eurodyce network; February 2010
EVALUATION OF THE QUALITY OF TERTIARY EDUCATION IN THE CZECH REPUBLIC

by Antonín Stratil
Member of the Accreditation Commission of Czech Republic

The Accreditation Commission of the Czech Republic (hereafter referred to as “AC”) is an institution systematically concerned with the evaluation of the quality of institutions of higher education and their study programs. Through its activities, the AC creates conditions for quality assurance and improvement in tertiary institutions’ primary activities. Its tools in these areas are: institutional evaluations, evaluations of accredited activities and accreditation processes. While evaluation is understood as the primary way in which to improve the quality of Czech institutions of higher education, the process of accreditation primarily fulfills a disciplinary function because it is based on minimum standards and requirements and attempts to separate the quality from the low quality.

1. National Higher Education System

In the Czech system of higher education, higher education institutions (HEIs) of university and non-university type exist; there are public (26), state (2 – University of Defence and the Police Academy) and private institutions (45) of both types. Private higher education institutions began to emerge shortly after the Higher Education Act came into the force (Law No. 111/1998 Coll.). They have often developed from private tertiary professional schools. Forty-five private institutions of higher education were registered by the beginning of 2009. Higher education institutions of non-university type usually offer bachelor study programmes and, if accredited, they can provide master study programmes. They are not allowed to provide doctoral study programs. Higher education institutions of university type offer programs leading to a bachelor, master and in all cases also to a doctoral study.

The type of higher education institution is stated in its statute in agreement with an expert standpoint of the AC.

There are three levels of higher education leading to the respective academic degrees (bachelor, master and doctoral). They are in line with the provisions of the Higher Education Act as well as with the ideas of the Bologna process. There are only few exceptions where a Master study program has the traditional “long” form and starts after secondary school graduation and students can continue to study at these master study programs after passing the entrance exam (e.g., medicine and veterinary medicine). These have to be decided by the Accreditation Commission.

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According to the 1998 Higher Education Act, all types of study programs are subject to accreditation. The award of accreditation to a study program is a task within the competency of the Ministry of Education, Youth and Sports, which involves state agreement with the way the program is to be delivered, including the right to award appropriate academic degrees. In the case that a study program is not accredited, no applicants can be admitted, no lectures may be held, no examinations can be held, and no academic degrees may be awarded. This award of accreditation is based on the decision of the AC. The Ministry of Education, Youth and Sports cannot act arbitrarily against the decision of the AC.

Internal organization of Accreditation Commission
The Accreditation Commission was established in 1990 as an independent government body taking care of the quality in higher education. It is composed of 21 members, academic and professional experts. The members are nominated by the Minister of Education and appointed by the Czech Government. The AC may establish work groups to carry out evaluation of specific matters and activities. They might be permanent and special work groups. Currently there are 20 permanent work groups and the number of members of the work group depends on the size of the field of the higher education to which they relate to. Administrative, material and financial means for the activities of the Commission are provided by the Ministry via the Secretariat of the Accreditation Commission.

International activities of AC
Since its foundation the AC has been aiming at implementation of internationally recognized procedures and practices of quality assurance. At least three members of the AC are usually academics from Western European countries. Frequently, foreign experts are asked to participate in processes of institutional evaluation in certain fields (law, medicine etc.). In order to have topical information and to participate in dissemination of good practice the Accreditation Commission of the Czech Republic became full member of INQAHE (International Network for Quality Assurance in Higher Education) and ENQA (European Network for Quality Assurance). It also participated in creating the Central and Eastern Network of Quality Assurance Agencies in Higher Education which was founded in 2001 in Cracow and established in October 2002 in Vienna. All these networks aim at disseminating information about good practice, share experience and foster cooperation among members, and serve as a clearing house for issues of quality assurance. Members of the AC and of its secretariat participate in workshops and seminars organized by these international networks.

During the evaluation of restructured study programs, the AC follows internationally used procedures and standards, where possible. Growing emphasis on transparency of curricula and their assessment in the practices of the AC is the result of the necessity to create adequate conditions for the mobility of students (demand for the recognition of qualifications, credits, and study periods abroad), and recognition of diplomas.
System of the quality assurance in the Czech Republic

The AC takes care of the quality of higher education and performs comprehensive evaluation of educational, scholarly, research, developmental, artistic or other creative activities of higher education institutions. According the 1998 Act and its Statute it must perform in particular following activities:

1. evaluate activities pursued by higher education institutions and the quality of accredited activities, and publish the results of such evaluations;
2. accredit study programs;
3. assess other issues concerning the system of higher education presented to it by the Minister, and express its standpoints over these issues.

The AC is authorized to require from the Ministry of Education, Youth and Sports, public, state and private higher education institutions and legal entities which participate in educational and scholarly, research, developmental, artistic or other creative activities of higher education institutions the necessary information, documentation and cooperation in accomplishment of its obligations.

To carry out its activities, the AC exploits permanent and special work groups to deal with the evaluation of specific matters and activities. These work groups are composed of specialists who are to consider particular study programs, HEI or other activities. According to the 1998 Act the AC is obliged to issue its statement on applications for accreditation of study programs, applications for the right to perform habilitation procedures and procedures for the appointment of professors, applications for establishment, merger, amalgamation, splitting or dissolution of a faculty of a public HEI, determination of the type (university or non-university) assigned to a HEI.

The AC is entrusted by the 1998 Act with general care for the quality of higher education, involving evaluation of all accredited activities and publication of the results. It is also obliged to elaborate a professional standpoint on further matters concerning higher education presented for its consideration by the Minister of Education, Youth and Sports.

The evaluation of activities of HEI

For evaluation, the AC usually chooses one HEI or several institutions performing similar accredited study programs. The evaluation lasts, if longest, one year and a half and is carried out according to following procedures:

1. selection of HEI by the Commission and authorization of a competent member of the Commission to implement the evaluation procedure;
2. establishment of a special work group;
3. notification to the Rector, dean or director of HEI of a fact that institution has been chosen for evaluation by the Accreditation Commission;
4. elaboration of requirements concerning information used for the evaluation of HEI, and their submission to the head of HEI being evaluated;
5. elaboration of gained information by the special work group;
6. expression of the opinion of the evaluated HEI’s head concerning the composition of the special work group;
7. visit of at least three members of the special work group in the evaluated HEI;
elaboration of recommendations and conclusions from the evaluation carried out by the special work group and discussion with representatives of the evaluated HEI about these recommendations and conclusions;

9. submission of recommendations and conclusions to the Accreditation Commission;

10. acceptance of recommendations and conclusions related to the evaluated HEI by the AC in participation of its representatives.

Recommendations and conclusions are then, together with the opinion of the representatives of evaluated HEI submitted to the Ministry of Education, Youth and Sports and are published.

A similar procedure is applied for evaluation of accredited study programs.

Accreditation of study programs

According to the 1998 Act, all types of study programs are subject to accreditation. The award of accreditation to a study program is a task within the competency of the Ministry of Education, Youth and Sports, it involves state agreement with the way the program is to be delivered, including the right to award appropriate academic degrees. In the case that a study program is not accredited, no applicants can be admitted, no lectures may be held, no examinations can be held, and no academic degrees may be awarded; and these programs may not be financed using public (government) funds (in case of public and state HEI).

The written application from a higher education institution for the accreditation of a study program must include the following:

1. the name of the higher education institution or its constituent part that is responsible for providing the study program;
2. the components of the study program under subsection 44 of the Higher Education Act;
3. evidence of appropriate staff, financial, material, technical and information support for the study program for at least the standard length of study;
4. a description of the planned development of the study program, its rationale and the anticipated number of students to be admitted;
5. in the case of study programs in the field of health services, the standpoint of the Ministry of Health with respect to the possible employment of graduates in this field is also required.

The Ministry passes the application immediately to the AC, which reaches a decision no later than 120 days from the date of receipt.

If there are any deficiencies in the application that might be corrected, the AC invites the higher education institution to do so within a reasonable length of time and suspends the review procedure. If the higher education institution fails to correct these deficiencies by the deadline that has been set, the AC makes its decision on the basis of the original documentation. No later than thirty days after receiving the standpoint of the AC, the Ministry makes its decision on whether or not to award accreditation. In making this decision, it takes into consideration the general policy of the higher education institution with regard to its teaching, scholarly, scientific, research,
development, artistic or other creative activities, as well as an assessment of its activities.

The Ministry will not grant accreditation if:

1. the study program does not comply with the requirements listed in Part 4 of this Act;
2. sufficient academic staff, equipment and information support are not guaranteed for the relevant study program;
3. implementation of the study program is not backed by sufficient financial, material or technical resources;
4. the higher education institution does not offer sufficient guarantees that regular teaching in the program will be ensured;
5. the application contains incorrect data deemed crucial to awarding the accreditation; the Accreditation Commission has issued a negative standpoint.

If the requirements listed in paragraphs 1) and 2) are not met, the AC will not issue an affirmative standpoint with regard to an application for the accreditation of a study program. The standpoint of the AC must include the reasons why the study program does not meet the requirements listed in paragraphs 1) and 2). The Ministry is bound by the 1998 Act not to award accreditation in the case of a negative assessment of a study program. In the case of a positive standpoint of the Accreditation Commission the Ministry is bound by an explicit list of grounds on which it may refuse to award accreditation.

Accreditation of a study program is awarded for a limited period of time, maximally for twice the standard length of the program. In the case of doctoral study programs, accreditation should not be awarded for more than ten years (usually it is awarded for 8 years). A HEI or a unit of such an institution may carry out procedures for habilitation (venium docendi) and procedures for the appointment of professors only on the basis of accreditation. A similar mechanism to that used for study programs also applies in the case of these procedures.

A more comprehensive information on the quality assurance of tertiary education in Czech R. can be found at: [http://www.akreditacnikomise.cz/attachments/180_Self_evaluation.pdf](http://www.akreditacnikomise.cz/attachments/180_Self_evaluation.pdf)
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN LEUVEN, FLANDERS-BELGIUM

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Abstract
The quality assurance and assessment of Biosystems Engineering of K.U.Leuven has been fully implemented - within the Bologna spirit - as well internally as externally. There is a legal obligation and frame for both. This is also the case for the accreditation which results from the external quality assessment. It is uniform for all universities and curricula in Flanders.

1. Legislation and Tools In Flanders (Belgium): a legal base for quality assessment of higher education programmes

1.1. General Base: the Bologna declaration 1999
The Bologna Process was initiated in 1999. It now involves 46 countries. An important action line in the process was and is the restructuring of higher education programmes and changes to the qualifications (diplomas) that are made as a result. In 2003, Ministers with responsibility for higher education gathered in Berlin to review progress in the Bologna Process. They called on each participating country to develop a national framework of qualifications. They also called for the elaboration of an overarching framework for qualifications of the European higher education area. For the purposes of brevity, this framework will be referred to as the Bologna Framework. Subsequently in Bergen in 2005, Ministers adopted the Bologna Framework. This framework had been developed by a working group set up by and reporting to the Bologna Follow-Up Group and chaired by Mogens Berg.

1.2. Implementation in Flanders (Belgium) [1]
Flanders’ intention was and is to respect and follow the intentions and of the Bologna declaration as strictly and close as possible. The signing of the Bologna Declaration in 1999 led to a radical new re-organisation and the implementation of the Bologna Declaration in Flanders was shaped by the:
- Decree on Higher Education Reform of 4 April 2003,

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- Decree on Participation of 19 March 2004,
- Decree on Flexible Learning Paths of 30 April 2004.

In Flanders, the higher education institutions are made up of statutory registered higher education institutions and registered institutions. Institutions may also form associations. The statutory registered institutions are institutions for higher education which are recognised by law and which can bank on government funding for their education and research. These institutions are listed in the Higher Education Register (cf. http://www.highereducation.be).

The statutory registered institutions are:
- the university colleges and the universities;
- the Faculty of Protestant Theology (Brussels) and the Faculty of Evangelical Theology (Heverlee);
- the other officially registered institutions: Vlerick Leuven Gent Management School, the Institute of Tropical Medicine and Antwerp University Management School.

Quite a remarkable institution is the transnational University Limburg (tUL). This university was founded under a treaty between the Netherlands and Flanders and is therefore a bi-national institution. In Flanders it is a statutory registered institution which forms part of the Flemish universities via the University Hasselt. Only the statutory registered universities and university colleges may call themselves “universiteit” and “hogeschool” and use this designation.

The registered institutions for higher education are private institutions which are officially recognised on the basis of a successful registration procedure:
- the initial accreditation procedure by the NVAO,
- followed by the review of the institution by the Flemish Ministry of Education and Training.

Candidate institutions must demonstrate their financial solvability and must enter into a cooperation agreement with a higher education institution, in order to guarantee that students can complete their studies at the contracting higher education institution in case the registered institution in question ceases its activities (cf. http://nvaoo.net/).

Their accredited Bachelor’s and Master’s programmes are included in the education register (cf. http://www.highereducation.be).

An association is an official cooperation between one university and one or more university colleges. University colleges that, in an association with a university, offer programmes with academic orientation are currently undergoing a process aimed at strengthening the link to research, i.e. embedding programmes in research. The institutions may assign certain powers of decision to the association.

There are five associations in Flanders. Associations have indeed several competences, but do not award degrees. Degrees are awarded by the universities and university colleges themselves.

In Belgium there is a constitutional freedom of education. This implies that institutions, which are totally private may offer any kind of education, but they may not call their qualifications Bachelor, Master or Doctor/PhD.
Only people who have been conferred the title of Bachelor, Master or Doctor, pursuant to the Flemish Law on Higher Education Reform of 4 April 2003 may carry the corresponding title of Bachelor, Master or Doctor and the legally protected abbreviations "dr." and "PhD".

1.3. Curricula as part of quality assessment
University colleges and universities have full competences over the curricula of their programmes. A curriculum consists of a coherent set of components. The contents of the curricula correspond with the award-type descriptors of the national framework of qualifications of Flanders. Additionally, the content of these curricula needs to take into account the requirements regarding certain functions or professions, determined by national and international legislation (e.g. the European Directive 2005/36).

1.4. The Quality Assurance and accreditation process in Flanders – role of VLIR and NVAO

In 1976, the Flemish Interuniversity Council (VLIR) was set up as an autonomous public body with its own institutional status [2]. The council consists of members who represent the Flemish universities. It defends the interests of the universities and gives advice to the Flemish government on university matters (consultation, advice and recommendations). In addition, the council organises consultation between the universities (cf. http://www.vlir.be/).

NVAO is the Accreditation Organisation of the Netherlands and Flanders. The organisation was established by an international treaty [3]. The NVAO independently ensures the quality of higher education in the Netherlands and Flanders by assessing and accrediting programmes and contributes to furthering this quality. In addition, NVAO contributes to raising quality awareness within higher education and advancing the position of higher education in the Netherlands and Flanders in the national and international context.

NVAO achieves its mission, by:
- the accreditation of programmes offered by higher education institutions;
- the initial accreditation of programmes that are not yet offered and/or registered;
- the contribution towards stressing the distinctive features of programmes or institutions by assessing the specific quality features at the request of institutions;
- the advancement of both the European and the international dimension in Dutch and Flemish accreditation and maintaining international contacts in order to reach agreement and cohesion;
- undertaking other tasks commissioned by the Dutch-Flemish Committee of Ministers;
- contributing to the public debate on the developments in higher education within the scope of NVAO's primary tasks.

In Flanders, accreditation is a formal decision by the NVAO that a programme meets the predefined quality criteria. These criteria are laid down in NVAO's (initial) accreditation frameworks.

The National Framework of Qualifications in Higher Education in Flanders is compatible with the overarching Framework for Qualifications of the European Higher Education
Area (QF-EHEA). This is stated by NVAO following the conclusion of an independent and international external verification committee. Accreditation is however only one part of the whole quality assurance system of higher education in Flanders. This quality assurance system consists of three parts: an internal part, an external part and the part where the formal decision is taken.

1.4.1 Internal Quality Assurance. The self-evaluation of the programme is organised by the higher education institution itself and results in the self-evaluation report.

1.4.2. External Quality Assurance. The self-evaluation report is the starting point of the external quality assessment. The result of the external quality assessment is the assessment report. The external quality assessment is organised by the VLHORA and VLIR. (From 2010 on, this should be done by one common and coordination council, the VLUHR). VLHORA and VLIR organise these assessments by setting up an independent assessment panel of experts responsible for assessing all the programmes in a certain field of study. The assessment panel consists of experts in the field of study, experts in quality assurance, educational/pedagogical experts and experts in the international development of the field of study. Students are always involved and represented in the assessment panel.

1.4.3. The formal decision: accreditation. The Netherlands and Flanders have set up an independent accreditation organisation by international treaty, the NVAO (http://www.nvao.net). Higher education programmes that have successfully gone through the external quality assessment sent their assessment report to the NVAO. The NVAO then evaluates the thoroughness of the external assessment and accepts or rejects its findings.

If the accreditation decision is positive, the programme is accredited. This means that the programme is included in the Higher Education Register. This registration means that the degree awarded by the programme is recognised by the national authority, Flanders. Additionally, accredited programmes can receive public funding and the students enrolled in these programmes can receive student support (e.g. grants). However, public funding and student support are normally not available for programmes offered by private institutions.

A positive accreditation decision by the NVAO is kept or listed in the Higher Education Register for 8 years. If the accreditation decision is negative, the programme looses accreditation. This means the programme is deleted from the Higher Education Register and can no longer be offered. However there is a possibility of temporary recognition during a recovery period. After the negative accreditation decision, the institution has the opportunity to submit an application to the Flemish government for a temporary recognition. This has to be done within one month after the notification of the negative decision. A detailed plan for improvement has to be put forward together with the application. Following advice from the Recognition Commission, the Flemish government takes a decision within three months of the application. Temporary recognition may have a validity of one to three years.

In the NVAO’s accreditation system, learning outcomes are made use of at three levels.

✓ A programme is expected to explicitly define its intended learning outcomes. These are the competences a graduate should acquire during his studies. An assessment
panel first judges whether a programme's intended learning outcomes are in line with the required level and the subject of the programme. The level is evaluated by matching the intended learning outcomes to the Framework for Qualifications of the European Higher Education Area. Additionally, the assessment panel assesses whether these intended learning outcomes are in line with what is (inter)nationally expected of a programme in that subject.

✓ NVAO secondly judges the potential learning outcomes. These are the competences a student can achieve in the programme as it is offered. This is mainly done by corresponding the content of the curriculum with the intended learning outcomes. An example probably clarifies this better. If a programme defines laboratory skills as an intended learning outcome, the curriculum of the programme should explicitly cover this and give students the possibility to do laboratory work. If this is not the case, there is of course no correspondence between the content of the curriculum and the intended learning outcomes. Certain input elements such as the facilities and the quantity and quality of the staff also contribute to the possible achievement of learning outcomes. These are therefore additionally assessed.

✓ Thirdly, NVAO assesses the achieved learning outcomes. These are the competences a graduate has actually acquired during his or her studies. An assessment panel needs to read students' work such as essays, end of term papers and theses to be able to judge the achieved learning outcomes and then match those with the required learning outcomes. The required learning outcomes are of course the level-specific and intended subject-specific learning outcomes as defined by the programme and (positively) assessed by the panel.

The legal importance of accreditation is that it is a prerequisite for awarding Bachelor's or Master's degrees education funding and study financing for students.

2. The implementation at K.U.Leuven level: a structured Internal Quality Control system

The quality assessment and accreditation process is uniform throughout all faculties and curricula of the whole K.U.Leuven University, with one common aim: a continuous development of the education quality.

Quality control at K.U.Leuven is organized on different levels. On the basis of the university’s pedagogical concept of "Guided Independent Learning" the so-called permanent education committee (POC) of each major discipline develops and implements the curriculum. Each of them makes its findings and report over to the K.U.Leuven's internal quality assessment council, the DOWB.

At least every eight years an extensive internal self-evaluation of each curriculum takes place in preparation of an external evaluation. Every eight years the external visitation commission evaluates each curriculum on the basis of the self-evaluation report, other relevant documents, and the dialogue with representatives of the discipline. The visitation report forms the basis for the further accreditation of a programme. After the publication of the visitation report a follow-up is performed. Representatives of the discipline will discuss the results of the evaluation with a delegation of the educational council and decide about the actions needed and how to tackle them. Later on a report is given to the academic council about the actions taken. To further improve quality of
teaching, student course evaluations are organized annually and study-time measurements are performed. All instructors of the university have the possibility to take training courses on pedagogical or ICT issues. The accreditation in Flanders is done by the independent NVAO, the Organization for Dutch-Flemish accreditation every four years. This organization is a cooperation of the Netherlands and Flanders since 1993, and determines the minimum qualities for higher education. They play an important role in preserving the international contacts and they help to adapt the Flemish and Dutch institutions to the international standard. They are members of several international networks: INQAAHE, International Network for Quality Assurance Agencies in Higher Education, ENQA, European Association for Quality Assurance in Higher Education, ECA, European Consortium for Accreditation in higher education.

The decisions made in the Bologna-convention are extended by the Dublin Descriptors, which form the basis of the accreditation done by the NVAO. The VLIR (Flemish Interuniversity Council) coordinates the external quality assurance. Quality assessment initiatives are embedded in the concept of GIL (Guided Independent Learning). Responsibility lays at the level of the permanent curriculum committees and the staff members. Each university and university college is responsible for their own internal quality assurance system.

K.U.Leuven has been awarded the ECTS label and is involved on a European level in discussions on ECTS and a project on ECTS. A working group of the K.U.Leuven also supports the members of the Association with obtaining the ECTS label (after 2007) and incites them to integrate the ECTS-system in their course descriptions and their computerized files according to the prerequisites of the European label.

Main associations that the institution is a member of:
- Coimbra Group;
- League of European Research-intensive Universities (LERU);
- Fédération Internationale des Universités Catholiques/Fédération des Universités Catholiques Européennes (FIUC/FUCE);
- International Association of University Presidents (IAUP);
- European Association of Universities (EAU);
- Organisatie voor Economische Samenwerking en Ontwikkeling (OESO);
- International management in Higher Education (IMHE);
- European Association of International Education (EAIE);
- European Universities Continuing Education Network (EUCEN);
- EuroPACE ivzw.


3.1 The Biosystems Engineering as part of the Faculty of Bioscience Engineering
The quality assessment of this curriculum is part of the one for the whole Faculty of Bioscience Engineering, to which it belongs.

3.1.1 Self-evaluation at the faculty of Bioscience Engineering. At the moment of the last (2006) visitation by the VLIR, the K.U.Leuven’s brand new system of self-evaluation just
had been set up, with the two main components provided by the universities internal quality control system:
  · a 2-year cycle of evaluation of each component of the curriculum with questioning of the students about the quality of each course. Those evaluations aim to develop an instant picture of each course in order to develop knowledge about their quality level, and to encourage good practices or adjust bottlenecks. The results – after adjustment to their context – make also part of the personal files kept on all concerned tutors. A study-time measuring and positioning system is also included in this cycle.
  · a 8-year cycle of evaluation of the curriculum from educational and professional development point of view. This curriculum evaluation is the hinge between internal and external quality control.

3.1.2. VLR-visitations report 2006. The VLR’s assessment and visitation report (http://www.vlir.be/media/docs/Visitatierapporten/2006/kv06v1-bio-ingwet.pdf) concerns all bachelor and master education in Flanders (Genth, Brussels, Leuven, Antwerp (only bachelor)).

In order to evaluate education programmes, the visitation committee uses a frame of reference based on formulated objectives, defined attainment targets and established quality requirements which, in its opinion, an academic study programme in Bioscience engineering should meet.

In compiling the frame of reference, the committee took as its basis 1) the frame of reference as used in 1999 for the Applied Biological Sciences educational visitation (VLIR, September 1999), 2) the teaching report from Life Sciences and Natural Resources (QANU, September 2005), 3) the working paper from the European Commission (Education and Training Cell, January 2004), 4) the Flemish “structure decree” (2003) and 5) the testing framework of the Dutch-Flemish Accreditation Body (NVAO) which presents several minimum requirements based on the internationally accepted Dublin descriptors, as well as on international requirements imposed on academic study programmes in Bioscience engineering. The frames of reference for the study programmes were also used where their contents are also found in the aforementioned documents.

The frame of reference describes the requirements to be met concerning the domain-specific minimum requirements for the study programme (Bachelor’s/Master’s), the required student profile for a graduate in the field and the transition to the labour market. At the same time, an adequate understanding must exist of the general educational starting points for an academic study programme, the requirements regarding teaching organisation, personnel policy and internal quality assurance.

The frame of reference was submitted to the Faculty before the actual visitation, but after submission of the self-evaluation. During the visit by the visitation committee, an opportunity will be provided to discuss the frame of reference with the Faculty.

3.2 **Specific assessment procedures regarding the curriculum Biosystems Engineering**

There is actually no single specific procedure regarding Biosystems Engineering, as it is part of the larger one for the whole faculty. But the VLIR did mention in its visitation report specific remarks for each curriculum, and thereby also for Biosystems Engineering.

4. **The accreditation of K.U. Leuven’s Biosystems Engineering and EUR-ACE**

In the past, some proposals were formulated to follow the EUR-ACE Framework Standards for the Accreditation of K.U. Leuven’s Biosystems Engineering education process. However as the actual accreditor, the NVAO, is partner of EUR-ACE, it was believed to be opportune to keep the actual procedures and agreement respecting the integration of this curriculum into the aims of the respectively the faculty, the university’s and finally also Flanders’ educational system and his legal structures and frames.

5. **Analysis of K.U. Leuven’s Biosystems Engineering curriculum**

This analysis has been part of the “Proceedings of the 6th USAEE workshop, Budapest, September 19-20, 2005” and is still valuable [4].

**References:**

CURRENT STATE OF QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF AGRICULTURAL ENGINEERING STUDIES IN BULGARIA

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A priority of the European cooperation in the area of Higher Education is the development and establishing an open and flexible European Qualifications Framework, founded on transparency and mutual trust [3].
Nowadays, Bulgarian government exerts the necessary efforts for applying the Recommendation of the European Parliament of 23 April 2008 about the Establishment of the European Qualifications Framework [3].

Bulgarian Strategy for the Higher education envisages ensuring the quality of higher education through activities in the following directions [1]:

- Creating conditions for introduction the European Qualification Framework (EQF) by upgrading the existing qualification system as well as by ensuring transparency of qualifications and simplifying the procedures for their recognition till 2011 year.
- Clearly defining the learning outcomes in accordance with the levels in the European Qualifications Framework (EQF);
- Improving the credit accumulation and transfer system;
- Enhancing the role of universities’ internal systems for quality control of education and the faculty performance;

The existing tools for Quality Assurance of Bulgarian Higher Education (Figure 1) are:
- Laws for Higher Education;
- National Strategy for Higher Education;
- National Qualification's System;
- External Control of Education Quality at HE Institutions done by National Agency for Assessment and Accreditation (NAAA);
- University System for Education Quality Control;
- Internal Control of Education Quality at Faculty Level;
- Periodic Control of Education Quality on each Subject done by Department Committee.
Tools in progress are:
• National Qualification Frameworks for Higher Education;
• Qualification Frameworks for particular courses as well as for Agricultural Engineering.

There are some missing tools:
• Independent advisor at each University;
• Professional structures, participating in development and implementation the National Qualifications Framework and Qualification Framework for separate subjects;
• Professional accreditation.

Moreover there is no any independent professional accreditation structure. Unfortunately, the Association of Agricultural Engineers of South Eastern Europe (AAESEE) does not conduct or implement such activities.

Figure 1. Structures & tools for Quality Assurance of Bulgarian Higher Education.
The loop in the figure would be closed and will function sustainable after establishing the missing tools and those in progress. Both tools break the interaction between responsible structures and bodies. For that reasons up to now there is no real implementation of Assessment Frameworks for Agricultural Engineering studies in Bulgaria. In spite of that, there are some positive consequences from applying the already introduced tools for Quality Assurance:

- Step-by-step equalization of Bulgarian educational regulations to European Union Standards.
- The chaotically establishing of new courses stopped;
- Academic accreditation as well as after-accreditation control leads to permanent improving the quality of education process and the efficiency of supporting structures;
- The Ministry of Education and Science envisages to introduce the EQF and to develop NQF for Bulgaria up to 2011 year.

The academic accreditation has introduced since 1995 year. It has conducted by the National Agency for Assessment and Accreditation, which has assigned by the Minister of Education and Science.

Procedure for programme assessment and structural accreditation of Bulgarian courses on Agricultural engineering is very closed to EUR-ACE Framework Standards [2]. It bases on self-assessment report followed by external assessment and accreditation by the National Agency for Assessment and Accreditation. The Agency puts a mark between 1 and 10 and makes a conclusion for positive and negative accreditation of the specific course. This mark is used for national grading the study courses and their supporting structures. Besides that, the agency gives requirements to adapt the course to national features of Higher Education in Agricultural Engineering and to ensure compliance with national legislation.

The assessed institution submits a detailed self-assessment report to the Agency before the visit of the accreditation team. The accreditation team consists of three persons, with relevant experience. Usually, one team member is an academic body, another one - engineering professional, coming from practice. All team members are preliminary trained for the conductions and rules of the accreditation process. The expert team study the self-assessment report and makes a short accreditation visit. It includes meetings with the University Rector, work group responsible for self-assessment report, academic staff, students, former students, employers. The expert team visits library, laboratories, classrooms, etc. At the end, the accreditation team prepares a conclusion about the correspondence between self-assessment report and the real situation.

The final accreditation decision has taken by an especially designated board of the accreditation agency. The decision defines the period of validity and whether it refers to year of entry or year of graduation. After the limited validity of the accreditation has expired, the programme must be submitted to re-accreditation. At the eng the accreditation decision is communicated to the Education Institution.
The agency publishes the accreditation results and renews them regularly. During the accreditation period the agency conducts post-accreditation control about the implementation of recommendations.

Accreditation procedure, necessary to receive the EUR ACE label has not established up to now. This is envisaged after introducing the NQF for Agricultural engineering, which is in progress.

Nowadays, the active modules on Agricultural Engineering in Bulgaria are:
- Mechanical Systems and Mechanisms, namely Agricultural mechanization and technology,
- Mechanical Systems and Mechanisms - Mechanization for animal husbandry

The following modules are in progress:
- Energy supply and management in agriculture,
- Water resources engineering

The ECTS comparisons between the active modules in Bulgaria and the FEANI requirements are presented at Table 1 and Table 2. It is seen, that 42 % of the results from the automatic check are marked with “FALCE” for the curricula on Agricultural Engineering at Agricultural University – Plovdiv. The correspondence between the curricula on Agricultural Engineering at Rousse University and FEANI requirements is better - 23 % negative results. In spite of that, both courses have positive accreditation by the National Agency for Assessment and Accreditation.

The first reason for this result is lack of real structure, dealing with professional accreditation of Agricultural Engineering courses. The second reason founds in the accreditation procedure, because the assessment objects are the only academic indices. The third, but not the last reason is missing connection between FEANI and Bulgarian structures, responsible for accreditation of Agricultural Engineering courses and their supporting structures.

Table 1. The ECTS comparison between the FEANI requirements and curricula for Mechanical Systems and Mechanisms at Agricultural University – Plovdiv.

<table>
<thead>
<tr>
<th>FEANI Requirements</th>
<th>Agricultural Engineering – Plovdiv</th>
<th>AUTOMATIC CHECK OF ECTS LIMITS AGAINST FEANI REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECTS</td>
<td>%</td>
</tr>
<tr>
<td><strong>ECTS Range</strong></td>
<td>MIN</td>
<td>MAX</td>
</tr>
<tr>
<td>36 (min) - 45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 (min)</td>
<td>10</td>
<td>5,6%</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>3,3%</td>
</tr>
<tr>
<td>12 (min)</td>
<td>5</td>
<td>2,8%</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>1,7%</td>
</tr>
<tr>
<td>18 - 27</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>18 (min)</td>
<td>14</td>
<td>7,8%</td>
</tr>
<tr>
<td>54 (min) - 72</td>
<td>52</td>
<td>28,9%</td>
</tr>
<tr>
<td></td>
<td>BASIC SCIENCES</td>
<td>FALSE</td>
</tr>
<tr>
<td></td>
<td>MATH</td>
<td>FALSE</td>
</tr>
<tr>
<td></td>
<td>CHEM</td>
<td>FALSE</td>
</tr>
<tr>
<td></td>
<td>ELECTIVES</td>
<td>FALSE</td>
</tr>
<tr>
<td></td>
<td>ECONOMICS &amp; HUMANITIES</td>
<td>FALSE</td>
</tr>
<tr>
<td></td>
<td>BASIC &amp; ELECTIVES</td>
<td>FALSE</td>
</tr>
</tbody>
</table>
Table 2. The ECTS comparison between the FEANI requirements and curricula for Mechanical Systems and Mechanisms at Rousse University.

<table>
<thead>
<tr>
<th>FEANI Requirements</th>
<th>Agricultural Engineering - Rousse</th>
<th>AUTOMATIC CHECK OF ECTS LIMITS AGAINST FEANI REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECTS Range</td>
<td>ECTS</td>
<td>%</td>
</tr>
<tr>
<td>36 (min) - 45</td>
<td>39.0</td>
<td>6,1%</td>
</tr>
<tr>
<td>24 (min)</td>
<td>11</td>
<td>6,1%</td>
</tr>
<tr>
<td>12 (min)</td>
<td>4</td>
<td>2,2%</td>
</tr>
<tr>
<td>18 - 27</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>18 (min)</td>
<td>19</td>
<td>10,6%</td>
</tr>
<tr>
<td>54 (min) - 72</td>
<td>76</td>
<td>42,2%</td>
</tr>
</tbody>
</table>
Usually the administrators look to the legislation in force only. That is why the present situation would be improved through synchronized activities in Bulgaria and from abroad.

Suitable activities in Bulgaria will be:

- using the tables above as tools for giving proof of appropriate change the curricula of Agricultural Engineering at each university, offering this study course;
- organizing workshop(s) with the aim to discuss the way for introduction of EQF in Bulgarian Agricultural Engineering courses;

Good activity from abroad will be sending an information package from ERABEE steering committee (or better from FEANI) to Bulgarian accreditation agency. The package could include all widely accepted rules and documents about higher education on Agricultural and Byostem engineering. The package could be offered as an initial point for preparing the future standards for Agricultural Engineering in Bulgaria and for planning activities that equalize the qualifications of agricultural engineers from West Europe and from Bulgaria, as well as for future accreditation procedures.

The agency address is: National Evaluation and Accreditation Agency, 125 "Tsarigradsko Shose" Blvd., bl. 5, fl. 4, North Wing, Sofia 1113, Bulgaria, Phone: (+359) 2 8077811 (+359) 2 8077812, Fax: (+359) 2 971 20 68, info@neaa.government.bg

Persons, interested to participate in the Biosystems Engineering EUR ACE academic accreditation or the recognition procedure under the umbrella of EurAgEng are:
Conclusions:
There are significant differences between ECTS FEANI requirements and the active curricula on Agricultural Engineering offered by the Bulgarian higher education. For the Rousse University the difference is 23 % and for Agricultural University of Plovdiv 42 %. The system for Quality Assurance and Assessment Frameworks of Agricultural Engineering studies does not function smoothly in Bulgaria, because of missing some tools.
The present situation could be improved with synchronized activities in Bulgaria and from FEANI.

References:
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN CZECH REPUBLIC

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Abstract
Quality assurance process and Assessment Framework was developed as a key national policy instrument to protect the quality of education and training. The accreditation process is mandatory and the rules are general for any type of study program accredited. The results of assessment are analyzed at departments` meetings and feedback is applied for the next semester. Students evaluate quality of education of courses and teachers regularly at the end of each semester, or also immediately during semester. Graduates evaluate the quality of education as a complex by an Internet form after they finish study at the faculty. The system of accreditation, quality control and assessment applied at the Czech University of Life Sciences Prague (CULS) are well suited to identify compliance with the European Standards and Guidelines for Quality Assurance in the European Higher Education Area.

1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies
Quality assurance process and Qualifications Framework was developed as a key national policy instrument to protect the quality of education and training during the process of transformation of the national system of education during the nineties, when the whole system of economy and policy was in the changes in the Czech Republic. The conditions and relations between autonomous higher education institution and the state are laid down by the new Higher Education Act of 1998 (Act in further text). Very important changes in the system of higher education were made according to the Lisbon, Bologna, Paris, Prague, Berlin and Bergen declarations, to enable its internationalisation, especially in the frame of EU.

To protect the quality of the higher education the system of accreditation, evaluation and quality control and assessment was developed during the last years. It starts at the University level and it is valid for higher education in the whole country. Higher education involves study in an accredited study programme. The Accreditation Commission was established by the Act of 1990 as an independent body appointed by the Government. New and greater competencies and a number of responsibilities have been given by the new Act. According this Act, all types of study programme have to be accredited. The Statute of the Accreditation Commission was approved by the
Government Decree, No. 744 dated 28th of July 2004 and has come into effect on this day.
The accreditation grants the right to offer the study programme and to award appropriate academic degrees. The decision on accreditation is based on an expert assessment of the content of the study programme and the ability of the institution to deliver it. The accreditation is awarded by the Ministry of Education, Youth and Sport of the Czech Republic for a limited period (from 4 to 10 years). The Ministry is bound by the act not to award accreditation in the case of a negative assessment. A similar mechanism is used for accrediting the right to carry out the procedures for awarding “venium docendi” (habilitation), and for the procedures for the appointment of a professor.
A special tool “Theses.cz” is a system used to search for traces of plagiarism in theses (Bc. and MSc. levels). It represents a nationwide (and not only that) registry of theses and all the information related to these (their names, names of their authors, etc.). The system allows the representatives of the schools participating in the project to upload their students' theses into it and search these for instances of plagiarism. Theses.cz is being developed and administered by Masaryk University. The theses of graduated in the field of Agricultural and Biosystems Engineering are also under this control system. The general public can access individual registry records of theses, or even their full texts (depends on the school), and search these for information. The system, which is going to be developed to address the newly arising needs even in the future, also offers other registry-related services, tools and applications.

2. European Qualification Framework (EQF)
In the context of Bologna process implementation, the structure of Bachelor and Master Study Programs has been changed with the aim to support the practical aspects of education (more applied and practically oriented courses) in the frame of Bc. level. Simultaneously the structure of MSc. has been changed with many new optional courses and individual study projects with aim to intensify the study and challenge the independence of graduates.
The third type of study programme, at Doctoral level, follows an individual study plan under the guidance of a supervisor. Doctoral study programmes are aimed at scientific research and independent creative activity. Graduates of master programmes may apply for a doctoral programme. This programme has a nominal length of three years. The programme leads up to the State doctoral examination and the presentation of a dissertation in which the applicant demonstrates his/her independent theoretical creativity.
The studies at the Universities are based on the Study programs, mostly divided in the Branches (specialisations). The education, instructions and training in study programs are ruled according to the Study plans. Study plans determine the time and content sequence and the extent of studied courses and the form of student results control. The time sequence is based on the academic year time schedule, which is valid for CULS Prague and all its parts. The department guaranties the courses; and the head of department nominates the guarantee of the course.
The implementing the EQF has been based on common principles of quality assurance in Higher Education in Czech Republic as a member of EU. The EQF is used as a reference tool to compare the qualification levels of the different qualifications. Each of the 8 levels is defined by the set of Descriptors indicating the learning outcomes relevant to qualifications at that level. The strategy and realization started in practical way at University/Faculty level with the definitions of:

- Learning outcomes
- Knowledge
- Skills
- Competence.

All Descriptors were applied and used for the definition of study programs (and expected quality of graduates), according to their level (Bc., MSc., PhD.). E.g. learning outcomes relevant to:

- Level 6 – advanced knowledge of field of work or study, involving a critical understanding of theories and principles,
- Level 7 – highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research; with critical awareness of knowledge issues in a field and at the interface between different fields,
- Level 8 – knowledge at the most advanced frontier of a field of work or study and at the interface between fields.

The quality of new study courses and study programs must be always assured by standardized accreditation procedure at the Faculty and University level. The curricula of the courses and programs are presented to the scientific board of the Faculty, and the special commission nominated by the Vice-rector also recognizes it. It assures not only the quality of the course but it also eliminates duplicity of the courses. All activities related to the accreditation, evaluation and quality assessment include also the rules for the education on the field of Biosystems Engineering. We believe that this system of accreditation, evaluation, quality control and assessment applied at the Czech University of Life Sciences Prague (CULS), Faculty of Engineering (FE) are well suited to identify compliance with the European Standards and European Qualification Framework valid in the European Higher Education Area.

3. Academic and Professional Accreditation Procedure

There are standards of Accreditation Commission which characterize the general minimum requirements of the Accreditation Commission for the handling of applications for the granting, expansion and renewal of accreditation for study programmes and their fields of study (“applications”). If a programme is divided into several fields of study, the requirements apply to the individual fields. In addition to the standards of the Accreditation Commission (“ACCR”), further specific criteria may be set for individual groups of study programmes related by field.

The accreditation process is mandatory and the rules are generally valid, but different for any type of study program accredited. E.g. in accreditation of 3rd level of studies the
main attention is paid to the high quality of teaching staff (scientific degree, evaluation of publications, SCI etc.). Any new study program has to be accredited under the legislation rules. As it is described above, the Accreditation Commission considers the accreditation application. In the application are presented the curricula of the program, characteristics of each course (number of hours, percentage of theoretical background, applied sciences, etc.), personal data of each course guarantor and his quality, publications of departments, teaching staff structure, library and information sources for student’s support etc. The application has the mandatory structure and the accreditation commission is allowed to require additional materials and information for its evaluation. Usually the accreditation is permitted for 4 years.

Application content:

- The content of an application meets the requirements of Decree No. 42/1999 Coll. Of the Ministry of Education, Youth and Sports on the content of applications for the accreditation of study programmes.
- When writing the application it is necessary to pay attention to substantial data and to ensuring to a maximum degree their accuracy and openness.
- If a study program and a field of study are also delivered at a location other than the premises of the of the higher education institution (i.e. at a detached location), full data are also provided for this location.
- The ACCR recommends that the forms placed at the ACCR website, section Application Requisites should be used for the application.
- If the application is presented on a solid electronic device it must be structured so as to ensure a maximum level of user-friendliness towards, and comprehension on the part of, the evaluators. The format of the application must correspond to that of an application presented in a printed form. Optimally, one file represents one study program. The file titles must not be long and should not contain diacritics. The ACCR recommends that the application should be presented in the .doc., .rtf or .pdf formats.

The quality control for existing courses is reviewed on two main levels. The first mandatory level of the review and the evaluation is done by the Accreditation Commission CR in the process of prolonging the obtained accreditation. The process of an accreditation prolonging is the fundamental base of the Czech study legislation. The procedure in this principle is almost the same as by applying for an accreditation of a new study program under the conditions of the legislation. Review is in both cases done by the Accreditation Commission. The consequences of this review lead either to obtaining the accreditation for following cycle, thus to the permission to present courses and award diplomas of the program, or they can also lead to rejection of the study program. Usually, about 20 % of submitted applications are not accepted (rejected, recommended to improvement etc.).

For the process of accreditation is necessary to prepare all information materials for the Accreditation Commission CR in advance. The teaching staff, heads of departments, Deans and Rector groups prepare the main parts of materials for accreditation procedure at their corresponding level. It is focused above all on:

- Study Programs and their characteristics
List of courses and their syllabi
Curricula Vitae of teachers including the list of their publications
Study materials available for the students (printed and e-learning)
List of the questions including the questions for the State Examinations
Basic statistics of examination results
Examples of final projects, Diploma and Dissertation Thesis.

The following accreditation procedure includes:
- preliminary study of all prepared materials by the commissions, which are different according to the branches (engineering, agriculture, economy etc.)
- meetings with the teachers, Deans, students and discussion of the principal educational problems
- comments of the commission
- reaction to the comments
- final accreditation and also the duration and validity of accreditation results.

The results of accreditation are published in the form of: passed/failed, and in the case of rejection with detail explanation. The results are very strictly used for the recognition of study programs of the university. Study programs, which did not pass successfully the accreditation, cannot be taught more at that university in the future. Results of such review are presented publicly on the web pages of the Ministry or Accreditation Commission respectively.

There are not “professional accreditations” in the field of Biosystems Engineering valid in Czech Republic, but there are several societies, which represent scientific, and special interest of professional engineers for different branches, like Czech Scientific Technical Society and its parts, e.g. Czech Society for Quality, Society of Environmental Engineering, etc. There are also limitations/restrictions on the job functions, which are related to the designing process of either buildings or technological facilities. Persons, who want to be designers, must past the professional examination by Czech Commission of Chartered (Authorized) Engineers. The graduates from the Faculty of Engineering of CULS Prague can achieve the degree of “Chartered (Authorized) Engineer” after graduation of two study programs: “Technological Equipment of Constructions” and “Waste Disposal Technology”.

The evaluation in Czech terminology is different from accreditation. The evaluation of all university studies in Czech Republic, not only Biosystems (Agricultural) Engineering curricula, is voluntary. Czech University of Life Sciences Prague is organizing the evaluation of the whole University approximately each four years. The foreign prestigious universities or international commissions created from the representative persons of EU universities make the evaluation.

The process of evaluation is similar to accreditation. There is necessary to prepare all information materials for the evaluation commissions in advance. The teaching staff, heads of departments, Deans and Rector groups prepare the main parts of materials for evaluation procedure at their corresponding level.
The results of external evaluation are used for the improvement of the university image and improvement of the recognition between the other universities. The second main level of a quality control is done on the internal level. The Faculties are fully connected to their University Information system. The management of the faculty regularly, usually twice a year after each semester, evaluates the statistical data obtained from this information system. Moreover students can evaluate each course at the end of each semester; this evaluation is done anonymously on the voluntary base. Results of the student’s course evaluation are public for the specific teacher(s) of the specific course and to the faculty management. Special form of evaluation is made by the Institute of Education and Communication of CULS Prague. Both students and teachers express anonymously their opinion about the current course with the aim to improve the quality. Results, the statistical data and the data from students’ evaluations are discussed with the guarantors of the study programs / branches.

4. Study Program at FE CULS Prague in Relation to Biosystems Engineering
EurAgEng Recognition Template

There are study programs offered by the Faculty of Engineering at CULS Prague, which could be suitable for recognition of programs of studies by EurAgEng. According to their curricula it could be:

<table>
<thead>
<tr>
<th>Existing Study Programs: Faculty of Engineering at CULS Prague</th>
<th>Programs of studies by EurAgEng</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural machinery</td>
<td>Mechanical systems and mechanisms</td>
</tr>
<tr>
<td>Waste disposal technology and techniques</td>
<td>Waste management</td>
</tr>
<tr>
<td>Technological equipment of constructions</td>
<td>Structural systems and materials</td>
</tr>
<tr>
<td>Information and Control Technology in Agri-food Complex</td>
<td>Information technology and automation</td>
</tr>
<tr>
<td>Technique for renewal and maintenance of countryside</td>
<td>Mechanical systems and mechanisms</td>
</tr>
</tbody>
</table>

The responsible guarantees and teachers of the other study programs could be also interested in EurAgEng Recognition and accreditation. The situation will depend also on the complex situation in education in Czech Republic and EU.
5. Institutions Interested to Participate in Biosystems Engineering Eur-ACE Academic Accreditation under the Umbrella of EurAgEng
Faculty of Engineering
Czech University of Life Sciences Prague
Dean
Prof. Ing. Vladimir Jurca, CSc.
165 21 Prague 6 – Suchdol
Czech Republic

6. References:
http://www.msmt.cz/areas-of-work/akreditacni-komise
http://www.theses.cz/
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS
OF BIOSYSTEMS ENGINEERING STUDIES
IN DENMARK

H.W. Griepentrog¹, S. Kobayashi¹, M.D Rasmussen²
¹ Department of Agriculture and Ecology, Faculty of Life Sciences (LIFE), University
   of Copenhagen, Højbakkegaard Allé 9, 2630 Taastrup, Denmark
² Department of Agricultural Engineering, Faculty of Agricultural Sciences,
   University of Aarhus, Blichers Allé 20, 8830 Tjele, Denmark

Abstract
In Denmark exist a range of procedures of good practice support the activities for
quality assurance in teaching and learning. During the recent years they were adapted
and modified according to specific experience and requirements in relation to the
Bologna process. The structure of the Danish Qualification Framework consists of the
three elements knowledge and understanding, skills and competences. This structure is
used at all three levels; 1st, 2nd and 3rd cycle levels. In general the procedures are
regarded as important means without doubt for assuring goals within teaching and
learning.

1. Tools for Quality Assurance and Assessment Frameworks of Biosystems
   Engineering studies

1.1 Which tools exist in your country?
At KU-LIFE a range of procedures of good practice support the activities for quality
assurance in teaching and learning.
- Setting appropriate course objectives in course descriptions. The objectives are
  written in relation to level, teaching intentions and management of learning.
- Providing material and resources to support objectives
- Monitoring and evaluating courses (by students and teachers)
- Accounting to faculty boards
- Revising courses and study programmes

International collaboration gives a thorough insight into partners’ educational profile and
organisation. Therefore, collaboration also opens the possibility for mutual inspiration
and international benchmarking. In the framework of strategic networks, the Faculty of
Life Sciences participates in a number of quality assurance projects in relation to course
evaluation, development of joint education, pedagogic quality, development of new
exam forms etc.

¹ Corresponding author: Hans W. Griepentrog, +45-353-33572, e-mail hwg@life.ku.dk
1.2 Please describe shortly the implementation of those tools at your country / University
The implementation was done during the recent years and adapted and modified according to specific experience and requirements in relation to the Bologna process.

1.3 Which are the consequences of applying these tools?
In general the procedures are regarded as important means without doubt for assuring goals within teaching and learning.
Furthermore, our faculty has participated in a number of international evaluations focusing on the veterinary and agronomic degrees and an evaluation of the strategy for internationalisation. The veterinary degree from the Faculty of Life Sciences is approved by the EAEVE (European Association of Establishments for Veterinary Education) and LIFE is currently investigating the possibilities for being accredited by the American Veterinary Medical Association.

2. European Qualification Framework (EQF)
2.1 Please illustrate the impact of the EQF on the National Quality Assurance and Assessment procedure concerning the 1st and 2nd cycle of studies
A Danish Qualifications Framework for Higher Education was first launched in 2003. The framework has been widely implemented and used by institutions of higher education, and has been revised on the basis of evaluations of the knowledge and practical experience gained by the higher education institutions. The development of a Danish Qualification Framework has an impact on higher education as study programs earlier tended to be evaluated against their individually formulated objectives, while the situation now is that study programs formulate their objectives in accordance with the National Qualification Framework. Earlier individually formulated objectives mainly described the entry requirements, duration of studies and subjects of study, rather than competences acquired through the education. The Qualification Framework is used to explicate current evaluation criteria for accrediting study programs. The Danish Qualification Framework places the current Danish study programs within the overall structure of the Bologna declaration.

<table>
<thead>
<tr>
<th>CONCEPTS FROM THE BOLOGNA DECLARATION</th>
<th>DANISH DEGREES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ST Cycle</td>
<td>Ak Vvu</td>
</tr>
<tr>
<td>Sub-degree level</td>
<td></td>
</tr>
<tr>
<td>Degree level</td>
<td>Bachelor</td>
</tr>
<tr>
<td></td>
<td>Professional bachelor</td>
</tr>
<tr>
<td></td>
<td>Diploma</td>
</tr>
<tr>
<td>2ND Cycle</td>
<td>Master Kandidat</td>
</tr>
<tr>
<td>Master level</td>
<td></td>
</tr>
<tr>
<td>Doctoral level</td>
<td>PhD</td>
</tr>
</tbody>
</table>

48
The structure of the Danish Qualification Framework consists of three elements:

- Knowledge and understanding
- Skills
- Competences

This structure is used at all three levels; 1st, 2nd and 3rd cycle levels.

### 2.2 Please describe qualifications at structured 3rd cycle level as related to EQF and their implementation in your country

The Danish Qualifications Framework is implemented in Danish accreditation legislation, after which certification of the new framework will be initiated. At structured 3rd cycle level the Danish Qualification Framework describes the competences acquired through the PhD study program.

### 2.3 Please explain the interpretation and implementation of the EQF in your country and its relationship with the National Qualification Framework.

The Danish Qualification Framework is based on the EQF using their concepts to enhance transparency across countries. The Qualifications Framework for Danish Higher Education has been certified and found compatible with the framework of Qualifications for the European Higher Education Area, the Bologna Framework.

The interpretation made to describe the 3rd cycle level in terms of the three elements above gives the following description of competence goals for 3rd cycle level in Denmark:

**Persons awarded the PhD degree**

**Knowledge and understanding:**
- must have knowledge at the highest international level within the research area;
- must have provided a significant contribution to the development of new knowledge and understanding within the research area based on scientific/academic studies.

**Skills:**
- must master the scientific/academic methodologies and tools as well as other skills related to research and development tasks within the area;
- must be able to analyze, evaluate and develop new ideas, including designing and developing new techniques and skills within discipline;
- must be able to participate in the international discussions within the discipline and communicate scientific/academic results and advances to the general public.

**Competences:**
- must be able to plan and manage research and development tasks in complex and unpredictable contexts;
- must be able to independently initiate and participate in national as well as international collaboration initiatives on research and development with scientific integrity;
must be able to independently initiate research and development projects and through these generate new knowledge and new skills that develop the research area.

The Danish Qualifications Framework is available online at: http://en.iu.dk/transparency/qualifications-frameworks
The implementation of the Danish Qualification Framework takes place through the PhD regulations at university and/or faculty level, and refer directly to the Danish Qualification Framework. The PhD programme is a research programme aiming to train PhD students at an international level to independently undertake research, development and teaching assignments in the private and public sectors, for which a broad knowledge of research is required. The PhD programme mainly comprises active research training under supervision. The programme is equivalent to 180 ECTS points which corresponds to three years of full-time study. The three-year period is calculated as from the date of enrolment up to and including the date for submission of the thesis. The assessment is thus not included in the three-year period.

2.4 Please explain the interpretation and implementation of the EQF in the case of Agricultural and Biosystems Engineering programs of studies
All Danish PhD programs are subject to regulations laid out in the Danish University Act of 2007 (Ministerial order no. 1368 of 7 December 2007) and the Ministerial order no. 18 of 14 January 2008 on the PhD programme. Thus this also applies to 3rd cycle education within Agricultural and Biosystems Engineering programs of studies.
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORK OF BIOSYSTEMS ENGINEERING STUDIES AT THE ESTONIAN UNIVERSITY OF LIFE SCIENCES

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Abstract
The quality of study programs and institutions of higher education are assessed using two tools in Estonia: assessment of quality of a study programme group and institutional accreditation. Both of these are carried out by Estonian Higher Education Quality Agency. The European Qualifications Framework is being adopted by the Estonian Qualifications Framework.

1. Tools for Quality Assurance and Assessment Frameworks
The Estonian Higher Education Quality Agency (EKKA) is the organisation in Estonia with functions of developing the principles and the procedure for conducting quality assessment of study programme groups and institutional accreditation, and institutional accreditation and quality assessment of study programme groups [1]. The agency is carrying out quality assessment of study programme groups, and institutional accreditation.

Assessment of quality of a study programme group is the assessment of the conformity of the study programmes belonging to the study programme group and the instruction provided on the basis thereof to legislation and to national and international standards, including the assessment of the level of the corresponding theoretical and practical instruction, the research and pedagogical qualification of the teaching staff and research staff, and the sufficiency of resources for the provision of instruction [2].

Quality assessment is focused on assessing the quality of studies provided on the basis of study programmes and its objective is to support the self-evaluation and self-development of higher education institutions. Quality assessment of study programme groups is not followed by sanctions; expert opinions are considered recommendations. Quality assessment results in an assessment decision and concrete recommendations how the educational institution can improve the quality of studies. At the same time, EKKA has an obligation to inform the Ministry of Education and Research if the quality of studies has substantially declined compared to the results of the previous evaluation. In this case, the minister must conduct state supervision, which, at worst, may result in deprivation of the right to conduct studies. This decision is exceptional. The decision to deprive the educational institution of the right to conduct studies must be accompanied by the solution as to how its students can continue their studies.

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Quality assessment of study programme groups takes place once in seven years, unless EKKA has set an up to three-year deadline based on the results of the previous evaluation.

**Institutional accreditation** of institutions that provide higher education in Estonia must undergo at least once in seven years [3]. As a result of institutional accreditation EKKA makes one of the following decisions:

1) provides an assessment and decides that the internal quality assurance system of the educational institution and its functioning meet the requirements;
2) provides an assessment and decides that there are deficiencies in the internal quality assurance system of the educational institution or in its functioning, gives instructions as to their elimination, and sets a term not longer than three years during which the educational institution must again undergo an institutional accreditation;
3) provides an assessment and decides that there are significant deficiencies in the internal quality assurance system of the educational institution and its functioning that prevent the educational institution from duly performing its functions arising from legislation; communicates findings, in addition to the educational institution, to the Minister of Education and Research; and gives instructions as to the elimination of the deficiencies.

The transition to the system of quality assessment of study programme groups will also cause a change in institutional accreditation, the principles and the procedure of which shall be established by EKKA Quality Assessment Council. Pursuant to law, it is possible to request and to carry out institutional accreditation and quality assessment of study programme groups as of 1 January 2010, provided that the relevant educational institution has been granted the right to conduct studies at the higher education level in at least one study programme group. As the Government will issue first education licenses in the end of 2009, the actual implementation of institutional accreditation and assessment of quality of study programme groups will probably be postponed until 2011.

2. Estonian qualifications framework (EKR) and referencing it to the European qualifications framework (EQF)

According to the Professions Act the Estonian qualifications framework has 8 levels, whereas level one is the lowest and level eight is the highest. Descriptions of the qualifications levels in the EKR are identical to the EQF level descriptions. The aim of establishing the EKR is to develop a framework encompassing all qualifications in formal education (general, vocational, higher and adult education) as well as vocational and professional qualifications [4].

The quality criteria and procedures for referencing the National Qualifications Framework (NQF) to the EQF foresee two cases of referencing qualifications to the NQF: „including into the NQF“ and „describing the position in the NQF“ or assigning the NQF level. Only state recognised qualifications are included into the EKR. The EKR level can be assigned to the qualifications, which have not received state recognition yet or the qualifications with undefined conditions of recognition, e.g. partial qualifications or individual competences.
The state recognised qualifications have to:
1) be defined in a learning outcomes based qualification standard (curriculum or professional standard), meeting the requirements of the national framework standard(s) (if applicable);
2) have state recognised awarding institution (educational institution, professional association etc.).

As far as the EKR level descriptions are identical to the EQF level descriptions, the centre of gravity of the referencing process is shifting to referencing qualifications to the EKR levels. Therefore the quality criteria and procedures for referencing to the EQF have to be reformulated in terms of including the qualifications into the EKR or assigning the EKR levels to the types of qualifications.

The referencing of qualifications to the EKR proceeds in two steps. First, the EKR levels are assigned to the types of qualifications in general education, initial vocational education and training (VET), higher education, adult education, and professional qualifications. Second, a qualification is included into the appropriate EKR level or assigned an appropriate EKR level.

Principles of including qualifications into the EKR or assigning the EKR levels to the types of qualifications:
1. The responsibilities and/or legal competence of all relevant national bodies involved in the referencing process, including the NCP, are clearly determined and published by the competent public authorities.
2. There is a clear and demonstrable link between the types of qualification descriptions and the level descriptors of the EKR.
3. The qualifications are based on the principle and objective of learning outcomes and linked to arrangements for validation of non-formal and informal learning and, where these exist, to credit systems.
4. The procedures for inclusion of qualifications in the EKR or for describing the place of qualifications in the EKR are transparent.
5. The national quality assurance system(s) for education and training refer(s) to the EKR and are consistent with the relevant European principles and guidelines (as indicated in annex 3 of the Recommendation).
6. The referencing process shall include the stated agreement of the relevant quality assurance bodies.
7. The referencing process shall involve international experts.
8. The competent national body or bodies shall certify the referencing of the national qualifications with the EKR. One comprehensive report, setting out the referencing and the evidence supporting it shall be published by the competent national bodies, including the National Coordination Points (NCP), and shall address separately each of the criteria (learning outcomes descriptors).
9. The official EQF platform shall maintain a public listing of member states that have confirmed that they have completed the referencing process, including links to completed referencing reports.
10. Following the referencing process, and in line with the timelines set in the Recommendation, all new qualification certificates, diplomas and Europass
documents issued by the competent authorities contain a clear reference, by way of national qualifications systems, to the appropriate EQF level.

At the moment no educational or professional qualifications have been included into the EKR. Four types of qualifications in higher education and three types of qualifications in VET have been assigned the EKR level. Assignment of the EKR levels to professional qualifications framework levels has not been formalised yet.

3. EUR-ACE academic accreditation procedure
Currently the society of agricultural engineers (biosystems engineers) is not active. It is going through the ebb tide. Concerning the profession of engineer there are valid standards in place in Estonia currently. The occupational standard of agricultural engineer specifies three levels: agricultural engineer (Eng), diploma agricultural engineer (Dipl Eng) and chartered agricultural engineer (Chart Eng). The study programmes in the field of agricultural/biosystems engineering in Estonian University of Life Sciences qualify for the application of the professions above.

4. Analysis of programme of studies following EurAgEng Recognition Template
Estonian University of Life Sciences is launching a new curriculum called Biosystems Engineering in autumn 2010. This is a 4 year professional higher education program with to meet the job market requirements of agricultural producers. Hence, the amount of practical training is in the value of 45 ECTS. That curriculum was the objective of the analysis here. By the design it is an engineering education. However, there are some disagreements with the FEANI requirements such as slightly smaller amount of Mathematics and Chemistry. The process of reviewing and updating the university programs is continuous in Estonia.

5. Interested institutions regarding the EUR ACE academic accreditation of Biosystems Engineering studies
References:
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN FINLAND

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Abstract
In Finland, the University of Helsinki is the only university giving higher education in agricultural or Biosystems engineering. The University of Helsinki has had a compulsory quality system, which meets the requirements of Bologna process, throughout the university. Finland has decided to adopt the EQF. The functioning and clarity of the Finnish qualifications system will be enhanced by preparing a national framework based on the EQF by 2010. At the moment there is no accreditation agency in Finland. The engineer title is given by the universities or polytechnics when the student graduates. At the University of Helsinki, the direct translation of the agricultural engineering education subject from Finnish into English is ‘agricultural technology’. The engineering word is not used because the graduated students are entitled to use the title of MSc in agronomy not the title of engineer. The FEANI structure does not fit well in the Finnish ‘agrotechnology’ education system because it is more engineering orientated and also it does not include general agricultural/biosystems engineering line. Neither does it include agricultural production management line.

1. Finnish tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies
The University of Helsinki is the only university in Finland giving higher education in agricultural or Biosystems engineering. There are neither any polytechnics in Finland giving specialized education in this area. Thus, the quality assurance system of the University of Helsinki is the only system used to evaluate the quality of higher agricultural or Biosystems engineering studies in Finland.

1.1 Quality assurance principle and tools in Finland
Since 2006, the University of Helsinki has had a compulsory quality system throughout the university. Before that the quality assurance system work was carried out as voluntary bases. The quality system meets the requirements of Bologna process. In accordance with these principles, the national quality assurance system of the higher education institutions (Figure 1, [1]) includes a procedure, which guarantees the national and international quality of the higher education institutions. In Finland, this

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procedure is auditing or external evaluation of the quality assurance system, which is carried out by the Higher Education Evaluation Council (FINHEEC).

According to the audit manual [1], the auditing group has five members: three representing higher education institutes, one student and one external stakeholder. In their selection, care is taken to ensure that the auditors also represent different higher education sectors (universities and polytechnics) and different staff groups (management and administration, teaching and research and support services). The auditors must meet the following criteria: (a) solid knowledge of the higher education field, (b) experience of evaluation/auditing, (c) knowledge of quality management/quality assurance systems, and (d) participation in auditor training.

Universities and polytechnics have the choice of a domestic or international audit group. The role and number of international auditors is determined on a case by case basis. The audit group writes a report based on the analyses made and materials collected during the audit process. The audit report, which should be approximately 50 pages, is published in the language of the audit process. [1]

University of Helsinki was audited in 2007. The university passed the audit successfully. Audit results and report were published in 2008 [2].

1.2 Quality assessment process and tools at University of Helsinki
The University of Helsinki Operations Manual [3] is a tool for quality assurance. It constitutes the central documentation of the quality assurance system procedures. The quality system includes the following topics: (1) research, (2) education leading to a degree, (3) social interaction, (4) decision and management, (5) personal, and (6) administration and supporting services. Each topic is divided into processes, which include aim, responsibility, documentation, quality assurance tools and quality indicator. The faculties and departments formulate their own operations manual based on the corresponding document of the University [3]. A significant part of measures concerned with assuring the quality of education take place in the faculties and departments in the form of the procedures that are followed in the planning, implementation, evaluation and
development of education and teaching (Figure 2). The evaluation of education and development measures is part of the University’s management system, strategic planning and operations management. The faculties and departments regularly evaluate their own teaching activities against the common goals and development challenges of the University community.

The University has a separate tool for self-evaluation, the Teaching Evaluation Matrix [4]. In this matrix, each aspect of teaching is considered in the light of a four-level framework, which sums up the spectrum of quality from passable to excellent. The definitions of quality are based on the University's Strategic Plan and the Programme for the Development of Teaching and Studies. The faculties and departments decide independently on the implementation of their self-evaluation. The University has issued separate instructions for the practical implementation of self-evaluation on the basis of the Teaching Evaluation Matrix. [3]. The studies and study programs are accepted by the board of faculty, which consists of department directors, students and administrations stuff.

Students have an important role in evaluation: they can give feedback from each course to the teachers. Likewise, the student must prepare a personal study plan (HOPS), which must follow the guidelines of the major subject accepted by the faculty board. This study plan is updated annually and it is accepted by the leading professor of the major subject. Every course has three examination dates and if the student does not pass the examination in these dates, he/she must attend the course from the beginning again. The student progress is monitored by the credit point accumulation and based on the HOPS. If the student has not progressed satisfactorily, a note is sent to the department and student.

Lectures are mainly in Finnish, however, there are some English courses and the subject environmental engineering in agriculture is included in the Master's Degree Programme in Environment and Natural Resources MENV (http://www.helsinki.fi/menvi/). If an exchange student cannot find suitable English courses, then a personal course program is made for him/her, which includes English textbooks and written exercises in English.
At University of Helsinki, both education and research are nowadays periodically evaluated by foreign experts [e.g. 5]. University sets the standards for these evaluations and the departments are judged according to these. The scientific evaluation includes for instance following items: staff structure, publications, doctoral theses and degrees, implementation of earlier evaluation recommendations, strengths, weaknesses, interaction between the department and society, academic activity and collaboration and funding.

2. European Qualification Framework in Finland
Finland has decided to adopt the EQF. According to a development plan called ‘Education and Research 2007–2012’, the functioning and clarity of the Finnish qualifications system will be enhanced by preparing a national framework based on the EQF by 2010. It has proposed that the Finnish qualifications (including 1st, 2nd and 3rd cycle studies) will be placed in the EQF by placing them on the levels of the national framework corresponding those of the EQF [6].

3. Status of EUR-ACE
At the moment there is no accreditation agency in Finland. The engineer title is given by the universities or polytechnics when the student graduates. The direct translation of the agricultural engineering education subject from Finnish into English is ‘agricultural technology’. The engineering word is not used because the graduated students are entitled to use the title of MSc in agronomy not the title of engineer. The education is more agronomist type of education than engineering type. It seems that change or modification of the course structure more or entirely to biosystems engineering side could be easier than change to agricultural engineering side according to the USAEE proposal [1]. Biosystems engineering is also more in the line with the department strategy. Biosystems engineering is not known nationally and there are some disciplines which are using the name of biotechnology. This courses conflicts because the bio prefix is ‘reserved’ for biosciences. With EU level of definition biosystems engineering name could be introduced at least in the English translation.

4. Comparison to FEANI Requirements
At Department of Agricultural Sciences of the University of Helsinki, the discipline of agricultural and environmental engineering has two specialization lines, agricultural engineering and environmental engineering in agriculture. The education of the department is based on agronomic studies supplemented with technical subjects. The aim of the discipline is to educate agronomist who know the technical principles of agricultural production and machines. They are also educated to know the management principles used in the production and environmental questions related to the production. The university sets up the basic structure of the studies, i.e. there are regulations concerning the amount of credit points in different categories. In agricultural engineering program this leads to the structure shown in Table 1. When the HU subjects are compared to USAEE requirements, the fundamental engineering and agricultural part of the courses have the largest differences. The main emphasis in HU courses is in the professional studies, which include also fundamental
core basis matters. The allocation of the courses into different categories is difficult because the courses can be built up in many different ways. The national needs for agricultural engineering subject are satisfied with the present education. The unemployment of the graduated students is very low and they can easily find jobs in Finland. The education content is revised regularly based on discussion at the department and with employers of the graduated students. At the moment, there is no discussion going on in Finland to change the agricultural engineering course contents. The need is at the moment mainly in the international acceptance side of the education. By using internationally recognized structures the degrees can be widely recognized. This would have a positive impact on student’s enrollment both nationally or internationally. The FEANI structure does not, however, fit well in the Finnish 'agrotechnology' education system because it is more engineering orientated and also it does not include general agricultural/biosystems engineering line. Neither does it include agricultural production management line.

Table 1. Comparison of study structure at HU to USAEE structure

<table>
<thead>
<tr>
<th></th>
<th>HU</th>
<th>USAEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic science &amp; electives</td>
<td></td>
<td>Basic science</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>36–45</td>
</tr>
<tr>
<td>Electives</td>
<td>19</td>
<td>18–27</td>
</tr>
<tr>
<td>Agricultural engineering</td>
<td></td>
<td>Engineering part</td>
</tr>
<tr>
<td>fundamental core basis</td>
<td>20</td>
<td>44–51</td>
</tr>
<tr>
<td>Agricultural/Biological part</td>
<td>35</td>
<td>20–25</td>
</tr>
<tr>
<td>Agricultural engineering</td>
<td></td>
<td>Engineering part</td>
</tr>
<tr>
<td>professional studies*</td>
<td>44</td>
<td>28–30</td>
</tr>
<tr>
<td>Agricultural/Biological part</td>
<td>33</td>
<td>16–20</td>
</tr>
</tbody>
</table>

Another reason for internationally recognized study structure discussions is the English language MSc course supply. The University of Helsinki and also Ministry of Education are promoting English MSc courses in order to enroll foreign students. For this reason the department participates the Master's Degree Programme in Environment and Natural Resources MENVI (http://www.helsinki.fi/menvi/). The Scandinavian countries also have a strong collaboration in agricultural/biosystems engineering education (NORBE) and for this purpose English courses are also needed because the language in these courses is also English.
References:
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN GERMANY

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1. Tools for Quality Assurance and Assessment Frameworks
(Source: Resolution of the conference of education ministers 2005)
Deployment in quality and quality assurance process is an assignment of universities. Federal states in Germany have to set up general conditions and they have to assure that universities organize a working quality management system. A change of structure in the academic landscape took place with the introduction and implementation of Bachelor / Master Degree, the accreditation procedures of new Bachelor / Master Courses and collective structures in all federal states. Fundament in those collective structures was the equivalence in degrees, which ensures the mobility between the different federal states in Germany.
A National qualification framework will be developed, which target on the definition of workloads, competences, learning outcomes and profiles. A main issue there is a Description of learning outcomes instead of descriptions of study content, criteria’s for registration, quantitative guidelines etc.
Main elements of quality assurance in HE in federal states are accreditation and evaluation. The accreditation of programs takes place by independent accreditation agencies and the universities have to pay for it. As further step the accreditation of the system and of quality assurance procedures have to take into consideration.
The evaluation of study programs is an internal procedure of quality assurance within universities. The objective is to improve study and working conditions of students and lecturers. Indicators are (only examples)
- Number and percentage of students within the standard period of studies
- Duration of study
- Organisation of education and examination
- Further career of students, etc.

Federal law and regulations at universities define absolutely essential elements for Evaluation in HE. Those elements are the Combination of internal and external evaluation, the definition of a certain frequency of the procedure, the integration and active participation of students, the publication of results, the integration of Alumni, the definition of consequences, the involvement of an agreement of objectives between federal state and university, the definition of an incentive system and the definition of sanctions.
Further measures, which back the evaluation procedure, are the development of support concepts and programs for tutors and mentors and the offering of consulting programs.

Further main elements in quality assurance are:

- Promotion of competence in teaching
  - Didactical centers or institutes for further training
- Quality securing measures on certain interfaces:
  - Transition from school to university
  - Transition Bachelor / Master
  - Transition University / Career

We believe that our national system is well suited to identify compliance with the European Standards and Guidelines for Quality Assurance in the European Higher Education Area. In all cases some foreign specialists of the corresponding knowledge area (e.g. agricultural engineering) are integrated.

**The national level is based on the following principles**

1. Autonomy and independence of bodies responsible for quality assessment and assurance:
   i. Accreditation, external agency, for different study programs different agencies exist, sometimes also for one study program more than one agency is available. The agencies are financed by the universities and by official money. The department/institution has to pay for accreditation.
   ii. Evaluation by an independent competence center
      • Student survey to consultation and support by lecturers, Relevance of course content, framework conditions
      • Educational report with statistical evaluation
      • If the ranking of a lecture is too bad, a discussion with the student dean is necessary (I don’t know, what happens then)

2. Relating evaluation procedures to the way institutions see themselves
   i. Feedback from students
   ii. Evaluation as an source for improvements
   iii. Evaluation as a source for getting his own teaching level

3. Internal and external assessment:
   as described under 1.

4. Involvement of all players and publications
   i. Monitoring of university by teaching staff
   ii. Situation of alumni’s
   iii. Students survey
   iv. Educational report
5. Publication of the evaluation report
   i. The official accreditation report is sent to the ministry, to the head of the university and to the involved departments and/or faculties
   ii. Internal evaluation reports are sent to the lecturer and in the past they were publicized in the internet (but there was a hard discussion about it, and at this moment the internet publication was stopped)

Day-to-day responsibility for Quality Assurance in education
The study dean and a special committee for every study are responsible for fulfilling all relevant laws and regulations.
For the contents of courses and for the research topics and programmes only the professors are responsible. Nobody is allowed to influence this process.
The study dean has to inform about changes in lectures and courses.
Monitoring in student progression takes not place.

2. European Qualification Framework (EQF), Situation in Germany
Discussion proposal for a German Qualifications Framework for Lifelong Learning
Prepared by the "German Qualifications Framework Working Group"

In October 2006, the Federal Ministry of Education and Research (BMBF) and the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany (KMK) agreed to work together on the development of a German Qualifications Framework for Lifelong Learning (known by its German abbreviation of DQR). The DQR represents the first comprehensive matrix for the alignment of qualifications. It extends across educational areas and acts as a considerable aid to navigation within the German educational system. For this purpose the DQR describes on eight reference levels professional and personal competences which direct the alignment of qualifications obtained in general education, higher education and vocational education and training.
The starting point for the present decision is the Recommendation of the European Parliament and of the Council on the Establishment of the European Qualifications Framework (EQF), which entered into force on 23 April 2008. This Recommendation encourages the member states:
   - to use the EQF as a reference tool to compare the qualifications systems;
   - to relate their national qualifications systems to the European Qualifications Framework by 2010; - to develop national qualifications frameworks in accordance with national legislation and practice where appropriate and - to adopt measures, as appropriate, so that, by 2012, all new qualification certificates contain a clear reference to the EQF.

In embracing this recommendation, the primary objective of the BMBF and the KMK is to achieve appropriate alignment of qualifications acquired in Germany and to use this as a vehicle for enhancing the opportunities for our citizens on the European labour market. The BMBF and the KMK have established a joint "Federal Government/Federal States Coordination Group" for the German Qualifications Framework" (known by its German abbreviation of B-L-KG DQR), which has been commissioned with the task of
managing the process of drawing up a DQR. This process involves a large number of stakeholders from general education, higher education and vocational education and training, the social partners and other experts from research and practice. Together with the B-L-KG DQR, these stakeholders make up the "German Qualifications Framework Working Group" (known by its German abbreviation of AK DQR). Feedback on results has been sent to delegates' home institutions and committees on an ongoing basis. The B-L-KG and AK DQR are now able to present an initial draft of a DQR. The plan is for the next stage of the development process to investigate functionality by conducting sample qualification alignments. The aim is for this process also to involve monitoring of the structures of the DQR matrix and for any possible conclusions to be drawn with regard to the weightage of the descriptive categories. The objective is to make equivalences and differences between qualifications more transparent for educational establishments, companies and employees and to use this as a vehicle for supporting permeability. The important aspect here is to achieve reliability via quality assurance and development and to promote the idea that qualifications processes should be based on learning outcomes ("outcome orientation"). In its capacity as a national implementation of the EQF, the aims are for the DQR to accord due consideration to the specific characteristics of the German educational system and to assist in achieving appropriate evaluation and comparability for German qualifications in Europe. The DQR will act in the interests of affording the best possible level of opportunity by helping promote the mobility of learners and employees between Germany and other European countries. The objective is to foster and enhance access to and participation in lifelong learning and use of qualifications for everyone, including those who are disadvantaged or affected by unemployment.

The eight reference levels contained within the draft DQR each describe the competences required to obtain a qualification. The term competence constituting the heart of the DQR depicts the ability and readiness to use knowledge, skills and personal, social and methodological competences in work or study situations and for occupational and personal development. Competence is understood in this sense as action skills.

Since the DQR maps qualifications rather than individual learning and occupational biographies, there are some areas where it is not able adequately to record abilities and attitudes acquired within educational and qualifications processes. For this reason, the DQR matrix does not encompass individual characteristics such as reliability, precision, stamina and attentiveness, normative and ethical character building aspects, personality traits such as intercultural competence, active tolerance and democratic patterns of behaviour despite the high degree of significance accorded to all the above. In the same way as the EQF, the DQR draft focuses on selected characteristics which are relevant to successful action within a field of work or study. Methodological competence is understood as a transversal competence and for this reason is not separately stated within the DQR matrix.

The draft DQR differentiates between two categories of competence. These are "Professional competence", subdivided into "Knowledge" and "Skills" and "Personal competence", subdivided into "Social competence" and "Self-competence". These analytical differentiations have been actioned in the full knowledge of the
interdependence which exists between the various aspects of competence. Given the fact that the DQR consistently makes mention of competence, any use of the modal verb "can" has been avoided throughout the DQR matrix.

Standardised structure for the description of the eight reference levels within the DQR
All formal qualifications within the German educational system, including general, and higher education and vocational education and training, are included in the alignment of qualifications to the DQR. A further objective is to accord due consideration to the results of informal learning. The Federal Government-Federal State Coordination Group and the DQR Working Group are in agreement that the alignment of the qualifications within the German educational system to the reference levels of the DQR should not replace the existing system of access qualifications. Alignment takes place in accordance with the principle that each qualifications level may be accessible via various educational and training pathways. Achieving a certain reference level of the DQR does not provide automatic entitlement to access the next level. The achievement of a reference level has also not been considered in conjunction with the implications for collective wage agreements and laws relating to remuneration. Legal aspects will be investigated within the scope of the next phase of development.

The implementation of the DQR provides Germany with an opportunity to further embrace the principle that the important thing is what someone can do, not where he or she has learned to do it. The overall effect of the DQR will be to strengthen lifelong learning.

3. Please describe the EUR ACE academic accreditation procedure
The accreditation procedure will be done in three phases, preparation and application, Audit and decision. Those phases are described in the following tables.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>University</strong></td>
<td>Request with significant information to be sent to the accreditation agency. That information comprises the request for accreditation and a short outline of the curriculum. The subject specific contents of the study programme should be clearly defined.</td>
</tr>
<tr>
<td><strong>Accreditation Agency</strong></td>
<td>Confirmation of the request, check of the delivered information, determination of competences (which advisory board) and number of evaluators, offer through the agency for the accreditation process (time and costs) with the request for confirmation to the applicant</td>
</tr>
<tr>
<td><strong>Preparation and Application</strong></td>
<td>Contract with the accreditation agency. Elaboration of a report with self-evaluation according to the guidelines of the agency. Before the submission of the self report consultation (check of completeness) with the agency possible. Alternative the agency will send a written evaluation report</td>
</tr>
</tbody>
</table>
On Advice of the advisory board, the team of evaluators will be selected by the agency. One person of the evaluators will be appointed as a speaker

Implementation of the 1.5 day on the spot evaluation on the department of the applicant by the evaluators

Forwarding of the evaluators report to the applicant for the examination of factual faults and for statement

Statement of the applicant and if necessary corrections and additions to the draft of the accreditation report

Final evaluation of the evaluators with recommendation for a decision to the accreditation commission

Statement of the advisory board

Decision about accreditation by the accreditation commission of the agency

Information about the decision to the applicant and the accreditation council

Handover of the final accreditation report to the applicant as well as to the german accreditation council,

Publication of a short tabular summary in the internet

Discussion proposal for a German Qualifications Framework for Lifelong Learning; prepared by the “German Qualifications Framework Working Group”; DQR – Deutscher Qualifikationsrahmen für lebenslanges Lernen; February 2009
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN GREECE

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1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies

1.1 Which tools exist in your country?

A National Quality Assessment process abiding to the relevant requirements related to the Bologna declaration and complying with the European Standards and Guidelines for Quality Assurance in the European Higher Education Area [1] has already been introduced in Greece [2]. Its key points are:

- Assess in detail the quality of the education and research work conducted, the administrative adequacy and the social services provided to the students, along with the broader synergies and cooperation with the public and/or private sector.

- Establish internal evaluation by academic staff and students. Templates reporting educational and research activities and questionnaires are to be filled in by all staff members every four years and evaluation reports are to be completed for each course by the students every semester. This material is compiled with statistics for the reporting period and a final quality assurance report is prepared for each Department that is forwarded to the Quality Assurance Unit of each University. Additionally, interviews shall be given and discussions shall take place to present a general overview of the education and research activities, along with the social and international dimension of the University.

- Establish external evaluation by highly respected experts in the pertaining field from abroad and representatives of the corresponding professional bodies every four or five years. This external Committee reviews the internal evaluation report using various methods (i.e. interviews, on-site visits, etc.) and prepares its final report. The results of the external evaluation, along with those of the internal evaluation, are formally announced / published so as to ensure the widest possible transparency of the National Higher Education system.

The overall quality assurance process is coordinated by an independent board, which has administrative independence and comprises of eleven members, namely four University Professors, four Technological Education Professors, one representative from the Greek Academy and the Ministry of Education, and the president who is

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appointed by the Minister of Education. No students or administration personnel participate in this body.

1.2 Please describe shortly the implementation of those tools at your country/University. AUA started the implementation of the internal evaluation in 2009. The results of this first internal evaluation are to be presented to the public in May 2010. The Department of Agriculture, Crop Production and Rural Environment at the University of Thessaly currently undergoes an external evaluation, whereas for the School of Agriculture of the Aristotle University of Thessaloniki the internal evaluation has already been completed (to be presented to students and University administration) and implementation of the external evaluation is planned to be completed by the end of 2010.

The University’s responsibility for Quality Assurance and Assessment in Education and Research is mainly implemented through faculty staff committees (Department level) and special University scientific committees (Institution level).

The faculty staff committees are responsible for:

- Setting appropriate objectives in Education and Research and evaluating the success in meeting them for all three cycles of the study programme.
- Providing the intellectual and material resources to support these objectives, monitoring them annually and enhancing them
- Accounting for the faculty performance to faculty and University boards
- Demonstrating high standards to external examiners along with considering their reports

The University committees are in charge of:

- Taking lead responsibility within the University for the oversight of academic quality and standards
- Managing the University’s Education and Research strategy
- Overseeing the management and development of codes of Quality Assurance and Assessment procedures
- Over viewing external examiners’ reports and the annual monitoring of study programmes

1.3 Which are the consequences of applying these tools?

The major scope of applying these tools is to investigate the improvement achieved and identify the weak points and the difficulties faced by each University and the appropriate measures to be taken. The internal evaluation is not a step towards academic or professional accreditation or else imposition of financial penalties and it does not lead to the formation of ranking lists of excellence. It supports the need to improve the University educational, research and social activities and the demand for accountability and transparency to the public and the students.
2. European Qualification Framework (EQF)

2.1 Please illustrate the impact of the EQF on the National Quality Assurance and Assessment procedure concerning the 1st and 2nd cycle of studies.
As the internal evaluation is just at the first stage of implementation, the impact of the EQF on the National Quality Assurance and Assessment procedure regarding the integrated two-cycles program of studies in AUA concerns:

- The understanding and support of the scope of the EQF procedure by the staff members and students
- The active participation, for first time, of all members of the academic community to the internal evaluation procedure.

2.2 Please describe qualifications at structured 3rd cycle level as related to EQF and their implementation in your country.
Concerning the third cycle, there are already several qualifications required by the postgraduate cycle candidates and PhD students, even before the implementation of the internal evaluation. They have been extensively presented during the 3rd ERABEE Workshop held in Uppsala and among others include: (1) Entry prerequisites and student recruitment strategies, (2) Minimum duration, (3) Minimum number of courses (compulsory or optional) and assigned ECTS, (4) Requirements concerning coursework and conditions to choose a Thesis, (5) Selection of the supervisor and the research topic, (6) International period of learning (optional, compulsory, not common), (7) Peer-reviewed conference or Journal publications, (8) International dimension of the Thesis and (9) Final public examination/evaluation.

For the time being there exists no specific and detailed evaluation of the postdoctoral cycle and Doctoral programs of studies. However, effective 2011 each Department offering such studies must have been evaluated based on the National Quality Assurance and Assessment procedure which follows the European Standards and Guidelines for Quality Assurance in the European Higher Education Area.

2.3 Please explain the interpretation and implementation of the EQF in your country and its relationship with the National Qualification Framework.
Currently, the National Qualification Framework is under discussion, the aim being to be implemented by 2012 at the latest. It is directly related to EQF as it foresees 8 levels of knowledge, competence and skills. It varies from level 1 (basic general knowledge, basic skills required to carry out simple tasks work, study under direct supervision in a structured context) to level 8 (knowledge at the most advanced frontier of a field of work or study and at the interface between fields, the most advanced and specialized skills and techniques, including synthesis and evaluation, substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research).
2.4 Please explain the interpretation and implementation of the EQF in the case of Agricultural and Biosystems Engineering programs of studies
The EQF will be interpreted and implemented through the NQF which will classify the Agricultural and Biosystems Engineering programs of studies graduates to the 6th (1st cycle degree), 7th (2nd; and possibly the integrated two-cycle degrees – this is an open issue for the moment) or 8th (postgraduate cycle degree or PhD degree) level of competency.

3. Please describe the EUR-ACE academic accreditation procedure regarding Biosystems Engineering or related programmes of studies:

3.1 What is the status of professional accreditation in your country? Does an independent professional accreditation agency exist?
At the moment there is no professional accreditation for the Biosystems Engineering or related programmes of studies as all graduates are professionally licensed as Agronomists by the Geotechnical Chamber of Greece. Obviously there is not an independent professional accreditation agency related with these studies.

3.2 What is the status of academic accreditation in your country? Does an independent academic accreditation agency exist?
At present there is no academic accreditation procedure established in Greece and for this reason no independent academic accreditation agency exists.

3.3 What is the relationship between professional accreditation and academic accreditation agencies and procedures in your country for Engineering programs of studies? For Agricultural / Biosystems programs of studies?
For the time being the Technical Chamber of Greece professionally accredits most Engineers despite the fact that no academic accreditation exists. Graduates for Agricultural / Biosystems Engineering programmes of studies are given a job license by the Geotechnical Chamber of Greece based on their University degree. No professional accreditation is required for the members of this Chamber.

3.4 If there is an academic accreditation procedure in force in your country, what are the preconditions for the EUR-ACE academic accreditation (curricula, infrastructure, staff, etc.)?
As indicated in point (b) there is no academic accreditation procedure established in Greece. Therefore there has been no study programmes’ application for the EUR-ACE academic accreditation.

3.5 Please describe shortly the National academic accreditation procedure, which is necessary to receive the EUR-ACE label.
At the moment there is no academic accreditation procedure available in the public higher educational system Greece. The degrees offered by the public Universities in Greece are considered as legitimate and self-accredited by default. An academic accreditation procedure has been established for private institutions and colleges. The establishment of an academic accreditation procedure applicable to all educational institutions in Greece constitutes a prerequisite in order to proceed with the
implementation of compatible systems of academic accreditation in Europe, including the EUR-ACE labelling scheme.

3.6 If you have no independent accreditation agency, which organisation is or could implement the academic accreditation?
The EUR-ACE labelling procedure [3] foresees that accreditation may be offered by recognised European Agencies from other countries, provided that the appropriate legal and other arrangements are made and provided that this agency has been granted by ENAEE [4] the permission to perform this kind of accreditation and award EUR-ACE labels.

3.7 If no academic accreditation exists, is there a comparable procedure to formally accredit Biosystems Engineering or related programmes of studies on National level (e.g. professional accreditation)?
At the moment professional accreditation is offered only to several Engineering programs of studies through the Technical Chamber of Greece. There are some newly established Engineering programs of studies that are not (yet) accepted for accreditation by this Chamber. In general it takes a long time and negotiations between the new Departments and the Technical Chamber of Greece before a new Engineering program of studies is accepted for professional accreditation.

3.8 Will there be changes in the near future? Are there any plans or a procedure under development?
When a new Biosystems Engineering or related programme is established the procedure is expected to be analogous, unless by that time an academic accreditation system is established and the “closed” professions that require professional accreditation become “open” professions. A discussion about opening the “closed” professions has opened already in the Greek parliament.

3.9 Please analyze your programme of studies using the attached Agricultural/Biosystems Engineering EurAgEng Recognition Template

    a. Specify which modules are active.

Two specializations are offered, namely Farm Structures & Agricultural Machinery and Water Resources Management with several modules. Within these two specializations quite a lot of the courses specified in the FEANI report are given.

The rest of this analysis will refer to the Agricultural Structures & Farm Machinery specialization because the main findings for the Water Resources Management specialization are similar.

    b. Give details on the courses offered.

Details about the course offered may be found in TABE-Net web site (http://www.ucd.ie/tabe/).
c. Compare the corresponding ECTS to the FEANI requirements and if there is not an agreement explain the appropriate adjustments to be made.

Using the EurAgEng Recognition Template it becomes evident that the programme of studies of the Farm Structures & Agricultural Machinery specialization does not meet the FEANI criteria [5].

More specifically, the Basic Sciences as a total add to 36 ECTS (minimum FEANI criterion), however ECTS assigned to Mathematics are 16 against a minimum of 24 (considered as minimum for FEANI), whereas Physics, Chemistry and Informatics add up to 20 instead of 12 (considered as minimum for FEANI). Furthermore, the ECTS assigned to Economics & Humanities are only 9 against a minimum of 18 (considered as minimum for FEANI). Basic Sciences and Economics & Humanities account for 25% of the total 180 ECTS, instead of 30% at minimum (FEANI criterion).

The Core Engineering courses provide only 23 ECTS while the Module Engineering courses provide 0 ECTS. As a result they both total 23 ECTS, well below the minimum of 72 ECTS (considered as minimum for FEANI) and they provide only 12.8% of the total 180 ECTS. On the contrary the core Agriculture / Biosystems courses provide 80 ECTS while the Module Agriculture / Biosystems courses provide 0 ECTS. They both provide 80 ECTCs (44.4% of the total 180 ECTS) far more than 45 ECTS which is the maximum FEANI criterion.

At the moment the only probable and practical solution in an attempt to comply with the FEANI criteria is to establish an independent Biosystems Engineering Department, which will have a well-designed and structured study program starting from the 1st semester.

d. Are there any changes foreseen for the near future to comply to the FEANI requirements?

Discussion is ongoing on the possibility to formulate two independent Departments, the first entitled Biosystems Engineering and the second one entitled Environment & Natural Resources. Unfortunately, it is foreseen that it may take long to finalize any decision. Nevertheless, the efforts continue and the outcomes of USAEE-TN and ERABEE-TN are very helpful in this direction.

e. Please update the data of your program of studies in the data-base.

The data in the data-base have been updated for all three Greek Institutions.

4. Please list Institutions from your country that might be interested to participate in the Biosystems Engineering EUR-ACE academic accreditation or the recognition procedure under the umbrella of EurAgEng.

For the moment no Institution appears to cover the minima FEANI criteria to participate either in the EUR-ACE academic accreditation or in the EurAgEng recognition procedure.
References:


QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN HUNGARY

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Abstract
This paper introduces the quality assurance process and the qualification network for Hungarian higher education especially at the agricultural/biosystems engineering field. The practice of the accreditation in the agricultural/biosystems engineering field is in full accordance with the rules valid for the entire higher education process. An overall institutional level accreditation takes place every 8 years. The main national wide institution responsible for the accreditation is the Hungarian National Accreditation Committee which is an independent organization. The process includes the accreditation of the curriculum at BSc, MSc and PhD levels, and additionally involves all the personnel, infrastructural and operating conditions at the given higher education institute. The credit system was introduced with full accordance with the ECTS which is the part of the entire national approach. The overall alteration of the recently applied curricula from the FEANI and EurAgEng criteria is less than 25%.

1. Tools for quality assurance and assessment frameworks
1.1. Existing tools
The general Hungarian quality assurance and qualification take place within the framework of the general accreditation process supervised by the Hungarian Accreditation Committee. It includes a detailed visualization of the educational institutes and not only the checking the content of the curricula applied. It is absolutely advisable to make an overall evaluation taking into account the environmental condition of the education. All the available indicators should be used for evaluation of the overall assurance conditions of the education as:

a) Structure of the degree program. That could include all the details of the methodological aspects, didactic concepts, teaching methods, learning conditions, examination procedures, study programs, etc.
b) Infrastructure of the Faculty. It is required to ensure highly qualified teaching staff, laboratory facilities, financial conditions and the available internal and external funds, etc.
c) Quality assurance measures. A great number of indicators have been used for such purposes. The indicators are developed for national wide and not only for agricultural/biosystems engineering education.
d) Academic cooperation. It is a must, and without such evaluation no any educational institute can work. The cooperation with national and international
education and research in biosystems or agricultural and biological engineering in Europe; a thematic network (ERABEE-TN)

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Institutions, research organizations and also industrial partners are expected.

For the 3rd cycle studies the law on higher education gives the basic possibilities and duties and, the government set up some new regulations about the conditions of establishment a doctoral schools and about the terms of the PhD doctoral degree. The national doctoral schools are supervised by a National Doctoral Council, which has its own regulations on the working of the schools. At University level there is a Doctoral and Habilitation Council, which supervises the doctoral schools of the university. This Council has an own regulation for its doctoral schools.

1.2. Implementation of the tools

The university’s day-to-day responsibility for Quality Assurance in education and research is in connection with several items. This should be mainly seen through Faculty staff committees as well as special University scientific committees. The fulfilled lines are as follows:

Faculty staff committees
- Setting appropriate objectives in education and research and evaluating the success in meeting them
- Providing the intellectual and material resources to support these objectives and monitoring annually and enhancing them
- Accounting for the Faculty performance to Faculty and University Boards
- Demonstrating high standards to external examiners and other external agencies
- Preparing, where appropriate, for professional accreditation
- Assessing new programme specifications and any subsequent amendments
- Monitoring student progression

University scientific committees
- Taking lead responsibility within the University for the oversight of academic quality and standards
- Managing the University’s education and research strategy
- Approving Faculties recommendations relating to new programme proposals and discontinuation of programmes
- Overviewing external examiners’ annual reports and the annual monitoring of programmes
- Acting for the University in areas of external review, audit and accreditation

The quality assurance system of the doctoral school

In every 3 years the list of the compulsory and the elective subjects are reconsidered and updated.

The main checking points for the doctoral education are as follows:
- For the end of October in the first year every students have to prepare a Research plan for his/her job.
- For the end of the first year a Literature Overview has to be done.
- For the end of the second years a written Research Report has to be prepared and defended in a public surrounding.
For the end of third year a Final Research Report has to be taken to the director of the school, which has to be defended in public. After fulfilment the educational and research requirements the students can get an "Absolutorium" certificate giving a proof for finishing first stage of their PhD activities. After getting the Absolutorium, the student can apply for starting the degree process. As a prerequisite they should show an appropriate publishing. During this period the students have to get through on a comprehensive exam, and prepare their Thesis work. In order to submit the Thesis work for final evaluation a good level of internationally recognized publication is needed. In this term the journal publications and the foreign language publications have got higher value. To defend the Thesis work a public evaluation is organized with two official reviewers.

1.3. Consequences of applying tools
The quality assessment and assurance systems are expected to be totally transparent for all the partners including the European dimensions. At a national level the following principles are characterized:
I. autonomy and independence of the bodies responsible for quality assessment and assurance are absolutely assured;
II. an overall evaluation procedure is applied;
III. both internal and external assessment are carried out regularly;
IV. involvement of all the players (teaching staff, administrators, students, alumni, social partners, professional associations, inclusion of foreign experts) are provided;
V. publication of evaluation reports is provided.

2. European Qualification Framework (EQF)
2.1. Impact of EQF concerning to the 1st and 2nd cycle of studies.
The national system is well suited to identify compliance with the European Standards and Guidelines for Quality Assurance in the European Higher Education Area in the 1st and 2nd cycle of studies.

2.2. Impact of EQF concerning to the 3rd cycle of studies.
The national system is well suited to identify compliance with the European Standards and Guidelines for Quality Assurance in the European Higher Education Area in the 2nd cycle of studies.

2.3. Interpretation and implementation of EQF
The interpretation of EQF is to be applied in general for the national level of qualification procedure. Under the next section some special consideration for agricultural and biosystems engineering are to be explained.
2.4. Interpretation and implementation of EQF for Agricultural and Biosystems Engineering programs of studies

To develop new curricula an official national wide process has been applied including the National Accreditation Committee. Finally, all those forums have promoted the new basic study lines and/or specialization as it met the preconditions, as follows:

- In the content of the curricula is considerably (at least 40%) differs from any another existing ones.
- The educational areas, the disciplines and their relation, and the ratio between the theoretical and practical training are professionally acceptable.
- The system of the knowledge control is admissible.
- The coupling of specializations can be realized only with those specializations from which at least one assures scientifically fundamental training.

Some comments to the standard Assessment procedure for students are as follows:
- It is required for students to register for modules from a specific semester(s) onwards
- Modules are rated yearly, an overall evaluation is performed in every three year
- Normally the lecturer of a course is the examiner
- They have a limited chances to retry the failed exams
- There is no any special assessment arrangements for students with disabilities and/or additional support needs
- In a few cases there are special examinations (e.g. class or oral tests) for exchange students who have registered for one or more semesters

The main institution to educate students in agricultural and food processing engineering in Hungary is the Faculty of Mechanical Engineering, Szent István University Gödöllő. The agricultural/biosystems engineering programme has been developed in a close cooperation with introducing the new three level (BSc, MSc and PhD) education system in accordance with the Bologna process. The credit system was introduced with full accordance with the ECTS which is the part of the entire national approach. The quality assurance is applied with the newly developed system, as well.

3. EUR-ACE academic accreditation procedure

3.1. Status of professional accreditation

In Hungary there are only very few fields where professional accreditation system is introduced. In the field of engineering one of them is the architecture. They have to clarify their ongoing development via a score system. It is supervised by the Professional Association of Architects.
3.2. Status of academic accreditation
The practice of the accreditation in the agricultural/biosystems engineering field is in full accordance with the rules valid for the entire higher education process for Hungary. An overall institutional level accreditation takes place in ever 8 year period. The main national wide institution responsible for the accreditation is the Hungarian National Accreditation Committee which is an independent organization. That process includes the accreditation of the curriculum at BSc, MSc and PhD levels, and additionally involves all the personnel, infrastructural and operating conditions at the given higher education institute. There is a commonly applied accreditation process all through the higher education institutes. The evaluation of the agricultural engineering and the merged food industry study line at the Faculty of Mechanical Engineering, Szent István University, Gödöllő, Hungary is conducted to fulfil such conditions.

3.3. Relationship between the professional and academic accreditation
In the field of agricultural and biosystems engineering there is only academic accreditations applied as described in the previous section.

3.4. Preconditions for EUR ACE academic accreditation
The existing academic accreditation process in the field of agricultural and biosystems engineering could serve a basis to the EUR ACE recognition.

3.5. National accreditation procedure
The tasks of the accreditation are the following:

- to show the strengths and to discover the possible weaknesses inside the institutes and to identify the good training experience,
- to aware the evaluation requirements and to perform the internal self-evaluation,
- to perform the quality control in the in the education and thought to assist the institutional effectiveness,
- to spread the good experience by publishing the qualification and to develop new training study lines which meet the expectations of both the science and the market (employers, students, other organizations),
- to inform the interested people, to facilitate the good choice for the students and to provide a healthy competition among the universities.

The continuous assuring of infrastructural conditions should meet the following issues:

- Allocation of the schoolrooms, laboratories, rooms for professors and assistants according to the student number and to the training needs.
- Providing equipment for the whole educational cycle.
- Operating the organizational, administrative structure serving the training.
- Department, faculty or university library where the most important journals are available or electronically accessible covering the scientific area of the specialization.
- Having an up-to-date computer based informatics services affording access for the students regularly.
The quality control and the external recognition of a study line and specialization require a standard process which has the following main features:

- The accreditation process is mandatory. The Ministry of Education is the highest ranked body who is responsible for the review.
- The frequency of the review is every 8 year period.
- Technically, the Hungarian Accreditation Committee, as an independent organization conducts the review process.
- The procedure of the review could be basically two kinds. One is the ordinary 8 year period overall accreditation of the institute. If another institute would initiate to start an education in the field of agricultural education, then the review process is the prerequisite at starting.
- The final result of the accreditation is that the institute has got or not the right to continue the education on the given area. The Accreditation Committee has a right for checking in between two official reviews.
- The result of the review process is totally public. The Committee publishes the results in official ministry journals and the daily newspapers, as well.
- The same accreditation process is applied all through the country. No any big differences could be applied in case of the different specialization.
- The result of the accreditation is official in that sense, that the institute does not claim for changing the Accreditation Committee evaluation. For that reason, the accreditation is absolutely requested and so recognized by all research, educational and industrial partners, as well.

3.6. Organizational aspects of the accreditation process

In Hungary there is an independent agency, e.g. Hungarian Accreditation Committee which has the right to implement the accreditation process. Definitely, there exists an academic accreditation in the field of agricultural/biosystems engineering.

In the near future there is no plan to change the recent accreditation process.

4. Comparison of programme studies to EurAgEng recognition

4.1. Active modules

At the moment the following modules are active at the agricultural engineering and food industry study line conducted at the Faculty of Mechanical Engineering, Szent István University, Gödöllő, Hungary:

- mechanical systems and mechanisms,
- structural systems and materials,
- energy supply and management,
- information technology and automation.
4.2. Comparison of ECTS to FEANI requirements
Concerning the suitability and compatibility of the core curricula in the accreditation process described before for the agricultural/biosystems engineering, the following main statements could be identified:

1. The EurAgEng recognition process could serve a separate, stand-alone high level evaluation and not as a substitute for, or complement to the existing one.
2. Surely, the recognition process will add a real value to the local curricula.
3. The EurAgEng accreditation would offer extra benefits as better international recognition of the institute, higher student and staff mobility, continuous improvement of study programmes.
4. No drawbacks could be associated with the recognition process.

The credit system was introduced with full accordance with the ECTS system which is the part of the entire national approach. The overall alteration of the recently applied curricula from the FEANI and EurAgEng criteria is less than 25%.

4.3. Changes foreseen to comply FEANI requirements
As it was written before, the national accreditation process is fairly regulated, and so all the institutions should follow it strictly. It is also the case for the agricultural/biosystems engineering field.

At the same time, within the freedom of the higher education institutions, it is absolutely open for all the institutions that in addition to the compulsory accreditation they should follow any other recognition process providing high level of quality control.

In the near future there is no plan to change significantly the recent process. The most important thing will be the extension of the internationalization procedure in the 3rd cycle of education.

4.4. Program of studies in the data-base
The data of program of studies in the field of agricultural/biosystems engineering are to be updated in the data-base.

5. Institutes involving in the accreditation
As one of the final outcome of the ERAABEE Thematic Network it is quite natural to propose a unique Quality Assurance and Assessment Framework and Accreditation scheme for the Higher Education Engineering Education in Europe. It is rather probable, that Hungary will join to this process. It is obvious that all the recently available information and aspects concerning to the common European accreditation process will be used during the course of accreditation process at the Faculty of Mechanical Engineering, Szent István University Gödöllő, Hungary.
References:


Relevant web-sites:

National Doctoral Council: www.doktori.hu

Szent István University Gödöllő, Hungary: www.szie.hu

Doctoral School of Agricultural Engineering, Szent István University, Hungary www.mtdi.szie.hu

Faculty of Mechanical Engineering, Szent István University Gödöllő, Hungary www.gek.szie.hu

Department of Physics and Process Control, Szent István University, Hungary fft.szie.hu
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN IRELAND

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Abstract
Tools for quality assurance and assessment frameworks of Biosystems Engineering studies in Ireland are discussed. The interpretation and implementation of the EQF in Ireland and its relationship with the National Qualification Framework is outlined. The implementation of the EQF in the case of Biosystems Engineering programs of studies is also detailed.
The EUR-ACE academic accreditation procedure regarding Biosystems Engineering is reviewed. The preconditions for the EUR-ACE academic accreditation such as curricula, infrastructure and staff are presented. The accreditation criteria for Master Degree (level 9) programmes, designed to satisfy the higher education standard for the title of Chartered Engineer are outlined. The programme of studies in UCD Biosystems Engineering are compared against the FEANI/Agricultural/ Biosystems Engineering EurAgEng Recognition Template.

1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies
Quality processes in Irish universities operate within national legislative and regulatory contexts particularly the Universities Act 1997 that respect institutional autonomy and allow quality improvement to be the fundamental principle governing all the associated procedures and practices. These processes are inclusive of programmes of instruction, scholarship and research and contributions to the broader community. Student learning and wellbeing are considered in these broader contexts. The Higher Education Authority (HEA) is the statutory planning and development body for higher education and research in Ireland, and also has functions and responsibilities under the Universities Act 1997 regarding the review of quality assurance in the universities. The Department of Education and Science has overall responsibility for higher education.
Quality review, which is essentially a developmental process, is carried out in academic, administrative and service units. Periodically, reviews are also undertaken of cross-College structures, such as major Programmes, Graduate School Boards and Research Institutes. From time to time, thematic reviews of University-wide issues (e.g. first year student experience; staff/student consultation mechanisms) are also carried out. Typically the quality review model in University College Dublin comprises four key

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### Elements:
- A site visit by a Review Group that includes internal (UCD) and external experts, both national and international.
- Preparation of a Review Group Report.
- Agreement of an action plan to effect improvement.

The main evaluation tools for quality assurance of Engineering programmes in UCD are outlined below in Figure 1. Student feedback will in future be captured through on-line and assessment teaching tools and analysed centrally before forwarding to relevant staff.

![Figure 1: Evaluation tools for quality assurance of programmes in UCD](image)

#### 2. The European Qualification Framework (EQF)

The Irish National Framework of Qualifications (NFQ) has been in place since 2003. The NFQ is designed for the development, recognition and award of qualifications based on standards of knowledge, skill and competence acquired by learners. The Framework consists of 10 levels (outlined in Figure 2), from basic learning to Doctoral awards.
The University Framework Implementation Network was jointly established by the National Qualifications Authority of Ireland and the Irish Universities Association at the end of 2007. The purpose of the network is to deepen the implementation of the National Framework of Qualifications (NFQ) within the university sector, primarily through the exchange of experience and practice between members.

3. The EUR-ACE Academic Accreditation Procedure

Through the Institution of Civil Engineers of Ireland (Charter Amendment Act, 1969), Engineers Ireland has as one of its purposes the ‘Setting up and maintaining proper standards of professional and general education and training for admission to membership or to any category of membership of the Institution. Engineers Ireland, in fulfilment of this purpose, has formally accredited engineering degree programmes in the Republic of Ireland since 1982. The accreditation function of Engineers Ireland is carried out by its Accreditation Board.

Engineering education programmes which satisfy the appropriate criteria laid down in this document are deemed to meet the education standard required of individuals seeking one of the Registered Professional Titles of Chartered Engineer, Associate Engineer and Engineering Technician. Under international agreements such as the Washington, Sydney and Dublin Accords, accreditation decisions of Engineers Ireland are accepted in the signatory countries on the same basis as their “home” graduates.

Engineers Ireland is a member of FEANI (The European Federation of National Engineering Associations). All engineering degree programmes accredited by Engineers Ireland as satisfying the education standard for the title of Chartered Engineer are listed in the following table:

<table>
<thead>
<tr>
<th>Draft EQF levels</th>
<th>EHEA Framework (Bologna)</th>
<th>NFQ Levels</th>
<th>NFQ Major Award types</th>
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<td>1</td>
<td>Level 1 Certificate</td>
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<tr>
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<td></td>
<td>2</td>
<td>Level 2 Certificate</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>3</td>
<td>Level 3 Certificate, Junior Certificate</td>
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<tr>
<td>4</td>
<td></td>
<td>4</td>
<td>Level 4 Certificate, Leaving Certificate</td>
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<td>5</td>
<td>Short Cycle within First Cycle</td>
<td>5</td>
<td>Level 5 Certificate, Leaving Certificate</td>
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<td>6</td>
<td>First Cycle</td>
<td>6</td>
<td>Advanced Certificate (FET award); Higher Certificate (HEI award)</td>
</tr>
<tr>
<td>7</td>
<td>Second Cycle</td>
<td>7</td>
<td>Ordinary Bachelors Degree</td>
</tr>
<tr>
<td>8</td>
<td>Third cycle</td>
<td>8</td>
<td>Honours Bachelor Degree, Higher Diploma</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>9</td>
<td>Masters Degree, Post-Graduate Diploma</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>10</td>
<td>Doctoral Degree, Higher Doctorate</td>
</tr>
</tbody>
</table>

Figure 2: The Irish National Qualifications Framework
in the Index, are awarded the EUR-ACE label and are accepted in the member countries of FEANI. Engineers Ireland has been among the leading accreditation agencies in adopting the EUR ACE label as shown in Table 1. The accredited Master Degree programme will replace the accredited honours Bachelor Degree programme as the education standard required for the Chartered Engineer title from programmes completed in 2013.

<table>
<thead>
<tr>
<th>Agency</th>
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<th>Second Cycle</th>
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</tr>
</tbody>
</table>

Table 1: EUR-ACE Accredited Programmes at 26/04/2010

Engineers Ireland specifies the following programme outcomes which apply to Master’s degree engineering programmes (level 9) aimed at satisfying the education standard which will apply to the title of Chartered Engineer from 2013. It is to be understood that these programme outcomes are achieved through the learning outcomes of all modules in all years of the Master’s degree programme and any preceding Bachelor’s degree programmes. Programmes must enable graduates to demonstrate:

a) **Knowledge and understanding of the mathematics, sciences, engineering sciences and technologies underpinning their branch of engineering.**
Graduates should have, inter alia;

(i) knowledge and understanding of the principles, concepts, limitations and range of applicability of established mathematical tools and methods;
(ii) knowledge and understanding of the theoretical bases and the related assumptions underpinning the engineering sciences relevant to their engineering discipline;
(iii) knowledge and understanding of a wide range of engineering materials, processes and components;
(iv) knowledge and understanding of related developing technologies and how they might impinge upon their branch of engineering;
b) The ability to identify, formulate, analyse and solve engineering problems. Graduates should, inter alia, be able to;
   (i) integrate knowledge, handle complexity and formulate judgements with incomplete or limited information;
   (ii) create models by deriving appropriate equations and by specifying boundary conditions and underlying assumptions and limitations;
   (iii) identify and use appropriate mathematical methods for application to new and ill-defined engineering problems;
   (iv) identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques;
   (v) develop software tools including numerical techniques to solve engineering problems.

c) The ability to design components, systems or processes to meet specific needs. Graduates should have, inter alia;
   (i) knowledge and understanding of design processes and techniques and the ability to apply them in unfamiliar situations;
   (ii) ability to apply design methods to unfamiliar, ill-defined problems, possibly involving other disciplines;
   (iii) ability to investigate and define a need and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;
   (iv) knowledge and understanding of codes of practice and industry standards and the need for their application;
   (v) ability to redesign products, processes or systems in order to improve productivity, quality, safety and other desired needs.

d) The ability to design and conduct experiments and to apply a range of standard and specialised research tools and techniques. Graduates should, inter alia, be able to;
   (i) extract, through literature search or experiment, information pertinent to an unfamiliar problem;
   (ii) design and conduct experiments and to analyse and interpret data;
   (iii) evaluate critically, current problems and new insights at the forefront of the particular branch of engineering;
   (iv) incorporate aspects of engineering outside their own discipline and to consult and work with experts in other fields;
   (v) contribute individually to the development of scientific/technological knowledge in one or more areas of their engineering discipline.

e) Understanding of the need for high ethical standards in the practice of engineering, including the responsibilities of the engineering profession towards people and the environment. Graduates should have, inter alia;
   (i) ability to reflect on social and ethical responsibilities linked to the application of their knowledge and judgements;
Education and Research in Biosystems or Agricultural and Biological Engineering in Europe; a Thematic Network (ERABEE-TN)

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(ii) knowledge and understanding of the social, environmental, ethical, economic, financial, institutional and commercial considerations affecting the exercise of their engineering discipline;

(iii) knowledge and understanding of the health, safety and legal issues and responsibilities of engineering practice and the impact of engineering solutions in a societal and environmental context;

(iv) knowledge and understanding of the importance of the engineer’s role in society and the need for the highest ethical standards of practice;

(v) knowledge and understanding of the framework of relevant legal requirements governing engineering activities, including personnel, environmental, health, safety and risk issues.

f) The ability to work effectively as an individual, in teams and in multi-disciplinary settings, together with the capacity to undertake lifelong learning.

Graduates should have, inter alia;

(i) ability to recognise and make use of the interactions between the engineering technologies and the technologies associated with other disciplines and professions;

(ii) ability to consult and work with experts in various fields in the realisation of a product or system;

(iii) knowledge and understanding of the respective functions of technicians, technologists and engineers and how they together constitute the engineering team;

(iv) knowledge and understanding of group dynamics and ability to exercise leadership;

(v) ability to plan and carry through, self-directed Continuing Professional Development to improve their own knowledge and competence;

(vi) knowledge and understanding of concepts from a range of areas outside engineering.

g) The ability to communicate effectively with the engineering community and with society at large.

Graduates should be able to, inter alia;

(i) select and apply appropriate communication tools in order to create deeper understanding and maximum impact on a given audience;

(ii) describe succinctly, the relevant advantages and disadvantages of the various technologies to a lay audience;

(iii) communicate effectively in public, national and international contexts;

(iv) write technical papers and reports and synthesise their own work and that of others in abstracts and executive summaries;

(v) understand the training needs of others in appropriate engineering techniques.

4. Comparison of UCD Biosystems Engineering Programme against FEANI Criteria

Figure 3 lists a comparison against FEANI criteria for a typical module profile in UCD Biosystems Engineering. In general it shows broad compliance with FEANI criteria. A number of assumptions were made in allocating modules to different headings in Figure 3. For example components of project modules may be allocated under different
headings in Figure 3. Also individual students in Biosystems Engineering at UCD may select from a wide range of elective modules. Depending on the combination of modules selected by students they will may or may not meet the FEANI criteria as specified.

**Figure 3:** Comparison of UCD Biosystems Engineering against FEANI Criteria.

<table>
<thead>
<tr>
<th>ECTS Ranges</th>
<th>ECTS</th>
<th>%</th>
<th>Against FEANI Requirements</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 (min) - 45</td>
<td>50.0</td>
<td>BASIC SCIENCES</td>
<td>TRUE</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
<tr>
<td>24 (min)</td>
<td>30</td>
<td>MATH</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>12 (min)</td>
<td>10</td>
<td>18.7%</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>18 - 27</td>
<td>15</td>
<td>ELECTIVES</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>16 (min)</td>
<td>15</td>
<td>8.3% ECONOMICS &amp; HUMANITIES</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>54 (min) - 72</td>
<td>65</td>
<td>36.1% BASIC &amp; ELECTIVES</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>72 (min) - 81</td>
<td>70</td>
<td>ENGINEERING SCIENCES</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>44-51</td>
<td>60</td>
<td>27.6% CORE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>26-30</td>
<td>20</td>
<td>11.1% MODULE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>36 (min) - 45</td>
<td>35</td>
<td>AGRIBILOGICAL SCIENCES</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>20-25</td>
<td>25</td>
<td>13.6% CORE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>18-20</td>
<td>10</td>
<td>5.6% MODULE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>108 (min) - 126</td>
<td>105</td>
<td>53.3% ENG &amp; AGRIBOL SCIENCES</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>162 (min) - 198</td>
<td>170</td>
<td>94.4% BASIC &amp; ELECTIVE &amp; ENG &amp; AGRIBOL SCIENCES</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>18 (max)</td>
<td>10</td>
<td>5.6% APPLIED AGR ENGINEERING</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>180</td>
<td>180</td>
<td>100.0% PASS ALL THE FEANI CRITERIA?</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
</tbody>
</table>

**References:**


QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF ITALIAN BIOSYSTEMS ENGINEERING STUDIES

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Abstract
In Italy the tools for quality assurance and assessment frameworks of all University studies are established by the D.M. (Law) of the Ministry of Education, University and Research n. 544 of the 31st October 2007, concerning with the requirements that Universities must satisfy every year in order to offer degree study programs. Moreover, the accreditation procedure is established by the Law of the Italian Ministry of Work and Welfare n. 166 of the 25th May 2001, by which each Italian Regional administration can recognise the proposal and organisation of teaching activities (e.g. higher education) or guidance ones, funded by public resources, to public and/or private bodies (e.g. Universities).
The Italian institutions which might be interested to participate to the Biosystems Engineering EUR-ACE academic accreditation procedure or the recognition one, under the umbrella of EurAgEng, are all the Faculties of Agriculture offering degree study programs in Agricultural Engineering, which are shown in the database on Biosystems Engineering study programs.

1. Tools for quality assurance and assessment frameworks of Italian Biosystems Engineering studies
In Italy the tools for quality assurance and assessment frameworks of all University studies, including Agricultural Engineering ones, are established by the D.M. (Law) of the Ministry of Education, University and Research n. 544 of the 31st October 2007, concerning with the requirements that Universities must satisfy every year in order to offer degree study programs [1]. These requirements are the following:
- transparency requirements of the established 1st and 2nd cycle degree study programs, i.e. clear communication to the students and all the stakeholders interested;
- requirements for the quality assurance of the degree study programs;
- requirements of University infrastructures and enrolled teaching staff;
- amount of students sustainable for each degree study program.

As far as the requirements for the quality assurance of the degree study programs, every year the Universities plan degree study programs, by providing them with high

1 Antonio Comparetti, Phone +39 091 7028173, Fax +39 091 484035, e-mail: comparetti@unipa.it
levels of quality, efficiency and effectiveness. In order to achieve the above aim, the University Assessment Groups verify if the degree study programs satisfy the above levels, by means of indicators defined according to the document 07/01 of the National Committee for the Evaluation of the University System (CNVSU) [2] and included in the Annex A of the D.M. 544/2007 (Tab. 1).

Table 1. Indicators of efficiency and effectiveness (Annex A of the D.M 544/2007 of the Ministry of Education, University and Research).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Measurement units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicators of efficiency</td>
<td></td>
</tr>
<tr>
<td>Efficiency in using teaching staff</td>
<td>• Yearly average amount of hours / teacher</td>
</tr>
<tr>
<td></td>
<td>• Yearly average amount of ECTS obtained / student</td>
</tr>
<tr>
<td>Student efficiency</td>
<td>• Amount of students enrolled and attending the study program</td>
</tr>
<tr>
<td>Quality system</td>
<td>• Adoption of a University body, recognised by CNVSU*</td>
</tr>
<tr>
<td>Regularity of study program</td>
<td>• Amount of students abandoning the study program between 1st and 2nd years</td>
</tr>
<tr>
<td></td>
<td>• Yearly average amount of ECTS obtained / student</td>
</tr>
<tr>
<td></td>
<td>• Yearly percentage of graduates within the regular duration of the study program</td>
</tr>
<tr>
<td>Indicators of effectiveness</td>
<td></td>
</tr>
<tr>
<td>Tools for verifying the cultural background of</td>
<td>Examinations for entering the study programs</td>
</tr>
<tr>
<td>the candidates to access the study program</td>
<td></td>
</tr>
<tr>
<td>Satisfaction level of students about each</td>
<td>Interviews</td>
</tr>
<tr>
<td>course of the study program</td>
<td></td>
</tr>
<tr>
<td>Satisfaction level of graduating students</td>
<td>Interviews</td>
</tr>
<tr>
<td>about the whole study program</td>
<td></td>
</tr>
<tr>
<td>Employment percentage of graduates</td>
<td>Amount of employed graduates / amount of graduates (1, 3 and 5 years after the</td>
</tr>
<tr>
<td></td>
<td>degree)</td>
</tr>
</tbody>
</table>

* CNVSU = National Committee for the Evaluation of the University System.

The quality assurance process applied by Italian Universities, in order to achieve some level of internal quality control or assessment for the offered study programs, is established by the criteria for allocating the Government Ordinary Financing Fund (FFO) of Universities for 2009, regulated by the D.M. (Law) of the Ministry of Education, University and Research n. 45 of the 23rd September 2009 [3, 4]. The 44% of the total Ordinary Fund is divided among the Italian Universities according to the criteria summarised in the Annex 1 of this Law (Tab. 2). The 34% of this part is divided according to the indicators A1-A5, while the 66% is divided relying on the indicators B1-B4 of this annex.
Table 2. The criteria for allocating the Government Ordinary Financing Fund of Italian Universities (FFO) for 2009 (Annex 1 of D.M. 45/2009 of the Ministry of Education, University and Research).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of study programs and results of education processes</td>
<td></td>
</tr>
<tr>
<td>A1 Amount of enrolled teachers belonging to basic and peculiar scientific and teaching sectors/ amount of study programs established in 2008-09</td>
<td>0.20</td>
</tr>
<tr>
<td>A2 Amount of students enrolled to the 2nd year in 2008-09</td>
<td>0.20</td>
</tr>
<tr>
<td>A3 Amount of ECTS obtained in 2008 / foreseen ECTS for enrolled students in 2008-09</td>
<td>0.20</td>
</tr>
<tr>
<td>A4 Amount of courses for which the student assessment was required / total amount of courses offered in 2007/08</td>
<td>0.20</td>
</tr>
<tr>
<td>A5 Percentage of employed graduates 3 years after the degree</td>
<td>0.20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of scientific research</td>
<td></td>
</tr>
<tr>
<td>B1 Allocation coefficients of funds assigned to areas (VTR* 2001-03 - CIVR**)</td>
<td>0.49</td>
</tr>
<tr>
<td>B2 Allocation coefficients of funds assigned to valorisation activities (VTR* 2001-03 - CIVR**)</td>
<td>0.01</td>
</tr>
<tr>
<td>B3 Percentage of teaching staff included in PRIN*** projects 2005-2007 positively assessed</td>
<td>0.15</td>
</tr>
<tr>
<td>B4 Percentage of funding and success obtained by Universities within projects of the 6th Framework - EU – CORDIS</td>
<td>0.35</td>
</tr>
</tbody>
</table>

* VTR = Research Evaluation carried out every three years.
** CIVR = Committee for Research Evaluation.
*** PRIN = Projects of Relevant National Interest.

2. European Qualification Framework (EQF)
In Italy until now no information is available about the interpretation and implementation of the European Qualification Framework (EQF).

3. EUR-ACE academic accreditation procedure of Italian Biosystems Engineering or related study programs
As regards the status of professional accreditation in Italy, even if no independent professional accreditation agency exists, the examination for becoming a professional agronomist or engineer is carried out at Universities by an examination board, constituted by both representatives of the Professional Association and University teaching staff. Therefore, a strong cooperation exists between the professional associations and the University Faculties related to specific competences. This cooperation influences both the planning and the course contents of the degree study programs.

As regards the status of academic accreditation in Italy, according to the Law of the Italian Ministry of Work and Welfare n. 166 of the 25th May 2001, the accreditation is a procedure by which each Italian Regional administration can recognise the proposal and organisation of teaching activities (e.g. higher education) or guidance ones, funded by public resources, to public and/or private bodies (e.g. Universities).

This voluntary review should be carried out once a year, so that an education body can decide to apply for beginning it. Until now only a few Italian Universities have implemented this review and, therefore, offer recognised degree study programs.
The organisation which should carry out this review is an external education committee, which is established by the administration of the Region to which the University belongs. Therefore, the University willing to propose a new degree study program should send its request to the administration of its Region for obtaining the permission to establish the study program itself.

The procedure of the review is specifically established by each Regional administration: it is carried out by means of visits and/or technical analysis of the degree study programs and/or interview of students.

If the accreditation committee discovers some differences or variations of requirements which have determined the previous accreditation of the degree study program, the possible consequence of the review is the suspension or the revocation of the accreditation [5] and, sometimes, the reduction of the budget given to the University offering the study program itself.

This review is recognised by both the Ministries of Work and Welfare and of Education, University and Research, and also by the European Union, with the aim of obtaining EU funds (e.g. European Social Fund) [6].

In Italy, even if no independent professional accreditation agency exists, the National University Committee (CUN) carries out internal standardised evaluation and accreditation procedures (based on Bologna declaration), assuring the quality of the new 1st and 2nd cycle study programs proposed by the Italian Universities.

This Committee verifies whether the new study programs satisfy the accreditation requirements established for any homogeneous group of degrees (e.g. the group of Agricultural degrees, including Agricultural Sciences and Technologies, Forestry Sciences, Food Processing, etc.):

- amount of ECTS credits;
- course categories (e.g. Basic Sciences, Humanity and Economic Sciences, Engineering Sciences) and minimum amount of contact hours established for each course category;
- hours of practical activity;
- learning outcomes (knowledge, competences and skills) which graduates must demonstrate after the completion of a study program;
- minimum amount and scientific qualification of enrolled teaching staff for each degree study program.

The CUN is entitled to decide whether a new degree study program reaches or not the standards as it has been structured by the proposing University. In case of negative response the University has to modify it if it intends to submit it again for the approval.

In Italy a working group “Accreditation of Study Programs” was established within the National Committee for the Evaluation of the University System (CNVSU). This working group has the task of defining opportunities, procedures and general methods of accreditation, as a consequence of the reformation of University teaching activity [6].

4. Analysis of an Italian study program through the Agricultural/Biosystems Engineering EurAgEng Recognition Template

The 1st cycle degree study program in Agricultural Engineering, offered by Palermo
University, was selected for the analysis through the Agricultural/Biosystems Engineering EurAgEng Recognition Template. By comparing the corresponding ECTS of this study program to the FEANI requirements, it is possible to deduce that there is no agreement between them. Therefore, the possibilities and constraints for making the needed appropriate adjustments can be the following:

- to increase the amount of ECTS of Mathematics and, generally, Basic Sciences;
- to increase the amount of ECTS of Electives;
- to increase the amount of ECTS of Engineering Sciences;
- to reduce the amount of ECTS of Agricultural/Biological Sciences;
- to reduce the amount of ECTS of Applied Agricultural Engineering.

The database on Biosystems Engineering study programs is filled in with the updated data of the Italian ones running in the current academic year 2009-2010.

5. List of Italian institutions potentially interested to participate to Biosystems Engineering EUR-ACE academic accreditation or EurAgEng recognition

The Italian institutions which might be interested to participate to the Biosystems Engineering EUR-ACE academic accreditation procedure or the recognition one, under the umbrella of EurAgEng, are all the Faculties of Agriculture offering degree study programs in Agricultural Engineering, which are shown in the database on Biosystems Engineering study programs (http://sunfire.aua.gr:8080/ects/Welcome.do).

References:


QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN LATVIA

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Abstract
There is common study program and study quality assurance system in Latvia, which concern to all type and level study programs. European Qualification framework is still not introduced in Latvia. All type and level study programs is accredited by one accreditation committee, but the accreditation process is provided by Higher Education Quality Evaluation Centre. The existing bachelor level study program in Agricultural Engineering with specialization in Agricultural machinery, which is realized in Latvia University of Agriculture, does not completely correspond to FEANI requirements.

1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies
There is not single quality assurance and assessment system for the of Biosystems Engineering studies, but is common study program and study quality assurance system, which concern to all type and level study programs. The general framework for quality assurance of study programs and studies define the Law of Higher Education Institutions [1]. The article 55 of the law defines that the study program must be elaborated and submitted accordingly to procedure set by the Senate of Higher Education Institution. The study program is approved by the Senate of Higher Education Establishment. Before the approval must be organized the independent expertise of this study program. The license must be received before the start up of every study program. The procedure of study program licensing is defined the regulations of the Cabinet of Ministers [2]. The content of study programs define the State standards of higher education which are approved by the Cabinet of Ministers [3...5].

The Law prescribes that the study program must be accredited during the two years after the start up. For accreditation the self-evaluation report is prepared. During the period between the accreditations the self-evaluation report is prepared for every year. The study programs must go through accreditation every 6-years. Accreditation procedure is set by regulations approved by the Cabinet of Ministers [6]. The accreditation of study programs is executed by accreditation committee approved by the Minister of Education and Science.

For the additional study process quality assessment there are independently organized annual student questionnaire about performance of teaching staff in the Latvia University of Agriculture. In the Faculty of Engineering is defined that teaching staff at
the end of the course must organize students questionnaire in order to get evaluation feedback.

2. European Qualification Framework (EQF)
At present moment there is no one document adopted in Latvia concerning EQF. There is the statement in the economy report [7], which was reviewed by the Cabinet of Ministers in 12 January of 2010: “In the row of other necessary fields of reform, Latvia has good forerun already some years ago (for example, the first draft of Latvia Qualification Framework was prepared already in 2005), however these are not entirely introduced because still there is not adopted the Law on Higher Education in the Saeima and because the remaining reform must be done in the areas which are under competence of higher education institutions according to its autonomy.”
EQF also is not mentioned in the strategic plan of the Latvia University of Agriculture for the period from 2010 to 2016 [8], which accepted in June 10, 2009. Although the plan envisage “offer and develop qualitative internationally comparable studies in all levels and directions of higher academic and professional education”.

3. EUR-ACE academic accreditation procedure regarding Biosystems Engineering and related programs of studies
In the Latvia all type and level study programs have unified accreditation procedure which defined by the Regulations of the Cabinet of Ministers [6]. For the present there is no separate professional accreditation in the Latvia.
The accreditation of higher education programs perform accreditation committee which membership is approved by the minister of Education and Science. The Regulations of the Cabinet of Ministers [6] prescribe the following membership of the committee: by one representative from the Council of Higher Education, Latvian Council of Science, Latvian Association of Colleges, two representatives from the council of Rectors (one representative from state higher education institutions, one from private higher education institutions) as well as three representatives from the Ministry of Education and Science, by one representative from the Employer's Confederation, from the Tripartite Cooperation Sub-council of Professional Education and Employment and from Student Union of Latvia.
The accreditation committee performs only the evaluation of the programs according to submitted documents, but the accreditation process is organized by the Higher Education Quality Evaluation Centre (HEQEC) [9]. HEQEC: receive from the Ministry of Education and Science and check up submitted for accreditation applications and self-evaluation reports; recruit necessary evaluation committees from the foreign and Latvian experts, which are approved by the Accreditation Committee of Higher Education Programs (ACHEP) or/and the Council of Higher Education (CHE); conclude the agreements with higher education institutions and colleges on management of evaluation; organize the work of evaluation committees, prepare and submit all necessary documents for ACHEP and CHE to make a decision on higher education institution, college or study program accreditation.
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Professional organizations more tightly are involved in preparation of professional standard, which define the frame of content of the professional bachelor study programs. For the present there is not particular action in the Latvia for the change of situation in near future concerning to introduction of professional accreditation procedure.

4. Evaluation of Agricultural Engineering study program according to Agricultural/ Biosystems Engineering EurAgEng Recognition Template

At present moment there are only one undergraduate study program running in the Faculty of Engineering of Latvia University of Agriculture related to Agricultural/Biosystems Engineering. This is a 4 year long (240 ECTS) bachelor study program in Agricultural Engineering with specialization in Agricultural machinery and following master level study program in Agricultural Engineering with specialization in Technologies & Machinery of plant Breeding Products. The summary of accordance of currently running study program in Agricultural Engineering with specialization in Agricultural machinery with FEANI requirements is presented in the table 1. More detailed list of courses included in respective field of sciences is presented in Annex 1.

As we see from the comparison in table 1, the existing bachelor level study program in Agricultural Engineering with specialization in Agricultural machinery and does not completely correspond to FEANI requirements.

<table>
<thead>
<tr>
<th>MODULE 2. MECHANICAL SYSTEMS AND MECHANISMS</th>
<th>FEANI Requirements</th>
<th>Agricultural Engineering study program</th>
<th>ECTS LIMITS AGAINST FEANI REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASIC SCIENCES</td>
<td>36 (min) - 45</td>
<td>34,5</td>
<td>FALSE TRUE</td>
</tr>
<tr>
<td>Mathematics</td>
<td>24 (min)</td>
<td>16,5</td>
<td>FALSE</td>
</tr>
<tr>
<td>Physics</td>
<td></td>
<td>9</td>
<td>FALSE</td>
</tr>
<tr>
<td>Chemistry</td>
<td>12 (min)</td>
<td>3</td>
<td>FALSE</td>
</tr>
<tr>
<td>Informatics</td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ELECTIVES</td>
<td>18 - 27</td>
<td>24,8</td>
<td>TRUE TRUE</td>
</tr>
<tr>
<td>Economics &amp; Humanities</td>
<td>18 (min)</td>
<td>24,8</td>
<td>TRUE</td>
</tr>
<tr>
<td>Sub-Total BASIC SCIENCES &amp; ELECTIVES (1):</td>
<td>54 (min) - 72</td>
<td>59</td>
<td>TRUE TRUE</td>
</tr>
<tr>
<td>ENGINEERING SCIENCES</td>
<td>72 (min) - 81</td>
<td>93,5</td>
<td>TRUE FALSE</td>
</tr>
<tr>
<td>Core</td>
<td>44-51</td>
<td>51,5</td>
<td>TRUE FALSE</td>
</tr>
<tr>
<td>Module</td>
<td>28-30</td>
<td>42</td>
<td>TRUE FALSE</td>
</tr>
<tr>
<td>AGRICULTURAL/BIOSYSTEMS SCIENCES</td>
<td>36 (min) - 45</td>
<td>10,5</td>
<td>FALSE TRUE</td>
</tr>
<tr>
<td>Core</td>
<td>20-25</td>
<td>3</td>
<td>FALSE TRUE</td>
</tr>
<tr>
<td>Module</td>
<td>16-20</td>
<td>7,5</td>
<td>FALSE TRUE</td>
</tr>
<tr>
<td>Sub-Total ENG. &amp; AGR/BIOS SCIENCES (2):</td>
<td>108 (min) - 126</td>
<td>104</td>
<td>FALSE TRUE</td>
</tr>
<tr>
<td>Sub-Total (1+2):</td>
<td>162 (min) - 198</td>
<td>163</td>
<td>TRUE TRUE</td>
</tr>
</tbody>
</table>
There is partial unconformity in the basic sciences, engineering sciences, agricultural/biosystems sciences and in applied agricultural engineering.

In the basic sciences Agricultural Engineering study program has 1.5 ECTS less than ECTS range mainly due to insufficient amount of Mathematics and quite small amount of Chemistry courses. As the courses in Economics and Humanities are in sufficient amount the subtotal of Basic Sciences and Electives for Agricultural Engineering program fall in the FEANI range.

If we compare the course amount in Engineering Sciences and Agricultural/Biosystems Sciences with FEANI requirements, there are more courses in Engineering field and substantially less courses in Agricultural/Biosystems field. As a result there are 4 ECTS less than FEANI requirements in Engineering and Agricultural/Biosystems Sciences together.

The part of applied agricultural engineering many times exceeds the FEANI requirement as the total length of study program is four years. In this part are included study courses Agricultural Machinery (15 ECTS), Animal Husbandry Mechanization (9 ECTS), Technical Service of Machinery (6 ECTS) and free optional courses (9 ECTS), practices in total amount 21 ECTS and also Bachelor Thesis 15 ECTS.

There are no major changes planned in this study program during the next years. One of the reasons is that the structure of this study program is strongly influenced by other specializations which have much more students. At the same time local job market do not require remarkable changes in background of graduates of this specialization, but international dimension in this specialization is still weak.

References:

7. Informatīvais ziņojums „Par nepieciešamajām strukturālajām reformām augstākajā izglītībā un zinātnē Latvijas starptautiskās konkurētspējas paaugstināšanai” (Information report „Of the need for structural reforms in higher education and research to increase the international competitiveness of Latvia”). Izskatīts MK sēdē 12.01.2010. Available at: http://izm.izm.gov.lv/upload_file/Nonmativie_akti/infozin_18122009.pdf.


**Annex 1**

Comparison of currently running study program in Agricultural Engineering in Latvia University of Agriculture to core curriculum approved by FEANI.

### Basic Sciences

<table>
<thead>
<tr>
<th>FEANI Report</th>
<th>Agricultural Engineering (Latvia)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASIC SCIENCES</strong></td>
<td><strong>BASIC SCIENCES</strong></td>
</tr>
<tr>
<td>Mathematics (min. 24)</td>
<td>Mathematics (ECTS – 16.5)</td>
</tr>
<tr>
<td>Computer Science / Informatics</td>
<td>Informatics (ECTS – 6.0)</td>
</tr>
<tr>
<td>Physics</td>
<td>Physics (ECTS – 9.0)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Chemistry (ECTS – 3.0)</td>
</tr>
<tr>
<td><strong>Total ECTS: 36-45 ECTS CREDITS equal to 20-25% of total 180 ECTS</strong></td>
<td><strong>Total ECTS – 34.5</strong></td>
</tr>
</tbody>
</table>

### Humanities and Economics (min. 10% of total 180)

<table>
<thead>
<tr>
<th>FEANI Report</th>
<th>Agricultural Engineering (Latvia)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HUMANITIES AND ECONOMICS</strong></td>
<td><strong>HUMANITIES AND ECONOMICS</strong></td>
</tr>
<tr>
<td>• Engineering Economics</td>
<td>• Economy of Machinery Usage (ECTS – 3.0)</td>
</tr>
<tr>
<td>• Agricultural Economics</td>
<td>• Theory of Economics (ECTS – 2.25)</td>
</tr>
<tr>
<td>• Introduction to Philosophy</td>
<td>• Entrepreneurship (ECTS – 3.75)</td>
</tr>
<tr>
<td>• Introduction to Justice and Law</td>
<td>• Philosophy (ECTS – 3.0)</td>
</tr>
<tr>
<td>• Introduction to Sociology</td>
<td>• Basics of Law (ECTS – 1.5)</td>
</tr>
<tr>
<td>• Technical and Financial Management of Infrastructures</td>
<td>• Applied Psychology (ECTS – 2.25)</td>
</tr>
<tr>
<td>• Engineering Ethics</td>
<td>• Management (ECTS – 3.0)</td>
</tr>
<tr>
<td></td>
<td>• Introduction in Studies (ECTS – 2.0)</td>
</tr>
<tr>
<td></td>
<td>• Professional English (German) in Engineering (ECTS – 4.0)</td>
</tr>
<tr>
<td></td>
<td>• Labour Safety and Civil Protection (ECTS – 3.0)</td>
</tr>
<tr>
<td><strong>Total ECTS: 18-27 ECTS CREDITS equal to 10-15% of total 180 ECTS</strong></td>
<td><strong>Total ECTS – 24.75</strong></td>
</tr>
</tbody>
</table>

### Engineering Part of the Core Curricula: the Fundamental Core Basis

<table>
<thead>
<tr>
<th>FEANI Report</th>
<th>Agricultural Engineering (Latvia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning outcomes and contents follow. The learning outcomes may be delivered through the following structured coursework, or equivalent:</td>
<td>Learning outcomes and contents follow. The learning outcomes are delivered through the following structured coursework:</td>
</tr>
<tr>
<td>1. Engineering Graphics and Design - CAD</td>
<td>1. Descriptive Geometry (ECTS – 4.5)</td>
</tr>
<tr>
<td></td>
<td>8. Applied Electrical Engineering (ECTS – 4.5)</td>
</tr>
<tr>
<td></td>
<td>9. Dynamics of Machines (ECTS – 6.75)</td>
</tr>
<tr>
<td><strong>Total ECTS: 44-51 ECTS CREDITS equal to 24.5-28.3% of total 180 ECTS CREDITS</strong></td>
<td><strong>Total ECTS – 51.5</strong></td>
</tr>
</tbody>
</table>
### Agricultural /Biological Sciences Part of the Core Curricula: the Fundamental Core Basis

<table>
<thead>
<tr>
<th>FEANI Report</th>
<th>Agricultural Engineering (Latvia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total ECTS: 20-25 ECTS CREDITS equal to 11-14% of total 180 ECTS CREDITS</td>
<td>Total ECTS – 3.0</td>
</tr>
</tbody>
</table>

### Mechanical Systems and Mechanisms (Agricultural Machinery)

<table>
<thead>
<tr>
<th>FEANI Report</th>
<th>Agricultural Engineering (Latvia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL ECTS: 28-30 ECTS CREDITS: EQUAL TO 15.5-16.7% OF TOTAL 180 ECTS CREDITS</td>
<td>Total ECTS – 42.0</td>
</tr>
<tr>
<td>FEANI Report</td>
<td>Agricultural Engineering (Latvia)</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>AGRICULTURAL / BIOLOGICAL SCIENCES PART OF THE CORE CURRICULA: OPTIONAL COURSES</td>
<td></td>
</tr>
<tr>
<td>Learning outcomes and contents follow. Assuming 4 course units with 4 or 5 ECTS credits per unit, the learning outcomes may be delivered through the following structured coursework, or equivalent:</td>
<td></td>
</tr>
<tr>
<td>1. Crop Science and Management</td>
<td>1. Basics in Agronomy (ECTS – 4.5)</td>
</tr>
<tr>
<td>2. Crop Protection</td>
<td>2. Animal Breeding Technology (ECTS – 3.0)</td>
</tr>
<tr>
<td>3. Agro-chemicals Animal Science and Management</td>
<td></td>
</tr>
<tr>
<td>5. Environmental Impact Assessment</td>
<td></td>
</tr>
<tr>
<td>TOTAL ECTS: 16-20 ECTS CREDITS: EQUAL TO 8.9-11.1% OF TOTAL 180 ECTS CREDITS</td>
<td>TOTAL ECTS – 7.5</td>
</tr>
</tbody>
</table>
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN LITHUANIA

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Kestutis.Navickas@lzuu.lt

Abstract
National responsibility for quality policy of studies in Lithuania lies with Ministry of Education and Science. The Centre for Quality assessment in Higher Education is responsible for quality evaluation. Quality assurance is the responsibility on the institutional level is the responsibility of higher education institutions themselves. External evaluation of new and operating study programmes is compulsory. Accreditation of operating study programmes is compulsory. The national quality assurance system includes: responsibilities of the bodies and institutions involved; evaluation of programs or institutions, including internal assessment, external review, participation of students and the publication of results; a system of accreditation procedures; international participation, cooperation and networking.

The national qualifications framework plays a structuring role in the national system of qualifications because the qualifications are designed, issued, assessed and recognised according to the qualifications levels defined by the framework. Levels of qualifications in the national qualifications framework of Lithuania are structured hierarchically and encompass a comprehensive range of qualifications.

A core curriculum of the programme of Agricultural Machinery has enough courses in Basic Sciences and Fundamental Core Basis in comparison with recommendations on FEANI report. There is not sufficient amount of the courses of Agricultural /Biological Sciences.

1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies
Under the “Law on higher education and research” (2009) the Higher education institutions shall be responsible for the quality of studies and other activities. They must publicly announce the quality indices of their activities and the quality of activities regarding higher education and research together with assessment institutions. The quality of studies shall be ensured through the internal systems of ensuring of the quality of higher education institutions, external assessment and accreditation of study programmes, external evaluation of research activities and external assessment and/or accreditation of higher education and research institutions.
The objective of external assessment – to determine the quality of activities of higher education institutions, to offer recommendations for improving their quality, develop the culture of quality assurance in higher education and research. The purpose of the accreditation – to determine on the basis of external evaluation findings whether or not a study programme and/or a newly established higher education institution meets the requirements of legal acts.

Every higher education institution must have an internal system of quality assurance in studies based on the provisions of quality assurance in studies of the European Higher Education Area and on the strategy of improvement of activity quality approved by the higher education institution itself; must provide for action methods and measures which help to ensure the quality of higher education provided by the institution. A higher education institution must constantly announce in its website and in other ways the accurate quantitative and qualitative information about study programmes, awarded higher education qualifications, research activities, evaluation results, opinions of students, graduates and other interested parties about study quality, assessments of activities of the higher education institution performed by the accredited institutions, career indexes of graduates; it may also announce other data necessary to inform the public about studies. Higher education and research institutions shall constantly carry out self-assessment of research activities.

Only accredited study programmes shall be carried out. Branches of foreign higher education institutions may carry out only those study programmes which have been evaluated and accredited according to the procedure of evaluation and accreditation of that country and which have been positively evaluated according to the procedure of external evaluation and accreditation of study programmes. External evaluation of study programmes of higher education institutions shall be performed by the Centre for Quality Assessment in Higher Education or another agency for quality assessment in higher education, which is included in the Register of the European Association for Quality Assurance in Higher Education. Study programmes shall be accredited by the Minister of Education and Science in accordance with the procedure laid down by the Ministry of Education and Science. An accredited study programme shall be entered in the Register of Study and Training Programmes for a fixed period of time.

Study programmes must be accredited at least once in six years. A study programme which has not been accredited or a programme the accreditation period of which has expired shall be deregistered from the Register of Study and Training Programmes. In the cases where there are students who have studied under the programme which is being deregistered, but have not completed the said programme, the Minister of Education and Science shall set further possibilities for their studies. The description of the procedure of external evaluation and accreditation of study programmes shall be approved by the Minister of Education and Science.

In order to improve the quality of activities of higher education institutions and state research institutes and to implement their accountability, the Ministry of Education and Science shall, every six years, initiate external evaluation of their activities, involving experts from foreign states. External evaluation of activities of higher education institutions and state research institutes shall comprise all fields of activities indicated in their statutes, regulations and shall be based on the criteria of conformity of the
activities with the mission specified in the statutes, regulations, with an international level of higher education and research, conformity of the evaluation of study results with the set requirements, with the implementation of the requirements of academic ethics and procedures, with the efficiency of the use of state funds.

External evaluation of activities of higher education institutions shall be organized by an institution authorised by the Ministry of Education and Science. The results of the external evaluation of higher education institutions shall be used for accreditation or evaluation of the said institutions also in other cases provided for by a founder (a meeting of members of a legal person).

The main objectives of the Centre for Quality Assessment in Higher Education shall be as follows: to encourage the quality of activities of higher education institutions through an external assessment and accreditation of institutions and study programmes; to create favourable conditions of the free movement of persons when organising and carrying out the assessment and/or recognition of higher education-related qualifications awarded in foreign institutions in Lithuania and fulfilling other function set by the Government.

Under the “Description of study programme external evaluation and accreditation regulation” (2009), Centre for Quality Assessment in Higher Education determines how the study programme content, its structure and realisation correspond to the regulations of a particular study field, requirements of Sequential study programmes, Graduate study programme general regulations, Underground, Special Vocational and Consecutive study programme regulations, affirmed by the Ministry of Education and Science, and other legal acts regulating higher education, evaluates the programme in terms of programme accreditation criteria and provides suggestions for the Ministry with regard to its accreditation.

2. European Qualification Framework (EQF)

The national qualifications framework in Lithuania is currently an integral and central part of the national system of qualifications. According to the designed model [3], the national system of qualifications consists of the qualifications framework and the processes of designing, providing, evaluating and the recognising qualifications. The national qualifications framework plays a structuring role in the national system of qualifications because the qualifications are designed, issued, assessed and recognised according to the qualifications levels defined by the framework. Implementation of the national system of qualifications and the national qualifications framework will start in 2010.

The national qualifications framework of Lithuania will play an important role in all processes of the national system of qualifications: it shall form the basis of reference for designing the qualifications; it will help to define the level of qualifications for designing occupational standards and mapping existing and new qualifications in the national register of qualifications. These functions confirm the necessity of a competence-based approach, help foster equity between the different forms and ways of provision and acquisition of qualifications by setting a clear basis of information on the levels of qualifications and the ways of progression between these levels.
Levels of qualifications in the national qualifications framework of Lithuania are structured hierarchically and encompass a comprehensive range of qualifications acquired at secondary schools, vocational education and training schools, as well as qualifications acquired at employment training centres, continuing vocational training courses and institutions of higher education.

The first five levels of qualifications include qualifications acquired in initial vocational education and training institutions and continuing vocational training or at the workplace. Levels 6 to 8 encompass qualifications acquired at higher education institutions.

3. The EUR-ACE academic accreditation procedure regarding Biosystems Engineering or related programmes of studies.

In Lithuania there is established a Centre for Quality Assessment in Higher Education, which has also the responsibility to assess the programmes according to the requirements for programme accreditation.

National criteria and requirements for programme assessment are defined in a very general way and are not so detailed as in the European Standards and Guidelines for Quality Assurance in the European Higher Education Area. External evaluation visits are more oriented to check the correspondence of the contents, structure and implementation of the programmes to the “legal acts” regulating higher education than to evaluate the results of the programmes and to obtain evidence of the ability of the programmes to reach its objectives.

Qualifications of higher education are classified into 6 main spheres:

- humanitarian sciences,
- art studies,
- social sciences,
- physics sciences,
- biomedical sciences,
- technology sciences.

Every study sphere contains of different fields, and four number code is given to every of them. Also every study sphere is given qualification degree and qualification, after finishing higher education institution. But in this classification the study programmes are better distinguished than qualification itself.

Study programmes of Agricultural/Biosystems Engineering are registered in the sphere of Technological Sciences, in the fields of Mechanical Engineering and Energy Engineering. Four study programmes of Agricultural Engineering were accredited using national labels and performed by national and international reviewers in 2008. There is no specific field in Agricultural/Biosystems Engineering.

One study programme of Agricultural Engineering had trial EUR-ACE accreditation in 2005. National Centre for Quality assessment is in contact with EUR-ACE. There is no professional accreditation.
4. Analysis of programme of Agricultural Machinery using the attached Agricultural/ Biosystems Engineering EurAgEng Recognition Template.

Analysis of the study programme of Agricultural Machinery is made using EurAgEng Template. The study programme was divided in three parts: Basic Sciences, Fundamental Core Basis and Agricultural /Biological Sciences. Curriculum of the programme contains sufficient number of courses related with Basic Sciences (Table 1), that amounts 39 ECTS (required 36-45 ECTS).

<table>
<thead>
<tr>
<th>FEANI Report</th>
<th>Curriculum under ‘recognition’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Sciences</td>
<td></td>
</tr>
<tr>
<td>Mathematics (min. 24)</td>
<td>Basic Sciences</td>
</tr>
<tr>
<td>Computer Science / Informatics</td>
<td>Mathematics (ECTS 21)</td>
</tr>
<tr>
<td>Physics</td>
<td>Computer Science / Informatics (ECTS 5)</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Physics (ECTS 8)</td>
</tr>
<tr>
<td></td>
<td>Chemistry (ECTS 5)</td>
</tr>
<tr>
<td>Total ECTS: 36-45 ECTS CREDITS equal</td>
<td>Total ECTS 39</td>
</tr>
<tr>
<td>to 20-25% of total 180 ECTS</td>
<td></td>
</tr>
<tr>
<td>Humanities and Economics (min. 10% of</td>
<td>Humanities and Economics (Total ECTS 34)</td>
</tr>
<tr>
<td>total 180)</td>
<td>• Engineering Economics</td>
</tr>
<tr>
<td></td>
<td>• Agricultural Economics</td>
</tr>
<tr>
<td></td>
<td>• Introduction to Philosophy</td>
</tr>
<tr>
<td></td>
<td>• Introduction to Justice and Law</td>
</tr>
<tr>
<td></td>
<td>• Introduction to Sociology</td>
</tr>
<tr>
<td></td>
<td>• Technical and Financial Management of Infrastructures</td>
</tr>
<tr>
<td></td>
<td>• Engineering Ethics</td>
</tr>
<tr>
<td></td>
<td>• Society and Technical Development (ECTS 5)</td>
</tr>
<tr>
<td></td>
<td>• Philosophy (ECTS 5)</td>
</tr>
<tr>
<td></td>
<td>• Basics of Economics (ECTS 5)</td>
</tr>
<tr>
<td></td>
<td>• Basics of Law (ECTS 5)</td>
</tr>
<tr>
<td></td>
<td>• Management (ECTS 5)</td>
</tr>
<tr>
<td></td>
<td>• Foreign languages (ECTS 6)</td>
</tr>
<tr>
<td></td>
<td>• Technical language (ECTS 3)</td>
</tr>
</tbody>
</table>

The Engineering part of the core curricula has all recommended courses and amounts 56 ECTS (Table 2). It is a little more than recommended in the FEANI report. Programme of Agricultural Machinery is registered as programme of Mechanical Engineering and fulfils national requirements.
Table 2. The Fundamental Core Basis

<table>
<thead>
<tr>
<th>FEANI Report</th>
<th>Curriculum under ‘recognition’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering part of the core curricula: the fundamental core basis</td>
<td>Engineering part of the core curricula: the fundamental core basis</td>
</tr>
<tr>
<td>5. Fluid Mechanics</td>
<td>5. Fluid Mechanics (ECTS 5)</td>
</tr>
<tr>
<td>8. Electricity and Electronics</td>
<td>8. Electricity and Electronics (ECTS 9)</td>
</tr>
</tbody>
</table>

Total: 44-51 ECTS CREDITS equal to 24.5-28.3% of total 180 ECTS

Total 56 ECTS CREDITS

Part of the Agricultural /Biological Sciences in the Core Curricula is less than recommended in FEANI report (Table 3). Courses of Agricultural /Biological Sciences amount 19 ECTS credits. The situation might be improved with courses of Agricultural Meteorology and Micro-meteorology.

Table 3. Agricultural /Biological Sciences Part of the Core Curricula

<table>
<thead>
<tr>
<th>FEANI Report</th>
<th>Curriculum under ‘recognition’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural /biological sciences part of the core curricula: the fundamental core basis</td>
<td>Agricultural /biological sciences part of the core curricula: the fundamental core basis</td>
</tr>
<tr>
<td>1. Plant Biology</td>
<td>1. Plant Biology or equivalent (ECTS 5)</td>
</tr>
<tr>
<td>2. Animal Biology</td>
<td>2. Animal Biology or equivalent (ECTS 6)</td>
</tr>
<tr>
<td>3. Introduction to Soil Science</td>
<td>3. Introduction to Soil Science or equivalent (ECTS 6)</td>
</tr>
<tr>
<td>4. Introduction to Agricultural Meteorology and Micro-meteorology Understanding the Environment and its interaction with Living Organisms</td>
<td>4. Understanding the Environment and its interaction with Living Organisms or equivalent (ECTS 5)</td>
</tr>
</tbody>
</table>

Total ECTS: 20-25 ECTS CREDITS equal to 11-14% of total 180 ECTS

Total ECTS: 19 ECTS
References:

1. Law on higher education and research, 2009 // http://www3.lrs.lt
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS
OF BIOSYSTEMS ENGINEERING STUDIES
IN MALTA

George Attard
george.attard@um.edu.mt
University of Malta, Institute of Agriculture, Malta

Abstract
Regulatory instruments at the national level to ensure high quality are crucial to achieve and maintain a regional hub of higher education in Malta. While The Malta Qualifications Council and the National Commission for Higher Education are established and operational, the legal framework to set up a quality assurance agency and a quality assurance and licensing framework is in place, but the legislations is still awaiting approval. The University of Malta has set up internal quality assurance structures. The Programme Validation Committee monitors, reviews and recommends programmes for approval by Senate. The formation of the Institute of Earth Systems will facilitate the means through which a Bio Systems Engineering course could be offered. Furthermore the recent establishment of a Maltese Chamber of Agrologists could in theory eventually take up the role to grant professional accreditation.

Introduction
The Maltese Government has also put into force a vision of transforming Malta by 2015 into a regional hub of excellence in further and higher education. Concurrently, this sector is fast expanding to meet the growing demands driven by the increasing requests for a knowledge-based workforce, together with the aspirations of more students to continue their studies following the completion of compulsory education. Presently, foreign educational institutions are enquiring with the intention of setting up centres or provide programmes in Malta. This scenario requires a modern regulatory environment that ensures growth and promotes high quality standards.

1. National quality assurance structures
The Malta Qualifications Council (MQC) was set up in October 2005 through Legal Notice 347/2005 to define a National Qualification Framework (NQF) compatible with the European Qualification Framework (EQF). In November 2006, the first draft of the NQF was launched for consultation. The Maltese NQF was developed in the framework of lifelong learning, and focuses on learning outcomes defined in terms of knowledge, skills and competencies at all levels of qualifications, of entry and exit points at every level of qualifications as well as levels of qualifications by sector and by occupation. Similar to the European Qualification Framework, the Maltese NQF is the reference point between training providers, industry and learners.

The National Commission for Higher Education (NCHE) was set up in October 2006, in line with Government’s strategic objectives of further developing higher and tertiary
Education and Research in Biosystems or Agricultural and Biological Engineering in Europe; a Thematic Network (ERABEE-TN)

Project Number: 134306-LLP-1-2007-1-GR-ERASMUS-ENW

education and to define a clear vision, sustainable targets and objectives. For this purpose the legislative instruments were included in Act XIII 2006 which amended the Education Act of 1988. In 2008, the NCHE launched its recommendations entitled “A Quality Assurance Framework for Further and Higher Education in Malta”. Since then the NCHE has continued to advocate and attend conferences and international training workshops organised by the European Network for Quality Assurance Agencies (ENQA) representing Malta as a founding member of the European Quality Assurance Register (EQAR). The NCHE has also developed a draft for the future establishment of a quality assurance agency and continues to support the Ministry of Education in its drafting of regulations. The aims and principles of the proposed framework are based on the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) (ENQA, 2005) as adopted by the Ministers responsible for higher education within the Bologna Process in Bergen in 2005.

The National Commission for Higher Education (NCHE) believes that the necessity of quality assurance, accreditation and licensing is not an option but a pre-requisite, and government has the responsibility for the assurance of quality and excellence of both public and private provision. The more autonomous institutions are from their regulators, the bigger the need for transparent and adequate internal quality assurance systems. The establishment of a quality assurance agency and a quality assurance and licensing framework in Malta require legal reforms which to date has not as yet been finalised.

The proposed framework is made up of four elements: adequate internal quality assurance systems; external quality audits; accreditation and recognition decisions based on the results of external audits; and licensing systems linked to accreditation.

2. Quality assurance at the University of Malta

The University of Malta is an autonomous and self-governing body funded by public funds offering courses at undergraduate, graduate and postgraduate levels. Currently it is the only University which confers degrees, however a private sector has slowly but steadily emerged over the past years.

The fact that the University of Malta followed the British model for Higher Education, the already existing structure facilitated the implementation of the Bologna Process. Consequently what was required was mainly streamlining already existing courses to the Bologna requirements. By 2005, the University of Malta had already carried out the implementation of the ECTS system across all undergraduate courses except in the case of Medicine and Dentistry. The University of Malta also implements the framework of describing ECTS in terms of learning outcomes. All of the first cycle courses now run with harmonised regulations. ECTS are also being implemented in Masters courses and regulations have been changed to allow recognition of joint Masters degrees. In fact, the University of Malta is currently involved in the provision and recognition of joint degrees through EU programmes such as ERASMUS Mundus. It has also launched Joint Masters programmes with the US.

In 2006 the University of Malta developed the Diploma Supplement aimed to make the University of Malta awards more readable and easily comparable locally and abroad as it gives a precise description of the academic course followed and of the competencies acquired during the study period. It also aims to give a fair judgment of graduates’

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achievements and competencies, to facilitate access to opportunities for work or further studies and lifelong learning locally and abroad, and to foster graduates' employability across Europe. The University of Malta has issued the Diploma Supplement in full conformity with EU/CoE/UNESCO Diploma Supplement format. The first few Diploma Supplements were issued in the 2006 Graduation. In keeping with its strong commitment to the Bologna Process, in 2007 the University of Malta awarded the Diploma Supplement to over 200 graduates in the Bachelor of Engineering (Honours), Bachelor of Science (Honours) in Information Technology, Bachelor of European Studies, Bachelor of European Studies (Honours) and Bachelor of Psychology (Honours) courses. In November/December 2008, more than 50% of the students graduating from the University of Malta were issued the Diploma supplement.

The National Commission for Higher Education was set up in line with national quality assurances. In 2007 it carried out a review of all aspects related to Quality Assurance within the Maltese further and Higher Education system. The report concluded that there is a weak national structure for external QA. The University of Malta has taken steps to improve its quality assurance structures. The Programme Validation Committee has been established to monitor, review and recommend programmes for approval by Senate. The Programme Validation Committee (PVC) has been entrusted by Senate to ensure that programmes of study offered by the University are of the required academic standard, are supported by the necessary resources and are responsive to national and market needs. The Academic Programmes Quality and Resources Unit (APQRU) is the administrative arm of the PVC. APQRU is dedicated to the facilitation of quality assurance and improvement activities intended to promote a culture of commitment to excellence in the provision of academic services. Our mission is driven by the ultimate aim of supporting teaching and learning and of ensuring that the education provided to our students is of the highest standards. The APQRU forms part of the Rector’s Office and, in conjunction with the office of the Registrar, assists faculties, institutes and centres in designing their undergraduate and postgraduate programmes of study in line with the general regulations.

3. Recent Developments

Following extensive consultation with all Maltese stake holders, a strong impetus was felt to reorganise to better reflects the diversity of academic programs and research initiatives required in meeting the urgent local challenges surrounding food safety, resource use and environmental resources. In order to address the various challenges, Malta needs an institution that brings together experts from agriculture, ecology, environment, sociology and economics. The synergies created through this initiative will provide an interdisciplinary approach to achieve sustainability of our local agro-environment. During the fourth meeting of Senate of the University of Malta held on the 26th of April, 2010, Senate endorsed the proposal to amalgamate the Institute of Agriculture and the International Environment Institute and create a new institute by the name of INSTITUTE OF EARTH SYSTEMS.

The statue of this new institute defines “Earth Systems” as referring to a concept which goes a step beyond traditional disciplinary investigation, taking a wider perspective of the Earth’s dynamic systems. Such notion acknowledges the interconnectedness of
abiotic and biotic components, as well as the need for sound planning and integrated resources management. Critical to a ‘systems’ approach is the inclusion of people and their environment. Earth systems science thus recognizes the link and interaction between the geo-sciences, evolutionary processes and ecology, and the human dimension (broadly the social, economic, cultural and technological elements), through environmental management. Amongst other things, the aims shall also include the training of target groups (including environmental planners, environmental managers, agrologists, architects, engineers, economists, journalists and lawyers) on environmental issues pertaining, in particular, to their respective areas.

On the 12th May 2010, the first annual general meeting of the newly formed Malta Chamber of Agrologists was held and the first managing committee elected. The chamber defines “Agrologist” as meaning a person providing services related to the development, management, conservation and sustainability of agriculture and agricultural resources. The principle purpose of MCAg is to govern its members in accordance to the statute in order that the public interest may be served and protected especially where the safeguarding of life, health, property and the public welfare is concerned. Furthermore, the chamber aims to accredit its members with a list of competencies in the sector.
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES
SITUATION IN THE NETHERLANDS

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Abstract
All university programmes in the Netherlands have to be accredited by an independent agency. The programmes are assessed by a quality agency and their report is the basis for the accreditation decision. The Dublin descriptors play a very important role in the quality assurance. The programmes have to proof they meet the exit levels as described by the Dublin descriptors.
The quality assurance systems used in the Netherlands is in line with the Qualification Framework of the European Higher Education Area. In the Netherlands there is no professional accreditation. At this moment there is an issue between the Dutch accreditation organisation (NVAO) and FEANI on accreditation of engineering programmes as Dutch law does not accept accreditation by other bodies than the NVAO. It is likely that these issues will be solved in 2010.
The Biosystems Engineering related bachelor programme of Wageningen University is 180 credits but these 180 credits are not solely used for course work. The framework of the university prescribes 30 credits free choice for a minor and a bachelor thesis of at least 12 credits. This makes it impossible to meet the FEANI criteria by number; the programme is almost in line with the FEANI criteria when the relative shares of the different components are considered.

1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies
All university study programmes in the Netherlands are subject to a periodic accreditation by the NVAO (Accreditation Organization of the Netherlands and Flanders). The NVAO has set out a framework for the accreditation. In this framework the Dublin descriptors for the exit levels of the Bachelor’s and Master’s are incorporated as reference points for monitoring the quality of the study programmes. Accreditation of a program means that the graduates have attained the knowledge, insight and skills related to the respective level. For this it is necessary that the programmes are build on attainment targets and/or exit competences. The first step in the quality assurance and assessment framework therefore is formulating the learning outcomes of the graduates for respectively the bachelor and the master programme, in line with the Dublin descriptors. The second step is the realization of a study programme which enable the

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students to really attain the formulated learning outcomes. The third, fourth and fifth step are related to accreditation.

The third step is drafting a self study report by the programme in which the programme has to prove that it meets the criteria for the level (bachelor / master) and orientation (academic / professional) of the programme on the following six themes:

1. Aims and objectives: the learning outcomes have to correspond with the requirements set by the professional colleagues, both nationally and internationally. The learning outcomes must correspond with the internationally accepted descriptions of a Bachelor’s or Master’s qualification (Dublin descriptors).

2. Curriculum: For the academic orientation there must be clear link between education and research and the programme must ensure the development of competences in research. The curriculum must be an adequate realization of the intended learning outcomes. Next to these the curriculum must be consistent, can be successfully completed in the set time, must be in line with the qualifications of the incoming students, must meet the legal requirements for the number of credits, must have an educational concept in line with aims and objectives, adequately assess the students by means of evaluations, tests, and examinations.

3. Staff: for the academic orientation the teaching has to be provided by researchers that contribute to the development of the subject or discipline. In addition, there must be sufficient staff that must be sufficiently qualified.

4. Services: the housing and facilities have to be adequate, the students have to be adequately informed and tutored on their study progress, all in line with the needs of the students.

5. Internal quality assurance system: the curriculum has to be periodically evaluated. The outcomes of the evaluation are the basis for improvement and staff, students, and alumni, and the relevant professional field have to be actively involved in the internal quality assurance system.

6. Results: the achieved learning outcomes have to correspond with the aims and the objectives regarding level, orientation and subject-/discipline-specific requirements. The set target rates should be in line with those of comparable programmes and the realized success rates have to be met by the programme.

The reflection of this qualification framework on the university and programme level is that for each of the six themes specific activities are undertaken to meet the requirements. The learning outcomes are recently critically reviewed and reformulated to bring them in line with the standards, the curricula are regularly reviewed, academic staff must have a PhD, must do research and the quality of the staff is periodically evaluated, services are continuously improved and major investments are done to keep the facilities for teaching up to date, all courses are each time evaluated with a questionnaire, the outcomes are discussed with students and staff, and measures for improvement are taken when necessary, each programme has a professional field committee the meets at least once a year to discuss the quality of the programme, achieved learning outcomes are compared with intended learning outcomes and success rates are formulated and monitored and measures are taken when these are not met.
The fourth step is the assessment of the programme by a quality agency. This agency pays a site visit to the programme and an external panel verifies whether the assessment by the programme itself and written down in the self study report is correct or not. This panel meets with several bodies of the universities to check and discuss the relevant items. This panel writes a report and this report is sent to the accreditation organisation which finally takes a decision on accreditation of the programme or not (the fifth step).

2. **European Qualification Framework (EQF)**
The National Framework of Qualifications in Higher Education in the Netherlands are compatible with the overarching Framework for Qualifications of the European Higher Education Area (QF-EHEA). This has been verified by an independent and international verification committee ([www.nvao.net/nqf-nl](http://www.nvao.net/nqf-nl)). This verification is related to all three cycles.
Following this statement implies that the European Qualification Framework has no additional consequences for the quality assurance and the national framework in the Netherlands. This framework is briefly described in the previous section.
The consequence for the implementation of this system for the Agricultural and Biosystems Engineering programs of studies is that the learning outcomes drafted by the USAEE and the ERABEE project are likely to be used as reference level for the programme in the accreditation process.

3. **EUR-ACE academic accreditation procedure regarding “Biosystems” Engineering or related programmes of studies**
The Netherlands has no professional accreditation for Agricultural and Biosystems Engineering. There are a very few professions that have such an accreditation on the Netherlands.
The Netherlands has an academic accreditation. This accreditation is done by an independent body, the NVAO.
Since there is no professional accreditation, there is also no relation between professional and academic accreditation.
There has been a long debate between the NVAO and FEANI on delivering the EURACE label, and especially the accreditation part. Dutch law does not allow accreditation by any other organisation than the NVAO. The proposed solution is that for programmes that are interested in the EURACE label, the NVAO will impose the EURACE framework and other “obligations and rules” of the EURACE partners on the quality agencies that evaluate the programmes. However, this is still under discussion and not solved. It is expected to be solved by the end of 2010. Dutch study programmes are also free to choose for example ASIIN or CTI as quality agency but the final decision on accreditation is taken by the NVAO, since the Dutch law demands this.

4. **Analysis of the Biosystems Engineering related programme in the Netherlands**
The Biosystems engineering related programme of Wageningen University has no distinct modules the students can choose from. All students do almost the same bachelor programme. The program consists of 114 credits compulsory courses, 12
credits for restricted optionals (biology related courses), 24 credits for a bachelor thesis and 30 credits free choice, which is preferably used for a minor. 30 Credits free choice and a bachelor thesis are prescribed by the framework of Wageningen University for a Bachelor of Science programme. An overview is given in Table 1. The data in the table shows that the programme of Wageningen University does not meet the criteria of FEANI. This is mainly caused by that the FEANI criteria are based on a programme consisting of only courses. When the relative shares of the different components are compared it becomes clear that on this basis the compulsory programme of Wageningen University is in line with the criteria set by FEANI; for some courses it can be discussed whether they belong to engineering or to basic sciences.

Table 1. Overview of program Wageningen University in relation to FEANI criteria.

<table>
<thead>
<tr>
<th></th>
<th>Wageningen University</th>
<th>FEANI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Credits</td>
<td>%</td>
</tr>
<tr>
<td>Basic sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• mathematics</td>
<td>39</td>
<td>31%</td>
</tr>
<tr>
<td>• physics</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>• chemistry</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>• informatics</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Economics and humanities, electives</td>
<td>12</td>
<td>10%</td>
</tr>
<tr>
<td>Engineering</td>
<td>45</td>
<td>36%</td>
</tr>
<tr>
<td>Agricultural / Biosystems engineering science</td>
<td>30</td>
<td>24%</td>
</tr>
<tr>
<td>• agricultural engineering</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>• biological</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>126</td>
<td>100%</td>
</tr>
<tr>
<td>Bachelor thesis</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Minor (or electives)</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>180</td>
<td></td>
</tr>
</tbody>
</table>

The main required adjustment to meet the FEANI criteria is to abolish the free choice and replace it by courses and reduce the size of the bachelor thesis to a maximum of 18 credits. Abolishment of the free choice is in conflict with the framework of the university; total abolishment of the free choice is in conflict too, a reduction from 24 to 18 could be possible. Changes in the framework of Wageningen University on short term in the direction needed are not foreseen. The issue of meeting the criteria set by FEANI will probably be discussed in relation to the next accreditation round in 2013 with the quality agency, assuming that the issue between the NVAO and FEANI is solved by that time.

Another opportunity could be the re-evaluation of the FEANI criteria, taking into consideration the criteria of other engineering disciplines.
5. Other interested institutions
There are no other institutions that may be interested since Wageningen University is the only institute with a Biosystems Engineering related programme on BSc and MSc level.
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN NORWAY

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1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies in Norway

1.1 Evaluation
Evaluation of student courses is carried out annually. This is carried out by the students themselves in the middle of the course and after they have finished. The evaluation is anonymous. The teacher gets the results and may then be able to adjust and/or adapt the teaching the following year. The evaluation covers several aspects like progress, scientific level, work load, literature, use of digital means, communication between teacher and students, project work, co-teachers, learning skills etc. A credit from 1 (low) to 6 (highest) is given for every topic. The evaluation is made over the intranet. However, it is voluntary and thus only 20-40% of the students normally fill out the electronic evaluation form.
The program is also reviewed through discussions with students, at teacher gatherings and in discussions among the academic groups- and sections. Also, contact with external examiners, colleagues and networks outside the department give highly valuable input to ensure the quality of the program.
The educational program is also evaluated. Every single educational program is evaluated annually by an own committee at the university. Additionally, an evaluation is carried out every 5-10 years by a committee including international experts. This is very costly and time consuming because the committee consists of several members from other universities (students as well as professors) and companies especially from R&D.

1.2 Revision
All courses are also opened for an annual revision. This makes the teacher able to make improvements and other changes e.g. due to the former mentioned evaluation or other experiences. In the similar manner all educational programs are evaluated.
The aim of the possible revision and evaluation of single courses as well as educational programs is to improve the educational level and quality with an optimal amount of teaching staff as well as infrastructure. It is important to avoid too much administration costs. It is also of high value that the revision and evaluation mirror the real situation. Especially this question could be raised due to the student evaluation e.g. in a how large extend a change in the course is demanded if only 20-40% of the students respond by the voluntary evaluation. Probably this evaluation better should have been more simple and compulsory in order to ensure a correct conclusion and then following upgrading and implementation.
2. European Qualification Framework (EQF)
Because Norway is not an EU-member the EQF is still not implemented. However, the educational administration at the university has been informed about this system and it is said to be implemented at our university in one or two years. However, Norway has a national system which is very similar to the EQF system. The national qualification framework is mentioned in chapter 1.
At the Norwegian University of Life Sciences we do not have an own educational program dealing only with Agricultural and Biosystems Engineering. As explained in earlier ERABEE-papers we have an industrial engineering 5 years master study and some courses in agricultural engineering offered for several students e.g. from soil and plant science departments. All these educational programs and courses ought to be revised and evaluated due to the routines earlier described.

3. EUR-ACE academic accreditation procedure regarding “Biosystems” Engineering or related programmes of studies.
a. The EUR ACE academic accreditation is not implemented at our department. This is because our students may go into different positions and not only into a certain specific position which has to be approved by any academic accreditation.
b. Due to missing implementation, the relationship between professional accreditation and academic accreditation agencies and procedures in Norway for Engineering programs of studies has no relevance.
c. A national academic accreditation procedure in force at our university does not exist.
d. There does not exist any national academic accreditation at our university. This is because the position titles, given after the students are finished, are not protected in this manner. However, the Norwegian Association of Higher Education Institutions http://www.uhr.no/ and Norwegian Agency for Quality Assurance in Education (NOKUT) http://nokut.no/en/ decide what to be implemented in the educational program in order to be finally approved. The quality is ensured by the evaluation of courses and programs and the credits obtained by the student themselves when passing the final examination. However, the Norwegian authorities have set special requirements and have to approve every specific educational program and what to be included to get a master title or siv.ing title (senior engineer).
e. If an academic accreditation should be needed in the future, the most potential organisation to carry out such an accreditation probably would be the Norwegian Agency for Quality Assurance in Education as mentioned above.
f. As mentioned earlier a comparable procedure to formally accredit Biosystems Engineering or related programmes of studies on a national level is ensured by an annual national approval of the program and international evaluation of the program every 5-10 years. Any professional accreditation is so far not need and thus not wanted at this stage.
g. The Norwegian University of Life Sciences is planning to introduce the EQF system from 2011 including all study programs offered.
4. Program studies at the Norwegian University of Life Sciences with relevance to the Biosystems Engineering studies.

The educational program for 5 years master in engineering and 5 years master in renewable energy are corresponding very well with the FEANI-report. More information about study programs can be found on the internet http://www.umb.no/study-options. All courses given at the university may also be studied in details from the internet http://www.umb.no/search/courses/?string=. Both web addresses contain files written in English as well as allocated credits for all courses. Below more details about the two master programs are mentioned.

4.1. Technology - Machinery, Process and Product Development – 5 years master

The following are compulsory: Introductory course 10 credits, Mathematics 30 credits, Informatics 10 credits, Physics 20 credits, Statistics 10 credits, Examen Philosophicum 10 credits, Economy and Social sciences 10 credits, Innovation and Product Development 5 credits. Furthermore, natural scientific courses, select courses and programme-specific courses amounting to 105 credits are included. Examples are the following: FEM-design, Chemistry, Micro-biology, Mechatronics, Electronics, Control Engineering, Modelling and simulation of technical and biological systems, Materials technology, Fluid-dynamics, Thermo-dynamics, Waste-treatment, etc. In addition to a Master's thesis of 30 credits, the student has to choose courses at the 300 level amounting to 30 credits, whereof one of the two courses TMP301 Machinery- and product development or TMPP350 Process technology II, each counting 15 credits, has to be included. The rest of the programme can be filled in with elective courses, totalling 300 credits. The programme is tailored so that the student can include several other courses at the 300 level, provided sufficient background. Suitable courses can be in production technology and management, energy and environmental engineering etc. The student will gain basic engineering knowledge by the courses in Materials technology, Technical design, Electronics and Control engineering (totals 35 credits) and by choosing 45 credits from the following (or similar): Machinery parts and mechanisms, Mechatronics, FEM-design, Product development and product design, Electronics, Hydromechanics, Transportation of fluids and gasses, Thermo physics and Process technology.

4.2 Technology - Environmental Physics and Renewable Energy – 5 years master

300 credits, taught in Norwegian. Contact: Department for Mathematical Sciences and Technology (IMT). www.umb.no/imt

The program gives the students a combination of qualifications in both the natural sciences and technology, qualifications which are required by society for operation and innovation within businesses, management and research. The study program represents a continuation of the previously offered civil engineering program, and at UMB it emphasizes topics which are central to the maintenance and development of a sustainable society. Upon program completion, the students are qualified to work within private technical consultancy firms and producers/distributors, as well as in communal and state-owned technical departments and directorates. The candidates can also work
within education (provided that the requirements for pedagogical qualification is fulfilled), research institutes, universities and university high schools. The Master’s degree qualifies students to apply for enrolment into Ph.D. studies within the scientific field.

**Admission requirements:** Higher Education Entrance Qualification and specific courses within science and mathematics from upper secondary school is a requirement. Acceptance to the higher level is open to students with a 3-year Bachelor’s degree in Technology/relevant education of at least 180 credits. This has to include at least 27 credits of Mathematics (including Math 3, from an engineering college). Applicants with relevant background for the specialization can normally complete the program in two years. For applicants with an educational background only partially relevant to the specialization, the study period may exceed two years. The study program is taught in Norwegian and applicants who do not have Norwegian as their native language must document sufficient Norwegian skills (Bergenstest) to be admitted.

**Internationalization, studies abroad and exchange agreements:** The Institute recommends students to take a semester or a year abroad on one of our bilateral or ERASMUS agreements. This should preferably be done in the 4th year of study. Many scientists are active in international fora and this contributes to the development of their research area. A study period abroad can be arranged during the 4th year. Relevant teaching institutions include: the Institute for Mathematical Modelling at the Danish Technical University and the Mathematical Institute at the Kungliga Tekniska Högskolan in Stockholm.

**Related studies:** The study program is related to similar study programs in technology at NTNU and will lead to the same degree.

**Learning goals:** Upon program completion, the students should have acquired the qualifications necessary to become key employees, specialists, within businesses where the combination of natural science and technology plays an important part. They shall have sufficient theoretical knowledge in order to solve assignments and gain further knowledge on their own. They should also have developed practical ability in technology and methodology, so that they can go straight to productive work. The students shall have basic knowledge of mathematics, physics and computer science. The shall be able to understand the physical basis for sensors/ data acquisition, and the mathematical and informatical basis the presentation, analysis, interpretation and interpretation of data sets. The students shall be able to plan and perform data acquisition, treatment, analysis and interpretation of data. The knowledge should be applicable in an experimental situation with a topic from the central projects in environmental physics, energy use, cycles, or food science at UMB. Modern computer technology is actively used in this process. The students will receive training in designing and analyzing mathematical models for processes in for example physics, biology, technology and work with other problems based on one of the applied science represented at UMB. Computer-based calculations shall play an important role. The graduates shall be able to judge, valuate and argue around themes regarding scientific questions. In addition, they shall be able to understand how natural science and basic knowledge in physics can be used in order to understand and describe nature and to
understand, use and develop technology. The graduates should have a scientific platform within the central environmental political questions, but should also be able to understand that physics, computer science and mathematics are man-made tools used for investigating nature, that are dependent on our modeling and input. Nature always holds the “answer key”.

**Teaching and evaluation methods:** The program includes the following teaching methods: 1) Lectures. 2) Lectures given by the students in connection with presentation of their semester papers. During the work on their Master’s theses, meetings are arranged where the students present their work. 3) Demonstrations. 4) Group work in relation to topics, methods, computer-models. 5) Exercises taken from previous examination papers or other relevant exercises. 6) Analyses in laboratory. 7) Participation in seminars. 8) Excursions. 9) Study trips. Some courses have a written examination, while others have an oral examination. Grades (A-F) are mostly used, but also passed/failed in some courses. Assessment of completed assignments (with high relevance for the profession) is considered to be a very natural evaluation method, and will still be used extensively. In the final part of the programme, the students will do an independent assignment that shall show their understanding, reflection and maturity.

**Program content:** The program encompasses basic common courses, Examen Philosophicum, introductory courses, statistics, economics and social science (together 50 credits). Courses worth 160 credits in total in physics (at least 60 credits), mathematics (at least 50 credits) and computer science (at least 20 credits). Up to 60 credits in physics, computer science, mathematics (FIM) at the 200 level shall be chosen according to: a) preferred knowledge required for enrolling in certain 300-level courses, b) the topic for the Master’s thesis c) goal of the program. The last academic year will include the work with the thesis (30 credits) and courses at the 300 level (30 credits out of which 15 in physics). 30 credits with elective subjects can be chosen from computer science, mathematics, physics, chemistry, biology, geomatics and geology.

**Student advising:** Student supervision is provided by the student adviser affiliated with the program, e-mail: studieveileder-teknologi@umb.no Supervision will be offered when designing the study plans. The different course teachers are available for academic supervision during office hours. The students are encouraged to contact their teachers if needed.

**4.3. Other activities**

If you visit our web pages you will find several 3 years Bachelor, 5 years Master and 2 years Master (Bachelor from earlier) educational programs more or less containing courses touching Biosystems or Agricultural and Biological Engineering in a low or high extent. At the moment our department has about 60 PhD students within different areas, and the university about 320 PhD students totally.
References:
- [http://www.uhr.no/](http://www.uhr.no/) The Norwegian Association of Higher Education Institutions
- [http://www.umb.no/study-options Overview of Bachelor/](http://www.umb.no/study-options) Master Studies at the UMB. A PDF of Course Catalogue is able to be downloaded
- An own webpage for the Department of Mathematical Sciences and Technology in English is in progress and will be reachable from [http://www.umb.no/about-umb/article/organisation](http://www.umb.no/about-umb/article/organisation) in near future.
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF AGRICULTURAL ENGINEERING STUDIES IN POLAND

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Abstract
In Poland studies are assessed and accredited by the State Accreditation Committee. It is an independent institution which assures quality of higher education. There is no separate institution for quality assurance and assessment of agricultural/biosystem engineering studies. The FEANI requirements are adjusted.

1. Tools for Quality Assurance and Assessment Frameworks of studies in Poland
The main legal institution which is working within the higher education system in Poland for the assurance and improvement in the quality of higher education is the State Accreditation Committee (PKA - Państwowa Komisja Akredytacyjna) [4]. It is an independent institution. PKA is the only statutory body entrusted with the responsibility of evaluating the quality of higher education. Its opinions and resolutions have a legally binding effect. The primary objective of the Committee is to support Polish public and non-public higher schools and universities in the development of educational standards matching the best models adopted in the European and global academic area. The main aim of these activities is to ensure that graduates of Polish higher education institutions (HEI) rank high on the national and international labour market, and to enhance the competitiveness of Polish higher education institutions as European institutions.

The Act of 20th July 2001, amending the existing Higher Education Act, established PKA as legal body working for the quality of education and defined its tasks and its working procedure. On 27th July 2005, the Law on Higher Education adopted by the Parliament redefined the objectives of the PKA.
PKA carries out its mission by conducting obligatory assessments of the quality of education and giving opinions on applications for the authorization to provide degree programmes submitted by polish HEI. The overriding value guiding the work of the Committee is the objectivity of such assessments and opinions. The Committee takes care to ensure that its assessments leave - within the limits of the legislation in force - sample space for autonomous initiatives promoting innovativeness in the teaching process and high quality education culture.

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PKA acts with a sense of responsibility for decisions taken, building its credibility through professionalism in the activities undertaken, adherence to the principle of openness and transparency of the procedures applied, precision of statements justifying the resolutions adopted and respect for academic traditions. This is an institution financed exclusively by public funds.

PKA is a platform for co-operation and dialogue between all parties interested to work with a view to ensuring high quality of higher education. PKA undertakes co-operation initiatives in this area and also in the international arena. The Committee actively cooperates with other accreditation commissions and their international umbrella organisations in the implementation of the Bologna Process and the creation of the European Higher Education Area. PKA has status of a full member in ENQA (European Association for Quality Assurance in Higher Education) since January 2009. PKA was officially accepted on April 2009 to European Quality Assurance Register for Higher Education (EQAR) founded to enhance transparency and trust in quality assurance. This organization publishes and manages a register of quality assurance agencies that substantially comply with the European Standards and Guidelines for Quality Assurance (ESG) to provide the public with clear and reliable informations on quality assurance agencies operating in Europe.

Acting on the belief that quality and effectiveness of education contribute substantially to the socio-economic development of the country, PKA considers that it is its duty to work for the academic community, student applicants and employers, and co-operates with State authorities and public administration bodies in this area.

In Poland there are also few other independent non-for-profit organizations which carry out accreditation of studies. These organizations focus on selected areas: economic - Foundation of Promotion and Accreditation of Economic Education; technical studies - Accreditation Committee for Technical Universities and university studies - University Accreditation Commission. These organizations were established by higher schools or universities [1][2][6].

2. Procedures (steps) of the assessment by State Accreditation Committee (PKA) of the quality of higher education in Poland

1. The Presidium of PKA identifies the fields of study and the higher education institutions (HEI), which will be assessed in a given period (year).
2. The PKA Secretary notifies the HEI that the assessment in a given field of study has commenced and that a self-assessment report should be sent to the PKA.
3. The HEI sends the self-assessment report to the PKA (six weeks from the date of receiving the notification).
4. The Secretary of PKA appoints an assessment team (at least 3 persons).
5. The assessment team analyses the self-assessment report and identifies issues, which require clarifications and additional supporting documents.
6. The HEI is notified of the date of the inspection visit and PKA sends general inspection plan (at least 2 weeks in advance).
7. The assessment team inspects the HEI not later than 8 weeks from the receipt of the self-assessment report.
8. Within 6 weeks the assessment team prepares a report containing the assessment or required conditions for offering degree programs have been met as well as the assessment of the quality of the education.

9. The report of the assessment team is sent to the HEI concerned with a request to express an opinion on the report (within 3 weeks from receipt).

10. The HEI having examined the report sends its comments to the PKA.

11. At the Section meeting the chairperson of the assessment team presents the report and the comments made by HEI. The Section formulates the final assessment proposal and its justification.

12. At the meeting of PKA Presidium the Chairperson of the section presents an assessment proposal and its substantiation.

13. The PKA President puts to vote the assessment proposal formulated by the Section.

14. The PKA Presidium adopts a resolution on the assessment of the quality of education.

15. The resolution is sent to the vice-chancellor (vice-rector) of the HEI, the minister responsible for the higher education and, possibly, to another minister, who supervises a given HEI.

16. Within 30 days from the receipt of the resolution HEI can request the re-examination of the assessment.

17. The examination is published on the PKA’s website and includes the name of the HEI, field and level (cycle) of study which it pertains to.

3. The analysis of selected programmes of agricultural engineering studies in Poland

Studies which are similar to agricultural/biosystem engineering in Poland are officially called “agricultural and forestry engineering (technology)”. There are carried out by 10 universities with many different modules/specializations (table 1).

Table 1. Selected specializations of study in “agricultural and forestry engineering (technology)” offered by Polish universities [3][5][7]

<table>
<thead>
<tr>
<th>University/Faculty</th>
<th>Specializations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural University in Kraków (Cracow), Faculty of Production Engineering and Energetics</td>
<td>Technology and energetics, Information technology in food economy</td>
</tr>
<tr>
<td>Koszalin University of Technology, Faculty of Mechanical Engineering</td>
<td>Food engineering, Engineering of ecological agriculture, Information technology in agriculture and forestry, Engineering of services in rural area, Technology and methods of plant protection, Technology in landscape architecture</td>
</tr>
<tr>
<td>Opole University of Technology/ Faculty of mechanical engineering</td>
<td>Agricultural Engineering</td>
</tr>
<tr>
<td>University of Life Sciences in Lublin, Faculty of Production Engineering</td>
<td>Technical infrastructure in rural area, Technology and infrastructure of food industry</td>
</tr>
<tr>
<td>University/Faculty</td>
<td>Specializations</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| **University of Life Sciences in Poznań, Faculty of Agriculture** | Informatics in agricultural engineering  
Food engineering  
Technology in motorization and energetics  
Renewable energy sources |
| **University of Technology and Life Sciences in Bydgoszcz, Faculty of Mechanical Engineering** | Engineering of agroenergy  
Economy and organization of services in agriculture  
Agricultural technology  
Informatics and agroengineering (macromodule) |
| **University of Warmia and Mazury in Olsztyn, Faculty of Technical Sciences** | Engineering of agro and food processes  
Machines for preparing and protection of landscape |
| **Warsaw University of Life Sciences, Faculty of Production Engineering** | Agriculture and forest technology  
Energetics and renewable energy sources  
Mechatronics in agriculture  
Agricultural and food processing machines |
| **West Pomeranian University of Technology in Szczecin, Faculty of Environmental Management and Agriculture** | Infrastructure and ecotechnology  
Agroenergetics and informatics systems  
Technology and services in forestry  
Informatics and extension in agricultural and forestry technology  
Management of agricultural technology (macromodule) |
| **Wroclaw University of Environmental and Life Sciences, Faculty of Life Sciences and Technology** | Agricultural and forestry engineering  
Food and agricultural products engineering  
Informatics in agricultural engineering  
Motorization technology in agricultural engineering |

Because of the fact that they are so many specializations in agricultural engineering studies in Poland for comparison with FEANI requirements were selected only two modules: Bioprocessing (table 2) and Information technology and automation (table 3).
Table 2. Comparison the corresponding ECTS of module 5 Bioprocessing in ULS Lublin to the FEANI requirements

<table>
<thead>
<tr>
<th>Module 5. Bioprocessing</th>
<th>FEANI Requirements</th>
<th>ULS in Lublin, Faculty of Production Engineering Specialization: food engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECTS Range</td>
<td>ECTS</td>
</tr>
<tr>
<td>BASIC SCIENCES</td>
<td>36 (min) - 45</td>
<td>29,0</td>
</tr>
<tr>
<td>Mathematics</td>
<td>24 (min)</td>
<td>12</td>
</tr>
<tr>
<td>Physics</td>
<td>5</td>
<td>2,7%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>12 (min)</td>
<td>10</td>
</tr>
<tr>
<td>Informatics</td>
<td>2</td>
<td>1,1%</td>
</tr>
<tr>
<td>ELECTIVES &amp; COMPULSORY</td>
<td>18 - 27</td>
<td>18</td>
</tr>
<tr>
<td>Economics &amp; Humanities</td>
<td>18 (min)</td>
<td>18</td>
</tr>
<tr>
<td>Sub-Total BASIC SCIENCES &amp; ELECTIVES (1):</td>
<td>54 (min) - 72</td>
<td>47</td>
</tr>
<tr>
<td>ENGINEERING SCIENCES</td>
<td>72 (min) - 81</td>
<td>94</td>
</tr>
<tr>
<td>Core</td>
<td>44-51</td>
<td>61</td>
</tr>
<tr>
<td>Module</td>
<td>28-30</td>
<td>33</td>
</tr>
<tr>
<td>AGRICULTURAL/BIOSYSTEMS SCIENCES</td>
<td>36 (min) - 45</td>
<td>42</td>
</tr>
<tr>
<td>Core</td>
<td>20-25</td>
<td>6</td>
</tr>
<tr>
<td>Module</td>
<td>16-20</td>
<td>36</td>
</tr>
<tr>
<td>Sub-Total ENG. &amp; AGR/BIOS SCIENCES (2):</td>
<td>108 (min) - 126</td>
<td>136</td>
</tr>
<tr>
<td>Sub-Total (1+2):</td>
<td>162 (min) - 198</td>
<td>183</td>
</tr>
<tr>
<td>APPLIED AGRICULTURAL ENGINEERING (3):</td>
<td>18 (max)</td>
<td>-</td>
</tr>
<tr>
<td>Sub-Total (1+2):</td>
<td>162 (min) - 198</td>
<td>183</td>
</tr>
<tr>
<td>Others (4)</td>
<td>X</td>
<td>27</td>
</tr>
<tr>
<td>Diploma seminars</td>
<td>X</td>
<td>15</td>
</tr>
<tr>
<td>Foreign languages</td>
<td>X</td>
<td>7</td>
</tr>
<tr>
<td>Apprenticeship</td>
<td>X</td>
<td>3</td>
</tr>
<tr>
<td>Sport activities (P.T.)</td>
<td>X</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL ECTS CREDITS FOR 1ST CYCLE (1+2+3+4):</td>
<td>X</td>
<td>210</td>
</tr>
</tbody>
</table>
Table 3. Comparison the corresponding ECTS of module 7 **Information technology and automation** in ULS Lublin to the FEANI requirements

<table>
<thead>
<tr>
<th>Module 7. Information technology and automation</th>
<th>FEANI Requirements</th>
<th>ULS in Lublin, Faculty of Production Engineering Specialization: Informatics in agricultural engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECTS Range</td>
<td>ECTS</td>
</tr>
<tr>
<td><strong>BASIC SCIENCES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>24 (min) - 45</td>
<td>24,0</td>
</tr>
<tr>
<td>Physics</td>
<td>12 (min)</td>
<td>12</td>
</tr>
<tr>
<td>Chemistry</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Informatics</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>ELECTIVES &amp; COMPULSORY</strong></td>
<td>18 - 27</td>
<td>18</td>
</tr>
<tr>
<td>Economics &amp; Humanities</td>
<td>18 (min)</td>
<td>18</td>
</tr>
<tr>
<td><strong>Sub-Total BASIC SCIENCES &amp; ELECTIVES (1):</strong></td>
<td>54 (min) - 72</td>
<td>42</td>
</tr>
<tr>
<td><strong>ENGINEERING SCIENCES</strong></td>
<td>72 (min) - 81</td>
<td>135</td>
</tr>
<tr>
<td>Core</td>
<td>44-51</td>
<td>61</td>
</tr>
<tr>
<td>Module</td>
<td>28-30</td>
<td>74</td>
</tr>
<tr>
<td><strong>AGRICULTURAL/BIOSYSTEMS SCIENCES</strong></td>
<td>36 (min) - 45</td>
<td>6</td>
</tr>
<tr>
<td>Core</td>
<td>20-25</td>
<td>6</td>
</tr>
<tr>
<td>Module</td>
<td>16-20</td>
<td>0,0%</td>
</tr>
<tr>
<td><strong>Sub-Total ENG. &amp; AGR/BIOS SCIENCES (2):</strong></td>
<td>108 (min) - 126</td>
<td>141</td>
</tr>
<tr>
<td><strong>Sub-Total (1+2):</strong></td>
<td>162 (min) - 198</td>
<td>183</td>
</tr>
<tr>
<td><strong>APPLIED AGRICULTURAL ENGINEERING (3):</strong></td>
<td>18 (max)</td>
<td>0,0%</td>
</tr>
<tr>
<td><strong>Sub-Total (1+2+3):</strong></td>
<td>180</td>
<td>183</td>
</tr>
<tr>
<td>Others (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma seminars</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Foreign languages</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Apprenticeship</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Sport activities (P.T.)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL ECTS CREDITS FOR 1ST CYCLE (1+2+3+4):</strong></td>
<td></td>
<td>210</td>
</tr>
</tbody>
</table>

**References:**

Project Number: 134306-LLP-1-2007-1-GR-ERASMUS-ENW

[5] Szkoła Główna Gospodarstwa Wiejskiego, Wydział Inżynierii Produkcji/Warsaw University of Life Sciences, Faculty of Production Engineering: www.wip.sggw.pl
[7] Uniwersytet Przyrodniczy w Lublinie, Wydział Inżynierii Produkcji/University of Life Sciences in Lublin, Faculty of Production Engineering: www.wip.up.lublin.pl
QUALITY ASSURANCE AND ASSESSMENT
FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES
IN PORTUGAL

José R. Marques da Silva*, Luís L. Silva, Fátima Baptista &
Vasco F. Cruz

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1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering studies

To fulfill the objectives defined in the framework for qualifications of the EHEA it was created by the Government, through the State-Law n. 369/2007, November 5, the National Agency for Evaluation and Accreditation of the higher education system (A3ES), with the objectives of promoting and assuring the quality of the higher education system.

All higher education Institutions that desires to offer study programs leading to 1st, 2nd and 3rd cycle degrees, must submit their study programs to evaluation and approval by this National Agency. Only after the recognition and accreditation by the National Agency the Institutions can offer their accredited study programs.

The decision on the application for accreditation may be favourable or unfavourable. A favourable decision may be subject to the adoption of quality assurance measures that are determined within a reasonable time.

The process is currently underway and there are still no official results of the accreditation process that began in the last quarter of 2009 for all higher education institutions.

In addition to the A3ES agency and in the context of a professional training sponsored by the Portuguese Engineers Association, it was implemented OE+EUR-ACE evaluation system. In 2009, the ENAEE (European Network for Accreditation of Engineering Education) recognized the Portuguese Engineers Association as the Portuguese Authority that can grants the EUR-ACE label to 2nd cycle study programs, including Integrated Masters degrees (that combine 1st and 2nd Cycles study programs under the same designation). While the A3ES system is mandatory for all higher education institutions the OE+EUR-ACE system is a voluntary system.

Until today, the OE+EUR-ACE label was attributed to the following Master study programs: Biological Engineering (Instituto Superior Técnico, Technical University of Lisbon), Electronics and Telecommunications Engineering (University of Aveiro), Mechanical Engineering (Faculty of Engineering University of Porto), and Network Engineering Communications (Instituto Superior Técnico, Technical University of Lisbon).
2. European Qualification Framework (EQF)

The framework for qualifications of the European Higher Education Area (EHEA) has three relevant objectives: international transparency, recognition, and mobility. With these three principal objectives in mind Portugal has developed the Portuguese National Qualification Framework that has a strong regulatory function based in several Laws.

The National Agency for Evaluation and Accreditation of higher education system (A3ES), was created in order to fulfill the objectives defined in the framework for qualifications of the EHEA. The Agency is a foundation under private law, with legal personality and recognized as having public utility. The agency is independent in exercising its functions, subject to guidelines set by the State.

The system of evaluation and accreditation developed by the Agency is contained in the State-Law n.º 38/2007 of August 16.

The Board of A3ES approved on September 25, 2009, the rules and the decisions concerning the system of evaluation and accreditation of higher education institutions and their study programs, are presented below:


Deliberação nº 3348/2009, of A3ES (released initially as Resolution n.º 2/2009), published in the Official Journal, 2nd Series, of 18 December 2009 establishing the fees charged by the accreditation processes for new study programs and the preliminary accreditation of study programs already functioning.

Deliberação nº 3349/2009, of A3ES (released initially as Resolution n.º 1/2009), published in the Official Journal, 2nd Series, from December 18, 2009, setting the deadlines for submitting applications for the accreditation processes. The following are the regulations that should be taken into consideration for the overall analysis of the regulatory framework applicable to the evaluation and accreditation of higher education institutions and their study programs in Portugal:

- Lei nº 38/2007, August 16, which approved the legal framework for assessing the quality of higher education;
- Decreto-Lei nº 74/2006, March 24, amended by, 25 June, which approved the requirements for accreditation of study programs;
- Lei nº 62/2007, September 10, which sets the legal regime of the higher education institutions;
- Decreto-Lei nº 369/2007, November 5, establishing the Agency for Assessment and Accreditation of higher education institutions and its statutes approval.

The Agency's primary objective is to improve quality and performance of the higher education institutions and their study programs and fulfill the basic requirements of the official recognition.
These objectives are pursued through the evaluation and accreditation of institutions and higher education study programs, and through these, the promotion of an internal culture of institutional quality assurance. Therefore the objectives of A3ES are:

- Developing the assessment of quality of performance of higher education institutions and their study programs;
- Realizing the evaluation criteria in order to obtain the translation of results into qualitative appreciations as well as defining the consequences of the evaluation for the institutions and their study programs;
- Promote the accreditation of education cycles and institutions to ensure compliance with legal requirements for recognition;
- Promote dissemination to society based on the performance and quality of higher education institutions;
- Promote the internationalization of the evaluation process.

In developing its mission, are functions of A3ES:

- The definition and guarantee of the quality standards system;
- The evaluation and accreditation of education cycles and higher education institutions;
- Public disclosure of results of evaluation and accreditation;
- The promotion of the internationalization of the Portuguese higher education system.

Are also functions of the Agency:

- Advice the State in regard to quality assurance in higher education;
- Promote studies and opinions at its own initiative or at the request of the State;
- Participation in the European system of quality assurance in higher education;
- Coordination of activities of evaluation and accreditation in Portugal with institutions and mechanisms at an international level.

In the next two years, 2010/2011, A3ES strategic plan, given the time limits imposed by law, must focus on the creation and implementation of the instruments to, immediately, in addition to prior accreditation of new cycles of studies, promote the preliminary accreditation of study programs already in operation.

The A3ES agency consider in its evaluation and accreditation the descriptors used in the Framework for Qualifications of the European Higher Education Area, agreed by the ministers responsible for higher education at their meeting in Bergen in May 2005 in the framework of the Bologna process. These descriptors correspond to the following learning outcomes for EQF:
First cycle: **advanced knowledge of a field of work or study, involving a critical understanding of theories and principles.**

Second cycle: **highly specialized knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research; critical awareness of knowledge issues in a field and at the interface between different fields.**

Third cycle: **knowledge at the most advanced frontier of a field of work or study and at the interface between fields.**

In Portugal first cycle is usual limited to 180 ECTS, second cycle is usual limited to 120 ECTS and the third cycle has no specific rules concerning the number of ECTS.

The application for accreditation to the A3ES agency should contain the following:

a) Identification of a higher education institution concerned;

b) Identification of the organic unity to which the study program is associated with;

c) Characterization of the educational, scientific and cultural context strategy in which falls the study program;

d) Identification of the study program to be accredited and the degree to which it leads;

e) Objectives characterization for the study cycle in evaluation;

f) The predominant scientific areas of the study program in evaluation;

g) Indication of ECTS credits required to obtain the degree;

h) Indication of study program duration;

i) Indication of curriculum structure and study program;

j) Indication of options, branches, or other forms of alternative organization;

k) Identification of faculty members assigned to the study program;

l) Review curriculum of individual faculty members assigned to the study program;

m) Identification of infrastructures where the study program will be developed;

n) Description and evidence of other human and material resources needed to achieve the level and quality of training in the study program, given the degree to which he leads;

o) Critical analysis summary of strengths and weaknesses, opportunities and constraints of the study program;

p) In the case of application for accreditation to a master's degree, evidence of existent training and research activity and development of a high-level professional nature in the scientific area of specialty should be presented;

Accreditation models for submission of applications are used in electronic formats and at any time, the A3ES Board of Directors, manager of the procedure, or external evaluation committee, may require to the higher education institution the original documents.

In the case of application for a 3rd cycle accreditation the requirements for educational institutions in Portugal are usually higher and therefore the institutions have to:

i) Describe and demonstrate the human and organizational resources needed to carry out research;
ii) Demonstrate assessed experience of research and relevant scientific and academic production in the branch of knowledge or expertise in question. These A3ES requirements at the 1st, 2nd and 3rd cycles are in line with the learning outcomes defined by the EFQ for these specific cycles. This A3ES evaluation system in Portugal is very new and because of that higher education institutions are a bit suspicious about the results of the process. However, there is a national consciousness that this process is necessary for the credibility of the higher education system in Portugal. The only accreditation process experience for Biosystems Engineering studies in Portugal is associated with a new Biosystems Engineering 2nd cycle proposed by the University of Évora. This proposal is still in evaluation by the A3ES agency panel but the first impression is that the number of ECTS, associated with the scientific area of engineering is being relevant to its approval.

3. Please describe the EUR-ACE academic accreditation procedure regarding “Biosystems” Engineering or related programmes of studies:
The professional accreditation in Engineering is made by the Portuguese Engineers Association that is an independent Association. This professional accreditation is mandatory by law to the professional exercise of some Engineering specialities, as for example Civil Engineering, but not in other cases, as Agricultural Engineering. The academic accreditation is performed, as mentioned early, by the National Agency for Evaluation and Accreditation of higher education system (A3ES), implemented in 2009. There is no direct relationship between the two accreditation processes. The procedures for application for both situations are different, although the information required for both is very similar. While the A3ES system is mandatory for all higher education institutions and cycle degrees, the OE+EUR-ACE system is a voluntary system and nowadays only applied to 2nd cycle studies. The OE+EUR-ACE label only recognizes the quality of the study program but has no implications in the professional activity. Only few Engineering specialities need a professional accreditation to allow the professional activity of graduates, as occurs with Civil Engineers. But, even in this case it is not yet required the EUR-ACE label. Before the creation of the National Agency for Evaluation and Accreditation, it was the professional accreditation made by the professional associations that was a mandatory to the exercise of some engineering professions, and the state law mentioned that. With the creation of the A3ES Agency the government withdrew to the professional associations the ability of accreditation of program studies, giving that task to the A3ES Agency. However, the state law has not changed yet, and by law it is still required a professional accreditation for developing an engineer activity in many fields of expertise. Therefore, the study programs that were recognized in the past by the Portuguese Engineers Association maintained their accreditation status until the A3ES agency is in full action and the laws that define the professional activities are changed in accordance to the new accreditation reality. In this context the OE+EUR-ACE label is a quality label which is not mandatory to regulate the professional activity of Engineers.
For the OE+EUR-ACE accreditation, the application is submitted to the Portuguese Engineers Association. Upon receiving the application, the Engineers Association Evaluation Committee (EAEC) visits the education institution during two days. This visit will result in a report developed by the Evaluation Committee, which will refer the non-conformities. A general assessment of the study programs will be made with reference to the strengths, weaknesses and inadequacies. During the visit, information will be collected on the facilities and academic conditions for the study program operation through the analysis of documentation, interviews and visits to the school facilities: classrooms, laboratories, libraries, etc.

Non-conformities should be identified and presented in a sustained manner for transmission to the University Institution, referencing the information used for the diagnosis and making their respective suggestions. After the visit, the Commission prepares a report that, in a preliminary form, is sent to the University Institution for comment. Following the comments of the University Institution, the Commission prepares a proposal for a decision on application of quality label EUR-ACE. In case of a favourable decision, that can take one of two ways: for a period of 6 years or for a period of 6 years with recommendations or even with restrictions in cases that require immediate corrective actions, being subsequently verified by the Evaluation Committee. The process is then submitted to the Council for Admission and Qualification (CAQ) for examination and formulation of the proposal to the National Board (CDN) for approval. The final decision, signed by the president, is then sent to the University Institution.

Any master's degree in Engineering with a cumulative curriculum content corresponding to five years of training can apply for the OE+EUR-ACE label, which, if granted, is recognized either nationally or internationally in any country integrating the European Network for Accreditation of Engineering Education (ENAEE).

The A3ES accreditation agency stipulates in its regulation document n.º 504/2009 (article 40) that the evaluation process can be simplified if any assessments results conducted by national, foreign or international institutions taking in account the principles adopted by the European Quality Assurance in Higher Education. The accreditation process can also be simplified if the Institution is equipped with internal systems of quality assurance certificates.

4. Please analyze your programme of studies using the Agricultural/ Biosystems Engineering EurAgEng Recognition Template

The 1st cycle of Agricultural Engineering in Portugal is normally a typical Agronomic study program and the number of Engineering courses is reduce.

We have some expectations about the preliminary reports of the National accreditation Agency regarding the accreditation of these study programs because we would like to see what will be their opinion about the Agricultural Engineering in Portugal and the lack of engineering courses on it.

The following example belongs to a reference University in Portugal on this scientific area.
Example of a 1st cycle (180 ECTS): (Agronomic Engineering: Universidade Técnica de Lisboa – Instituto Superior de Agronomia)

<table>
<thead>
<tr>
<th>UNIDADE CURRICA</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>12</td>
</tr>
<tr>
<td>Physics</td>
<td>12</td>
</tr>
<tr>
<td>Mathematics and Computing</td>
<td>12</td>
</tr>
<tr>
<td>General Chemistry and Biochemistry</td>
<td>12</td>
</tr>
<tr>
<td>Introduction to Agriculture</td>
<td>12</td>
</tr>
<tr>
<td>Climate and Water Resources</td>
<td>7.5</td>
</tr>
<tr>
<td>Statistics</td>
<td>7.5</td>
</tr>
<tr>
<td>Functional Biology</td>
<td>7.5</td>
</tr>
<tr>
<td>Soils and Plant Nutrition</td>
<td>7.5</td>
</tr>
<tr>
<td>Geomatics</td>
<td>7.5</td>
</tr>
<tr>
<td>Plant Protection</td>
<td>7.5</td>
</tr>
<tr>
<td>Ecology</td>
<td>7.5</td>
</tr>
<tr>
<td>Agricultural and Rural Policies and Programmes</td>
<td>7.5</td>
</tr>
<tr>
<td>Horticultural Production Systems - Vegetables, Fruits and Grapes</td>
<td>15</td>
</tr>
<tr>
<td>Agriculture</td>
<td>15</td>
</tr>
<tr>
<td>Farm Management</td>
<td>7.5</td>
</tr>
<tr>
<td>Optional</td>
<td>7.5</td>
</tr>
<tr>
<td>Food Quality and Safety</td>
<td>7.5</td>
</tr>
<tr>
<td>Seminar</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Considering the FEANI Report

**BASIC SCIENCES (43.5 ECTS – 24.17 %)** – should have 20% to 25% of 180 ECTS

**HUMANITIES AND ECONOMICS (15 ECTS – 8.33 %)** - should have 10% of 180

**ENGINEERING SCIENCES (7.5 ECTS – 4.17 %)** - should have 24.5% to 28.3% of 180

**AGRICULTURAL / BIOLOGICAL SCIENCES (91.5 ECTS – 50.83 %)** - should have 11% to 14% of 180

**OTHERS (22.5 ECTS – 12.5%)**

- Universidade Técnica de Lisboa – Instituto Superior de Agronomia, has also a second cycle on Agricultural Engineering.
- University of Évora has a first cycle on Agronomy (not Agricultural Engineering) and a 2nd cycle on Agronomic Engineering. Is trying to approve a second cycle on Biosystems Engineering.
- The University of "Trás dos Montes e Alto Douro" has a First cycle on Agricultural Engineering but it was difficult to get its curricula. No second cycles were found in this area.

5. Please list Institutions from your country that might be interested to participate in the Biosystems Engineering EUR-ACE academic accreditation or the recognition procedure under the umbrella of EurAgEng.
Considering the previous answer we don’t know if any of the Portuguese universities will be interested in getting the EUR-ACE academic accreditation. We are also curious to know what will be said by the A3ES accreditation agency about these agronomy study programs with a Engineering label.
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN ROMANIA

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Abstract
The paper presents the current stage of the Quality Assurance and assessment frameworks related to Biosystems Engineering study in Romania. Considering the experience of the Technical University of Cluj – Napoca in Farm Machinery specialization related to the first and second study cycle in agricultural engineering filed and the cooperation with the other national universities where are in going the same specialization, an evaluation of the possibilities to promote the Biosystems Engineering in accordance with national quality demands is presented too. The experience regarding the second cycle study in Biosystems Engineering which was promoted in Technical University of Cluj – Napoca, is describing as a new experience in this field.
The paper contains a diagram of the quality assurance policy and evaluation steps by the National Agency for Programme Study Evaluation (RQAAHE - the Romanian Quality Assurance Agency for Higher Education).
The main considerations and challenges for Biosystems disciplines in agricultural engineering and food industry field resulted from the legislation and educational context.

1. Tools for Quality Assurance and Assessment Frameworks in Romania
Each university which developed a specialization is responsible regarding the quality of the study programme and the quality of the specialization. The employable capacity of the graduates represents a measure of the quality of the specialization.
Each programme study is evaluated by the Romanian Quality Assurance Agency for Higher Education, in accordance with criteria and quality indicators specified in the “Study programmes accreditation external Evaluation guide”. The university study programmes (or specializations) external evaluation Guide is a work instrument of higher education institutions, as well as of external evaluators of academic quality, meant to provide specific indicators and practices in order to ensure quality at the level of every study programme. The Guide is based on the External evaluation methodology, on the standards, reference standards and on the list of performance indicators adopted by Government Decision. The mission of the Quality Assurance Agency for Higher Education consists of achieving public interest for high quality standards in developing study programmes and in obtaining qualifications in higher education (HE), in supporting the continuous improvement of HE quality management.
Specific objectives of accreditation are:

- to ensure the university communities, the beneficiaries and the public in general that the education providing organization, accredited or authorized to organize a study programme, proves to comply with the minimum quality standards of a higher education institution;
- to direct the education providing organization towards the continuous increase of academic quality, asserted by results in education and research;
- to support higher education institutions in order to develop a quality management and culture and to demonstrate their state, by relevant proof and documents;
- to determine the education providing organization to self-evaluate and to cooperate in its external evaluation in order to ensure and increase quality;
- to determine the education providing organization to cooperate with other higher education institutions in order to achieve, monitor and compare academic quality;
- to identify and publish any functioning attempt of a programme that does not comply with the minimum standards of academic quality.

The academic evaluation of a study programme is mainly based on the following aspects:

- **the learning experience offered to the students** by running through a higher education programme to ensure the access to a distinct academic qualification (an assessment concerning the way in which the study programme’s content allows the students fulfilling all their professional obligations to obtain the knowledge, the competences and abilities which are defining for the academic qualification promised by the university);
- **the peer review**, used as a means of the internal quality assurance;
- **the flexibility in organizing the external evaluation mission**, so as the activity of the Agency’s expert-evaluators not to create disturbances in the good operation of the teaching process;
- **the mutual respect**, so that the process should be carried out in a friendly;
- **the maintenance and continuous improvement of academic standards** and of improving the learning infrastructure;
- **the use of self-evaluation as a key document**, which must have a reflexive and evaluative character (it starts from the statements comprised in the self-evaluation report and these statements’ truthfulness is further analyzed);

In the figure no. 1 is presented a diagram of the quality evaluation steps for each study programme.

The qualifications for high education system is establish and monitorized by a national agency (APART). The National Agency for Partnership between Universities and the Economic and Social Environment (APART) was set up in December 2001, as a legal entity, specialized body subordinated to the Ministry of Education and Research. APART set up branches in Cluj Napoca, Galați, Timișoara and Iași.

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Economic and Social Environment – APART, taking over APART’s assets, all rights and obligations, logistic infrastructure, personnel, database and archive.

**Figure 1.** The diagram of the program’s evaluation – accreditation.
According to its Organisation and Functioning Regulation (ROF), ACPART’s activities are structured on three departments: Qualifications in Higher Education, Partnership between Universities and Economic and Social Environment and Financial – Administrative. In order to achieve its missions, ACPART cooperates with the Ministry of Labour, Family and Equal Opportunities, with national institutions responsible with quality assurance in higher education as well as with other social partners.

At European and international level, ACPART cooperates with similar institutions as well as with other competent bodies in the fields of qualifications and quality assurance, with a view of contributing to the European Higher Education Area.

**Missions:**

- to elaborate, implement, and update the national framework for higher education qualifications concerning the development, recognition and certification of qualifications based on the knowledge, abilities, and competences acquired by beneficiaries of the higher education system;
- to analyse compatibility of the specialisations curricula in the fundamental areas of higher education with national qualifications framework standards;
- to involve Romanian higher education institutions in the development of a European society based on knowledge and productivity, with a competitive and dynamic economy;
- to promote the opening of higher education institutions towards the socio-economic environment through cooperation actions among higher education institutions, economic operators and other organisations, aimed at developing specific partnerships, labour market research, an entrepreneurial dimension to Romanian universities, as well as knowledge transfer.

**Tasks:**

- elaborates, manages, and regularly updates the national framework for higher education qualifications;
- establishes, maintains, and regularly updates the methodology for elaborating and certifying higher education qualifications;
- devises and regularly reviews – based on best practices – the national reference standards and descriptive elements of higher education qualifications;
- issues recommendations to higher education institutions on rendering the specialisations curricula in fundamental areas of higher education compatible with the national qualifications framework standards;
- proposes legislative acts to the Ministry of Education and Research on the national qualifications framework for higher education in Romania, as well as for the recognition of competences and professional experience acquired in the course of life;
- identifies, supports, and promotes cooperation actions by developing specific partnerships among universities, economic operators, Romanian and foreign institutions and organisations, by elaborating and implementing specific programmes and projects;
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- facilitates absorption of higher education graduates into the labour market, through specific programmes and projects;
- promotes long-and medium-term programmes of continuing training, specialisation, vocational training and retraining of personnel employed by higher education institutions, economic operators, and other organisations;
- provides consultancy and technical assistance in its areas of expertise.

2. Programme study in Agricultural Engineering analyzes in accordance with EurAgEng template

At Technical University of Cluj-Napoca, a programme study in Machines and Equipments for Agricultural and Food Industry specialization is on going as an evaluated programme and accepted by the Romanian Quality Assurance Agency for Higher Education. This study program for the first cycle continued with two modules for the second cycle (master programme): Biosystem Engineering for Agriculture and Food Industry and Renewable Energy. For the first cycle, (four year duration) a total 240 ECTS are provided. For the second cycle the sume of credits are establishes in accordance with national regulations, (120 ECTS).

In accordance with FEANI requirements, the program study in our university presents some differences due to the fact that according with ACPART the specialization is included in mechanical engineering branch which provide a four years study for the first cycle (Table 1).

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FEANI Report</strong></td>
</tr>
<tr>
<td><strong>BASIC SCIENCES</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Total ECTS: 36-45 ECTS CREDITS</strong></td>
</tr>
<tr>
<td><strong>Humanities and Economics</strong> (min. 10% of total 180)</td>
</tr>
<tr>
<td>• Engineering Economics</td>
</tr>
<tr>
<td>• Agricultural Economics</td>
</tr>
<tr>
<td>• Introduction to Philosophy</td>
</tr>
<tr>
<td>• Introduction to Justice and Law</td>
</tr>
<tr>
<td>• Introduction to Sociology</td>
</tr>
<tr>
<td>• Technical and Financial Management of Infrastructures</td>
</tr>
<tr>
<td>• Engineering Ethics</td>
</tr>
<tr>
<td><strong>Total ECTS: 18-27 ECTS CREDITS</strong></td>
</tr>
<tr>
<td>equal to 10-15% of total 180 ECTS CREDITS</td>
</tr>
</tbody>
</table>
FEANI Report | Curriculum under ‘recognition’ | Engineering part of the core curricula: the fundamental core basis
---|---|---
11. Mechanics-Statics | 2. Mechanics-Statics or equivalent...13 (ECTS....) |
13. Mechanics-Dynamics | 4. Mechanics-Dynamics or equivalent 9 (ECTS....) Fluid Mechanics or equivalent 9 (ECTS....) Applied Thermodynamics or equivalent 18 (ECTS....)
14. Fluid Mechanics | 7. Electricity and Electronics or equivalent 8 (ECTS....) |
15. Applied Thermodynamics | 8. System Dynamics or equivalent... 12 (ECTS....) |
16. Heat and Mass Transfer |  |
17. Electricity and Electronics |  |
18. System Dynamics |  |

<table>
<thead>
<tr>
<th>Total ECTS: 44-51 ECTS CREDITS equal to 24.5-28.3% of total 180 ECTS CREDITS</th>
<th>Total ECTS 92</th>
<th>38 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering part of the core curricula: optional courses Learning outcomes and contents follow. Assuming 6 course units with 4 or 5 ECTS credits per unit, the learning outcomes may be delivered through the following structured coursework, or equivalent:</td>
<td>Engineering part of the core curricula: optional courses Learning outcomes and contents follow. The learning outcomes are delivered through the following structured coursework:</td>
<td></td>
</tr>
<tr>
<td>TOTAL ECTS: 28-30 ECTS CREDITS: EQUAL TO 15.5-16.7% OF TOTAL 180 ECTS CREDITS</td>
<td>Total ECTS 80</td>
<td>33.33%</td>
</tr>
</tbody>
</table>

Considering the ECTS distribution and Core curricula for the analyzed specialization some differences was observed due to specially the total credits number and the fact
that the specialization is distributed on four years study. The motivation of this situation consists in different ACPART classification of our specialization. Quality assurance and assessment program concern into correlate the three steps of study (bachelor, master and doctoral study) in order to ensure the high qualification in the field of the Biosystems Engineering.
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF AGRICULTURAL ENGINEERING STUDIES IN SLOVAK REPUBLIC

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Abstract
The paper is focused on the issues of the quality assurance and assessment frameworks of agricultural engineering studies in conditions of Faculty of Engineering of the Slovak University of Agriculture in Nitra, Slovak Republic. All educational activities are realized within the framework outlined by University Act from the year 2002. The quality of the teaching, research and development of the Faculty is evaluated by the Accreditation Commission, as a advisory body of the Government of Slovak Republic Accreditation Commission monitors, estimates and independently evaluates the faculty each six years. The set of criterions used by the Accreditation Commission is characterized. The effects of the European Qualification Framework are described. In conditions of Slovak Republic the work on implementing the National Qualification Framework has started in 2008 and attention is paid first of all to the Lifelong Learning Programmes. The status of academic accreditation in Slovak Republic is characterized. Comparison of the study programme “Agricultural engineering” to the FEANI requirements is given.

1. Tools for quality assurance and assessment frameworks of agricultural engineering study
Agricultural engineering studies has been established at the Faculty of Agricultural engineering (since 2008 - Faculty of Engineering) of the Slovak University of Agriculture in the year 1969. During last 40 years of the faculty existence, more than 6000 graduates completed their studies.
Faculty of Engineering provides university level education to educate engineers able to manage and organize production processes, to design mechanized production systems, to secure reliable operation of production equipment, and to keep the machines quality parameters at the necessary level, to create and manage systems for the renewal of the technical life of machines, to control energy systems of production facilities, to design and manage technical development of production subjects, using electronics, computer-supported technology, to provide commercial services for producers of machines. In the year 2002 the Ministry of Education of the Slovak Republic has issued the Set of study programmes of university level education of the Slovak republic. According to this set of study programmes, the study programmes connected with the agricultural engineering belongs to two different groups:

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- the study programme 5.2.46 Agricultural engineering providing education for Bachelor and Engineers study level belongs to the sub-group 5.2 Design engineering, technology, production and communication, group 5. Design, technology, production a communication.
- the study programme 6.1.14 Techniques and Mechanization of Agricultural and Forest Production providing education for PhD. study level belongs to the sub-group 6.1 Agriculture, group 6. Agricultural and Veterinary Sciences.

All educational activities are realized within the framework outlined by Law No. 131 of 21 February 2002 on Higher Education (University Act), [1]. According to this law the Accreditation Commission is a body providing the accreditation of study programmes at the faculties in the Slovak Republic.

It is possible to state that accreditation process and conclusions elaborated by Accreditation Commission (2008-2009) can be considered as tools for quality assurance and assessment frameworks of agricultural engineering study at the Faculty of Engineering.

The Accreditation Commission monitors, estimates and independently evaluates the quality of the teaching, research, development, of the Faculty of Engineering of the Slovak University of Agriculture in Nitra and contributes to its improvement. It generally assesses conditions under which such activities are carried out and works out recommendations for improvement of work at the Faculty. The Commission performs comprehensive accreditation activities of universities every six years according to the previously published plan of comprehensive accreditations. Within this comprehensive accreditation the Commission also evaluates the level of research, development and other creative activities of the university and provides its opinion of the standards of the particular university compared with other universities according to the Article 2 Section 13. of the University Act [1].

During last evaluation of the Faculty of Engineering and its workplaces providing implementation of the study program, the following attributes are the subject of assessment:

a) the level of research:
Criterion KSP-A1: level of research activity of the higher education institution and workplaces providing implementation of the study programme;

b) material, technical and information provision:
Criterion KSP-A2: adequacy of material, technical and information provision of the study programme;

c) personnel provision:
Criterion KSP-A3: composition of lecturers, or university teachers, working in the key forms of teaching depending on specificities of the field of study (qualification structure);
Criterion KSP-A4: competency of university teachers, research workers, who supervise the final theses as regards the number of students;
Criterion KSP-A5: composition of examination boards for holding State examinations (for opposing final theses);
Criterion KSP-A6: guaranteeing the quality and development of the STUDY programme;
As consequences of applying these tools can be considered fact that The Faculty of Engineering of the Slovak University of Agriculture in Nitra has been classified in as faculty matching all criterions and was granted the rights to provide education in the study programme related to agricultural engineering within all three levels (Bs., Eng and PhD.).

2. The effects of the European qualification framework
National Qualifications Framework (NQF) plays an important role in the Bologna process. In conditions of Slovak Republic [2] the work on implementing the framework has started in 2008 and a timetable for implementation has been agreed. Necessary decisions about the process of the National Qualifications Framework creation in the Slovak Republic are already going on at the level of the Ministry of Education of the Slovak Republic and at the level of institutions governed by the referred-to ministry. The creation of the NQF will be the core activity in the process of implementation of the European Qualification Framework (EQF) in Slovakia. NQF will be created by progressive incorporation of State Educational Programmes (primary and secondary schools) and Study Fields (HEI) into particular referential levels in terms of EQF descriptors. Intention is that sector-based Slovak NQF will be fully compatible with the overarching framework of qualifications of the European Higher Education Area, one of the aims of Bologna Process.
Draft document about implementation of the EQF under the conditions of the Slovak Republic was submitted for the meeting of the Slovak Government in December 2008. On this basis, it will be able to approach to development of the National Qualification System on the part of the Ministry of Education of the SR and, to development of the National System of Occupations, on the part of the Ministry of Labour, Social Affairs and Family of the SR. The National Qualification System will be realized and established through the national project co-financed from the European Social Fund by direct assigning to the contractor. Both systems will be incorporated into the National Qualifications Framework, which will be created in parallel.

3. Description the EUR-ACE academic accreditation procedure regarding agricultural engineering programmes of studies
In Slovak Republic there is no professional accreditation institution for the field of agricultural or biosystems engineering. All accreditation procedures required by the law are assured by academic Accreditation Commission. As it it mentioned in the point 1, the Accreditation Commission was establish ed by the government of the Slovak Republic in the year 1990 as its advisory body. The Commission is accountable for its activity to the government of the Slovak Republic, to which it submits a report on its activity every two years.
Essential tasks of the Commission are to monitor and independently evaluate the quality of education, research, development and other creative activity of the universities. The Accreditation Commission comprehensively reviews conditions under which these activities take place at individual universities. Based on independent evaluation, the Accreditation Commission contributes to improving the efficiency and quality of the education provided at the universities and develops recommendations to
improve the operation of the universities.
The Commission's activity is governed by applicable provisions of the Act on universities.
The assessment of engineering study programmes at the faculties oriented to the engineering is based on EUR-ACE Framework Standards for the Accreditation of Engineering Programmes.
Engineering study programme „Agricultural engineering“ for which a Faculty of Engineering of the Slovak University of Agriculture in Nitra requested reaccreditation has been consistent with legal national requirements and has in place:

• programme educational objectives consistent with the mission of the Higher Education Institution and the needs of all interested parties (such as students, industry, engineering associations, etc.) and programme outcomes consistent with the programme educational objectives and the programme outcomes for accreditation (cf. section 1);
• a curriculum and related processes which ensure achievement of the programme outcomes;
• academic and support staff, facilities, financial resources and cooperation agreements with industry, research institutions and other higher education institutions adequate to accomplish the programme outcomes;
• appropriate forms of assessment which attest the achievement of the programme outcomes;
• a management system able to ensure the systematic achievement of the programme outcomes and the continual improvement of the programme.

Correspondingly, the guidelines by the Accreditation commission for a programme assessment submitted for accreditation of the engineering study programme „Agricultural engineering“ prepared at the Faculty of Engineering of the Slovak University of Agriculture in Nitra have considered the following ITEMS:

1. Needs, Objectives and Outcomes;
Criteria assessed:
• needs of the interested parties,
• educational objectives,
• programme outcomes

2. Educational Process;
Criteria assessed:
• planning,
• delivery,
• learning assessment

3. Resources and Partnerships;
Criteria assessed:
• academic and support staff,
• facilities,
• financial resources,
• partnerships.
4. Assessment of the educational process;
   Criteria assessed:
   • students,
   • graduates,
5. Management System;
   Criteria assessed:
   • organisation and decision-making processes,
   • Quality Assurance System

In this context, the “criteria assessed” and the associated “requirements” in the form of questions, valid for both 1st and 2nd cycles study programmes was addressed when assessing an engineering programme for accreditation. It is possible to state that accreditation procedure was completely in accordance with the EUR-ACE Framework Standards for the Accreditation of Engineering Programmes. According to the information obtained from the Accreditation commission in a near future there will be no changes in the system for accreditation of the high education universities. There are no plans or a procedure under development.

4. Analysis of the “Agricultural engineering” study programme on the basis of comparison with the data of the Agricultural / Biosystems engineering EURAGENG Recognition Template

Agricultural/ Biosystems Engineering EurAgEng Recognition Template is based on FEANI requirements which are prepared for the following modules:

- Module 1. Water resources engineering
- Module 2. Mechanical systems and mechanisms
- Module 3. Structural systems and materials
- Module 4. Waste management
- Module 5. Bioprocessing
- Module 6. Energy supply and management
- Module 7. Information technology and automation
- Module 8. Other module – specialisation.

When comparing the set of above modules with the study programmes offered by Faculty of Engineering of the Slovak University of Agriculture in Nitra within the study branch Agricultural Engineering [4], it is possible to state that the study programme “Agricultural engineering” is very close to the “Module 2. Mechanical systems and mechanisms”.

151
Table 1. Comparing of the study programme “Agricultural engineering” to the FEANI requirements

<table>
<thead>
<tr>
<th>MODULE 2. MECHANICAL SYSTEMS AND MECHANISMS</th>
<th>FEANI REQUIREMENTS</th>
<th>AGRICULTURAL ENGINEERING COURSE FOR RECOGNITION</th>
<th>CHECK OF ECTS LIMITS AGAINST FEANI REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECTS RANGE</td>
<td>ECTS</td>
<td>%</td>
</tr>
<tr>
<td>BASIC SCIENCES</td>
<td>36 (MIN) – 45</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td>24 (MIN)</td>
<td>10</td>
<td>5.55 %</td>
</tr>
<tr>
<td>PHYSICS</td>
<td>12 (MIN)</td>
<td>13</td>
<td>7.22 %</td>
</tr>
<tr>
<td>CHEMISTRY</td>
<td></td>
<td>5</td>
<td>2.77 %</td>
</tr>
<tr>
<td>INFORMATICS</td>
<td></td>
<td>7</td>
<td>3.90 %</td>
</tr>
<tr>
<td>ELECTIVES</td>
<td>18 - 27</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>ECONOMICS &amp; HUMANITIES</td>
<td>18 (MIN)</td>
<td>20</td>
<td>11.11 %</td>
</tr>
<tr>
<td>SUB-TOTAL BASIC SCIENCES &amp; ELECTIVES (1):</td>
<td>54 (MIN) - 72</td>
<td>62</td>
<td>34.44 %</td>
</tr>
<tr>
<td>ENGINEERING SCIENCES</td>
<td>72 (MIN) - 81</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>CORE</td>
<td>44 - 51</td>
<td>45</td>
<td>25.00 %</td>
</tr>
<tr>
<td>MODULE</td>
<td>28 - 30</td>
<td>18</td>
<td>10.00 %</td>
</tr>
<tr>
<td>AGRICULT/BIOSYSTEMS SCIENCES</td>
<td>36 (MIN) - 45</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>CORE</td>
<td>20 – 25</td>
<td>24</td>
<td>13.13 %</td>
</tr>
<tr>
<td>MODULE</td>
<td>16 – 20</td>
<td>14</td>
<td>7.77 %</td>
</tr>
<tr>
<td>SUB-TOTAL ENG. &amp; AGR/BIOS SCIENCES (2):</td>
<td>108 (MIN) - 126</td>
<td>101</td>
<td>56.11 %</td>
</tr>
<tr>
<td>SUB-TOTAL (1+2):</td>
<td>162 (MIN) - 198</td>
<td>163</td>
<td></td>
</tr>
<tr>
<td>APPLIED AGRIC. ENGINEERING (3):</td>
<td>18 (MAX)</td>
<td>17</td>
<td>9.44 %</td>
</tr>
<tr>
<td>TOTAL ECTS CREDITS FOR 1ST CYCLE (1+2+3):</td>
<td>180</td>
<td>180</td>
<td>100.00 %</td>
</tr>
</tbody>
</table>

In the next step therefore was compared the study programme “Agricultural engineering” to the FEANI requirements from the point of ECTS credits. From the above table it is possible to see that study programme “Agricultural Engineering” offered by Faculty of Engineering of the Slovak University of Agriculture in Nitra within the study branch Agricultural Engineering has some strengths and weaknesses. In a future there will necessary to increase the share of “Mathematics” in the group of “Basic science” study subjects. Not sufficient is the structure of modules within “Engineering sciences” and “Agricultural & Biosystems Sciences” study subjects. In order to achieve the harmony and agreement of the study programme “Agricultural Engineering” offered by Faculty of Engineering of the Slovak University of Agriculture in
Nitra with the FEANI requirements it will be necessary to carry out a deep analysis of the study subject rating and valuation. The main problem is the different approach to study subject rating at different faculties of the Slovak University of Agriculture in Nitra.

5. Possibilities of participation in the Biosystems Engineering EUR-ACE academic accreditation or the recognition procedure under the umbrella of EurAgEng

Participation of the Faculty of Engineering of the Slovak University of Agriculture in Nitra in the Biosystems Engineering EUR-ACE academic accreditation or the recognition procedure under the umbrella of EurAgEng can be considered as a tool which could increase the prestige of faculty among the competitive faculties in the near future. At present time the Faculty of Engineering of the Slovak University of Agriculture in Nitra registers the decreased interest of the students to study the Agricultural engineering study branch. The students are more interested in industry-oriented study branches. To work in agriculture is not enough attractive. It is the result of the general crisis of the Slovak agriculture caused by the unfair and discriminatory Common Agricultural Policy of the European Union based on neo-colonial principles in relation to the new member states of the EU. It can be expected that after a crisis the study of agricultural/biosystems engineering will be more attractive for the students and it will create new conditions for the progress of the study branch. Participation in the Biosystems Engineering EUR-ACE academic accreditation or the recognition procedure within the EurAgEng will be more current and actual.

6. References
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN SPAIN

F. Ayuga¹, P. Aguado²

Abstract
Biosystems Engineering in Spain has the same procedure for quality assurance and assessment than the other branches of Engineering. In Spain a national independent Agency (ANECA) is in charge of the task since 2002, assisted by regional Agencies. In the field of Engineering every new programme of studies has to pass a process of verification and accreditation like any other degree, but if they want to apply for professional recognition they should accomplish with certain minimum of credits in key subjects established by the government. Regarding EUR-ACE procedure the most important thing is to promote cooperation between IIE (Institution of Spanish Engineering) and ANECA, due to the membership of IIE to FEANI and ENAEE, promoters of EUR-ACE.

Article 32 of the Spanish Law 6/2001 (1) on Universities lays down that, by means of a Resolution by the Council of Ministers and subsequent to a report by the Universities Coordinating Council, the Government shall authorise the setting up of the National Agency for Quality Assessment and Accreditation (ANECA). ANECA was set up as a public trust on 19 July 2002.
The ultimate goal of the Trust is to contribute to the quality improvement of the higher education system through the assessment, certification and accreditation of university degrees, programmes, teaching staff and institutions. This Agency works all over the country and the procedures are the same to all Universities and degrees in Spain. There are also some regional Agencies of the same kind with competences within their region (figure 1).
Law 4/2007 (2), which amended Law 6/2001, established a new structure for university degree programmes and degrees in Spain in line with the aims set for building the European Higher Education Area (EHEA). This law was extended by the Royal Decree 1393/2007 (3), which established the regulatory framework for the organisation and verification of recognised university degrees. This Royal Decree lay down that ANECA must establish the procedures, protocols and guidebooks for the verification of recognised degree programmes in accordance with the criteria established by the Royal Decree. It also lay down that ANECA must evaluate the study programme proposals, in

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accordance with these protocols and verification guides. All Spanish official university studies must be adapted to these regulations and start, at least with the first year, for the academic year of 2010-2011.

Figure 1. Spanish regions with their own Accreditation Agency

The verification process begins with the university applying for verification to the Universities Council. Once the Universities Council has verified the conformity of the general aspects, the programme of study is sent to ANECA for the evaluation report. The programme of study is assessed by a review panel consisting of experts who use the protocols of ANECA to draw up a draft report which will either be positive or negative, with reasons provided, together with recommendations, where applicable, for improvement. ANECA then sends the draft report to the University in order for any pleas (supporting arguments) to be made. The University has twenty days to do so. Once this deadline has passed and any pleas have been assessed, ANECA then draws up the final evaluation report, which will be either positive or negative, and it is then sent to the Universities Council. The University may appeal the verification resolution to the Board of the Universities Council.

In the case of the degrees with professional recognition the Royal Decree set that Ministry of Education has to develop specific regulations. There are specific regulations for the first and second cycle of the different branches of the engineering, including the Agricultural Engineering. ANECA has also to take in account such regulations in the accreditation of the university studies. Royal Decree 1393/2007 also establishes that after the verification the university studies must also be accredited. ANECA’s proposal on criteria, guidelines and procedures for accreditation of degree programmes leading to recognised undergraduate and Master’s degrees in Spain, has been drafted, but has not been
approved yet. Such accreditation process will be based on the comparison between the approved proposal and the effective development of the studies.

The aspects that have to be considered in the proposal for the accreditation and will be reviewed during the verification are the following:

- Description of the title
- Justification of the program
- Objectives and competences
- Students access (prerequisites…)
- Structure and subjects
- Staff (Curricula of the academic staff, number…)
- Facilities
- Predicted Results
- Internal Quality Assessment System
- Calendar (To implant the program of studies)

In addition, ANECA, in cooperation with other regional agencies have developed the AUDIT programme. The purpose of this initiative, which is addressed to all the university colleges and faculties that offer university education, is to provide guidance in designing internal quality assurance systems (IQAS) integrating all the activities implemented up until the present time related to degree programmes quality assurance. This programme will also contribute to the recognition of internal quality assurance systems designed by the university institutions. The Universities must prepare proposals that are evaluated by a review panel consisting of experts who use the protocols of ANECA to draw up a report which will either be positive or negative, with reasons provided, together with recommendations, where applicable, for improvement. If the proposal is not accepted the only consequence is that the IQAS has not been accredited, but it is not necessary for the verification. On the contrary, if the IQAS has been accredited within the AUDIT programme, will fulfill to the accreditation criteria.

Since the university teaching staff level of professional competence is an important criterion of the accreditation and verification processes, ANECA has also developed the DOCENTIA programme. This programme guides universities in the evaluation and continuous improvement of academic staff competences. To be accredited in this programme universities have also to present a teaching staff evaluation system according with the protocols developed by ANECA.

Regarding to the university services ANECA has also developed an excellence model for Accreditation/Recognition of university services and management departments, similar to that used at the international level by extremely prestigious organizations, respected for their high quality standards on management: the European Foundation for Quality Management model (EFQM).

Besides, Ministry of Education has also developed a Quality Label Recognition System for the Ph.D studies. This award will acknowledge the scientific, technical and educational high standards of Ph.D. studies and of the groups or departments involved. Obtaining Quality Label Recognition will also enable public and private universities with no profit motive in mind to participate at the call for applications for grants launched by
the Ministry of Education and Science. ANECA takes part in this programme setting up and applying the assessment procedure for applications’ assessment, audit and validation. The National Agency assesses how well the objective criteria related to quality are fulfilled, and contributes with the recognition of the quality of Ph.D. studies. The consequences of applying these tools have been all Spanish universities have modified their 1st, 2nd and 3rd cycle studies according to the new regulations and are implementing the described programmes. Therefore, at this moment, universities have to demonstrate their quality in the different aspects related to teaching: structure, teaching, staff, facilities, quality assessment systems, etc. All these new studies have also an IQAS and some of them have been accredited within the AUDIT programme.

Regarding to the studies in Biosystems Engineering, because of is an emerging discipline is difficult to demonstrate the university has academic staff with enough experience and suitable facilities for the new subjects that have to be incorporated to the existing studies. In addition, the long tradition of the Agricultural Engineering studies in Spain and the lack of experience transforming them into Biosystems Engineering Studies, difficult also the evaluation of the programmes of studies by the experts. In this respect the ERABEE TN represent an important tool to justify such transformation.

2. Implementation of the European Qualification Framework in Spain

Royal Decree 1393/2007 set a Spanish Qualification Framework (MECES) which have to be the minimum required competences for all the official studies of the three degree cycles. MECES is not completely developed; the Royal Decree describes only the learning outcomes of the Dublin Descriptors, and set them as the foundation of the Spanish framework. A national committee has been created to develop the MECES but the works are not finished yet. This committee is composed by representatives from the University Council, the central government, the regional governments, ANECA, students, business people and experts in the EHEA. Therefore, the present Spanish university degrees have only to be based, at the national level, on the Dublin Descriptors. However these qualifications have been extended in each university for the different developed degrees.

Qualifications of the different degrees are evaluated during the accreditation of the degrees and reviewed during the verification. Protocols of ANECA set how the universities have to describe and justify the qualifications of the degree in the proposals of accreditation. General and specific of the degree competences have to be described. These protocols also set that in the evaluation must be appreciated those references to documents developed by international, European or national thematic networks, projects or institutions. Therefore, in this respect the ERABEE TN works are of maximum utility to comply with this purpose. In the case of the engineering studies, including the agricultural engineering studies, the Ministry of Education has developed specific regulations.

The specific regulations for each branch of the engineering previously described also include a list of competences which must be included in the studies programmes. This is the case of the agricultural engineering studies. These regulations affect only to the first and second cycle. The first cycle corresponds to a four years bachelor degree and the second cycle to a Master Degree with duration of 60 up to 120 ECTS (1 to 2 years).
These regulations impose the competences for 120 ECTS (three years) in the Bachelor degrees and for 60 ECTS (one year) in the Master degrees. Within the 120 specified European credits for the bachelor degrees, 60 credits are devoted to develop specific competences in four different specializations. These specializations are Mechanization and Rural Constructions, Livestock Farms, Agricultural and Food Industries and Gardening and Horticulture.

In the case of the 3rd cycle universities have to include the competences described in the Royal Decree 1393/2007. These competences, the same that those included in the framework of qualifications of the EHEA, are the following:

- have demonstrated a systematic understanding of a field of study and mastery of the skills and methods of research associated with that field;
- have demonstrated the ability to conceive, design, implement and adapt a substantial process of research with scholarly integrity;
- have made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work, some of which merits national or international refereed publication;
- are capable of critical analysis, evaluation and synthesis of new and complex ideas;
- can communicate with their peers, the larger scholarly community and with society in general about their areas of expertise;
- can be expected to be able to promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge based society.

3. EUR-ACE Academic Accreditation Procedure regarding Biosystems Engineering or related programmes of studies

The profession of engineer can be practiced in Spain by (and only by) people with a University engineering degree. At the moment there are two kinds of engineers, the Technical Engineers with a three years University degree and the Engineers with a five or six years University degree. In the next academic year there will be new Bachelor degrees (or Grado in Spanish) lasting four years and a Master degree lasting one or, most commonly, two years. Once a student has finished it has the right to enter a professional official body “Colegio Oficial de Ingenieros…” within its branch of engineering. All branches of 5 or 6 years graduates are integrated in an Institution (Instituto de la Ingeniería de España-IIE) and all branches of 3 years graduated are integrated in a different Institution (Instituto de Ingenieros Técnicos de España-INITE). Both Institutions represent Spain as FEANI members.

The membership to one of the “Colegio de Ingenieros…” is necessary to develop technical projects as a freelance, but not to work in a company or the public Administration. There are few limitations specified by the laws and standards for each branch of engineering regarding the kind of professional work they can produce. Agricultural Engineering has been the only degree with specific activity in the agricultural (including animal production) and food sector during the last one hundred and fifty years. There is also a degree in Forest Engineering even older than Agricultural Engineering. Certain degrees such as Civil and Mechanical Engineering, Chemistry, Biology and some others develop partial activity in the agricultural sector.
Recently new degrees such as Food Technology and Sciences or Enology have been added to the Spanish list, with competences in the agricultural and food sector. There is not a degree in “Agricultural Sciences” or “Applied Biology in Agriculture” or “Agronomy”, so the Agricultural Engineers assume scientific and engineering competences together. Regarding the incoming degrees a greater variety of names is coming including Biosystems Engineering (two Universities have apply for this name, Universidad Politécnica de Cataluña for Bachelor and Universidad de León for the Master). The Spanish Government has published a Decree for each branch of the classical Engineering names (both long duration and shot duration) with some minimum requirements to be accomplished by the new programme of studies in order to recognize professionally the new degrees, as was described above. Bachelor degrees will lead to the old “Technical Engineers” (members of INITE) and Master degrees will lead to the old “Engineers” (members of IIE). Until now there are no provisions on the possibility for the new graduates not accomplishing with the minimum to be allowed to join the old “Colegios Oficiales de Ingenieros”.

As has been previously described, in Spain accreditation and quality assurance are made by a National agency ANECA. The Government authorized the setting up of the National Agency for Quality Assessment and Accreditation (ANECA). Among their guiding principles is to act in accordance with the principles of coordination and cooperation with the external evaluation bodies established for similar purposes, within their respective sphere of jurisdiction. Furthermore, the Agency shall take into consideration in its actions the internationally acknowledged general principles on the subject, for which it will form part of the existing international networks and establish appropriate mechanisms for cooperation to this end. In this sense ANECA is member of the European Association for Quality Assurance in Higher Education (ENQA) and the European Quality Assurance Register for Higher Education (EQAR). The ultimate goal of the Agency is to contribute to the quality improvement of the higher education system through the assessment, certification and accreditation of university degrees, programmes, teaching staff and institutions.

The academic accreditation body (ANECA) has the information on each programme of studies regarding their appliance to get engineering professional recognition (under the general programme to approve new degrees, VERIFICA programme). They are in charge of testing if the proposal of a programme of studies meets the official requirements to apply for professional recognition as engineering (both kinds). Usually there is a board of experts to analyze the proposals and in this board some representative of the professionals are present. The election is made by the ANECA but it is common to have people belonging to the staff of the “Colegios Oficiales de Ingenieros”

ANECA does not belong to ENAEE (European Network for Accreditation of Engineering Education) but IIE is one of its members. So, cooperation between IIE and ANECA is very important in order to internationalize Spanish Engineering studies accreditation and verification. The future of EUR ACE project in Spain depends mostly on the establishment of this cooperation.
In Spain Biosystems Engineering (as well as Agricultural, Rural or Biological Engineering) is included as a branch of Engineering. In this way all the steps to international recognition should be in the same package of the Engineering as a whole.

4. Testing some Biosystems Engineering Spanish programmes of studies against the USAEE-FEANI requirements

The ERABEE template has been used to test some of the Spanish Biosystems (or related) Engineering programmes of studies. For example the figure 2 corresponds to the bachelor in Agricultural Sciences and Engineering (Graduado en Ciencia e Ingeniería Agronómica) of the UPM, one of the 4 bachelors scheduled at the UPM that could be considered equivalent to Biosystems Engineering:

<table>
<thead>
<tr>
<th>Module &amp; Other Module - Specialisation</th>
<th>FEANI Requirements</th>
<th>Example Course for Recognition</th>
<th>Automatic Check of ECTS Limits Against FEANI Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECTS Range</td>
<td>ECTS</td>
<td>%</td>
</tr>
<tr>
<td>BASIC SCIENCES</td>
<td>36 (min) - 45</td>
<td>40,0</td>
<td>BASIC SCIENCES</td>
</tr>
<tr>
<td>Mathematics</td>
<td>24 (min)</td>
<td>22</td>
<td>MATH</td>
</tr>
<tr>
<td>Physics</td>
<td>12 (min)</td>
<td>12</td>
<td>CHEM</td>
</tr>
<tr>
<td>Chemistry</td>
<td>12 (min)</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Informatics</td>
<td></td>
<td>0</td>
<td>0,0%</td>
</tr>
<tr>
<td>Electives</td>
<td>18 - 27</td>
<td>20</td>
<td>ELECTIVES</td>
</tr>
<tr>
<td>Economics &amp; Humanities</td>
<td>18 (min)</td>
<td>12</td>
<td>ECONOMICS &amp; HUMANITIES</td>
</tr>
<tr>
<td>Sub-Total BASIC SCIENCES &amp; ELECTIVES (1):</td>
<td>54 (min) - 72</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>ENGINEERING SCIENCES</td>
<td>72 (min) - 81</td>
<td>58</td>
<td>ENGINEERING SCIENCES</td>
</tr>
<tr>
<td>Core</td>
<td>44-51</td>
<td>36</td>
<td>CORE</td>
</tr>
<tr>
<td>Module</td>
<td>28-30</td>
<td>22</td>
<td>MODULE</td>
</tr>
<tr>
<td>AGRICULTURAL/BIOSYSTEMS SCIENCES</td>
<td>36 (min) - 45</td>
<td>78</td>
<td>AGR/BIOLOGICAL SCIENCES</td>
</tr>
<tr>
<td>Core</td>
<td>30-35</td>
<td>58</td>
<td>CORE</td>
</tr>
<tr>
<td>Module</td>
<td>16-20</td>
<td>20</td>
<td>MODULE</td>
</tr>
<tr>
<td>Sub-Total ENG. &amp; AGR/BIOS SCIENCES (2):</td>
<td>108 (min) - 126</td>
<td>136</td>
<td>ENG &amp; AGR/BIO SCIENCES</td>
</tr>
<tr>
<td>Sub-Total (1+2):</td>
<td>162 (min) - 198</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td>APPLIED AGRICULTURAL ENGINEERING (3):</td>
<td>18 (max)</td>
<td>8</td>
<td>APPLIED AGR ENGINEERING</td>
</tr>
<tr>
<td>TOTAL ECTS CREDITS FOR 1ST CYCLE (1+2+3):</td>
<td>240</td>
<td>222</td>
<td>100,0%</td>
</tr>
</tbody>
</table>

Figure 2. Comparison of Universidad Politecnica de Madrid programme on Biosystems Engineering against USAEE-FEANI criteria

The programme is scheduled to last 4 years or 240 ECTS, so it would be easier to accomplish with the minimum requirements (because the USAEE core curriculum is based on 180 ECTS), and probably more difficult with the maximum but the result is not of this kind

It can be observed that the programme fails due to the next items:
Not enough Mathematics, even with more ECTS, the credits devoted to maths are 22, 2 less than the FEANI requisite.

Too much Basic Sciences credits, 46 ECTS 1 more than indicate by the USAEE-FEANI document.

Not enough Economics and Humanities, 12 credits instead of 18 credits

Too much Basic Sciences plus Electives, 78 ECTS instead of 72 ECTS

The real problem comes when analyzing Engineering Sciences, nor the core or the module credits are enough, 36 ECTS and 22 ECTS against 48 ECTS and 28 ECTS respectively.

The lack of Engineering is compensated by too much credits in core Agricultural/Biosystems Sciences, more than double the requisites, 58 ECTS against 25 ECTS

As a summary to meet the USAEE-FEANI criteria this programme should increase the Mathematics and Economy and above all change credits on Agricultural/Biosystems Sciences into Engineering Sciences.

Figure 3 shows the result for Agricultural and Rural Engineering degree at the Universidad de León. As can be seen there is no agreement with the USAEE-FEANI requirements. As in the previous case it must be taken into account that the duration of the Spanish first cycle degrees is 240 ECTS while the FEANI requirements were designed for 180 ECTS degrees what explain why the selected degree exceed the maximum values of some requirements. However the major problems are the lack of credits in Mathematics, Economics and Humanities and the elective modules. There are not expected changes in the immediate future because these studies have been recently modified.
Education and Research in Biosystems or Agricultural and Biological Engineering in Europe; a Thematic Network (ERABEE-TN)

Project Number: 134306-LLP-1-2007-1-GR-ERASMUS-ENW

Figure 3. Comparison of Universidad de Leon programme on Biosystems Engineering against USAEE-FEANI criteria

5. Spanish Institutions that might be interested to participate in the Biosystems Engineering EUR-ACE Academic accreditation or the recognition procedure under the umbrella EURAGENG.

Nowadays 15 Spanish public Universities and 2 private Universities offer the “Agricultural Engineer” degree. Seven of the public Universities and one private University offer the possibility of a 5 year programme without a degree at the end of the 3rd year, and a separate degree of “Technical Agricultural Engineer” of 3 years. The others programme their studies with a 3 year degree of “Technical Agricultural Engineer” plus two more years to obtain the “Agricultural Engineer” degree.

Another 11 public Universities and 2 private offer only the 3 years degree. It seems that all this 30 Universities (26 public and 4 private) will offer new Bachelor degrees in disciplines related with Agricultural Engineering. The map will be complete next academic year. Until now only one of them has proposed the name Biosystems Engineering. (Figure 4).
Figure 4. Spanish locations offering Agricultural Engineering degrees
After the end of the process it will be possible to list the names of Institutions that could be interested in EURACE accreditation

6. References:


QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN SWEDEN

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Abstract
In Sweden the National Agency for Higher Education validates suggestions for new and also already existing education programmes leading to professional degrees. Furthermore, all higher education leading to a professional or general degree is regularly evaluated. The evaluation is performed by a group of national and international experts within the field of the programme to be evaluated. The evaluation involves possible negative consequences in the form of institutions losing their degree-awarding powers for inferior provision of programme/subject. The title of Engineer is not legally protected in Sweden and has no legal status. A formal recognition procedure administered by a widely accepted organisation, e.g. an engineering society could serve as a complement to the governmental evaluation process already applied. Such a recognition process could add value to national curriculum by adding a better benchmarking of curriculum content and adding improved visibility for the programmes.

1. Tools for Quality Assurance and Assessment Frameworks
In Sweden the state is responsible for the provision of higher education. The Swedish Parliament and the Government decide what regulations are to apply and how resources are to be allocated. The Government exercises control by issuing appropriate directions, special government decisions, special ordinances (such as the Higher Education Ordinance) and assignments. The institutions report back to the Government in their annual reports. All institutions report to the Ministry of Education and Research except for the Swedish University of Agricultural Sciences (SLU), which reports to the Ministry of Agriculture. An additional instrument is the informal dialogue between the Government Offices and the universities.

The governing board of SLU consists of 15 members. The Government appoints eight members and chairperson, two members represent the teachers and researchers at the institution and these are appointed by the institution via election. The students nominate three members and the vice-chancellor also sits on the board.

All institutions of higher education are, according to the Higher Education Act and the Higher Education Ordinance, responsible for quality assurance of all their activities.

“Activities shall be adopted so that a high quality is achieved, in education as well as in research and artistic development. Available resources shall be efficiently utilised in order to maintain a high quality of activities. Quality efforts are a joint matter for staff and students at institutions of higher education”. The evaluation of programmes and subjects of all higher education in Sweden can be described as follows:
i. Mandatory evaluations are conducted on behalf of the Government.

ii. Subjects and programmes are reviewed regularly.

iii. The National Agency for Higher Education conducts the evaluation.

iv. The evaluation is performed by a group of national and international experts within the field of the programme to be evaluated. The group may consist of academic people as well as representatives from industry and society. The evaluations are performed by initially requiring a self-evaluation to be made by the university itself. The evaluation group makes visits where the university management as well as the teachers and students are interviewed and are able to give their comments to the self-evaluation already made at the time for the site visit. After this an evaluation report is published with comments and suggestions from the experts.

v. The authority requests the university to implement the suggestions within a certain period after the report has been published. The implementation is the responsibility of the faculties.

vi. The evaluation report is an official document printed as a book and also published on the web site of the Agency.

vii. All university programmes and subjects are evaluated in the same way as described above.

viii. The evaluations shall amongst other things comprise of an analysis of the programmes fulfilment of goals and implementation, relationship to the labour market, agro-industrial sector relevance, student volume, international circumstances and long-term education strategy. This brings about that the reviews are taken into consideration in many parts of society.

The National Agency for Higher Education claims that this evaluation system "bears all the international hallmarks of accreditation"

At the faculties, programme committees have the direct responsibility for a programme and its courses. A committee is composed of teachers, students, and representative(s) from industry life. According to the university (SLU) regulation “the evaluation of courses and programmes is one part of the education system and teachers and students have a joint responsibility for this". “Course and programme evaluations shall be followed up and be used as a tool in the quality assurance of the education. The department responsible for the course shall compile and follow up the course evaluations". The programme committee shall take part of and consider evaluation reports (now: web-based) as well as monitor students progression. Furthermore the committee shall consider the initiating of new study programmes and also the revising of them.

The utmost responsibility for academic quality and standard is shared by the faculty boards and the university board. The immediate work is handled by research committees and education committees headed by the vice-rector and vice-dean at the University level and Faculty level respectively. The committees are acting for the University in the areas of external review and audit. Officially, however, it is the responsibility of the University board.
2. Implementation of European Qualification Framework

Although the European Qualification Framework (EQF) was adopted already in 2008 by the Council and the European Parliament the discussion of how to implement the Framework on the national level has only just started. The Swedish National Agency for Higher Vocational Education has been given the task to be the National Coordination Point. It is the task of the Coordination Point to develop a National Qualification Framework (NQF), including a suggestion for descriptors. The suggested NQF shall be presented in October 2010. It is not yet possible to give an illustration of the impact of the EQF on the 1st, 2nd and 3rd cycles of studies. No analyses have been made. It is officially declared that Sweden shall implement the EQF. The implementation shall comprise all education within the public education system. However, within the higher education system a national reference framework already exists. Also for other educations references and levels shall be made explicitly. Mainly all educations are criterion-referenced and qualifications are defined by achieved learning outcomes. As long as no Agricultural and Biosystems Engineering programmes of study exists no interpretation of the EQF can be made.

3. EUR-ACE academic accreditation

a. There is no professional accreditation related to Engineering in Sweden.
b. The National Agency for Higher Education is responsible for academic accreditation. It can also involve a possible negative consequence in the form of institutions losing their degree-awarding powers for inferior provision of programme/subject.
c. Since no professional accreditation exists related to Engineering there are no relations to the academic ones.
d. It should be the task of the National Agency for Higher Education to handle a possible EUR-ACE academic accreditation of a public university-level organisation.
e. A designated group of evaluators will go through suggested curricula, staff, infrastructure etc. Final decision on accreditation of a non-public organisation is made by the Government.
f. Not applicable.
g. No applicable.
h. No changes are foreseen.

4. EurAgEng Recognition Template

No structured education in Agricultural or Biosystems Engineering is in progress in Sweden. Single courses related to basic sciences and various engineering specialisations are given at the Swedish University of Agricultural Sciences. The university still runs two Master programmes in collaboration with Uppsala University where the students graduate from the latter university. They are: the Energy Systems Programme and the Environmental and Water Technology programme. Discussion are going on together with some technical universities to work out possible cooperation in Agricultural or Biosystems education and programmes.
5. Related bodies and institutions

- Swedish National agency for Higher Education, P.O.Box 7851, SE-10399 Stockholm,
  url: www.hsv.se;
  e-mail: hsv@hsv.se
- Swedish Association of Graduate Engineers, P.O.Box 1419,
  SE-111 84 Stockholm; Url: www.sverigesingenjorer.se ;
  e-mail: info@sverigesingenjorer.se
QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN TURKEY

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Abstract
The objective of this paper was to reveal some information regarding Quality Assurance and Assessment Frameworks of Biosystems Engineering Studies in Turkey. The Council of Higher Education (YÖK) regulation in 2005 set up YÖDEK, a body responsible for implementing university quality assurance in the country, mainly by setting quality criteria together with YÖK, and by approving quality assurance agencies. YÖK’s involvement in quality oversight and its link to both universities and government through its membership, could be a potential cause for concern with regard to the independence of quality judgments, as called for in the “Standards and Guidelines for Quality Assurance in the European Higher Education Area”. Association for evaluation and accreditation of engineering programs (MÜDEK) became the seventh agency Authorized by ENAEE to award the EUR-ACE label in 2009 in Turkey. MÜDEK does not accredit any 2nd and 3rd cycle studies in Agricultural and Biosystems Engineerings. Actually, some modifications on the directive on policies and procedures for evaluation and accreditation of MÜDEK was made on the 20th of March, 2010. This will allow the accreditation of the faculties of Agriculture and the departments at these faculties.

1. Tools for Quality Assurance and Assessment Frameworks of Agricultural /Biosystems Engineering Studies
The Council of Higher Education is the fully autonomous supreme corporate public body responsible for the planning, coordination, governance and supervision of higher education within the provisions set forth in the Constitution (Articles 130 and 131) and the Higher Education Law (Law No. 2547) of Turkey. The Interuniversity Council is an academic advisory body, comprising the rectors of all universities and one member elected by the senate of each university. In addition to those, the Turkish Rectors Conference acts in an advisory capacity to the President of the Council of Higher Education. The Center for Student Selection and Placement, ÖSYM (to all higher education institutions) functions subject to the decisions of the Council of Higher Education including both Turkish and foreign nationals.
By law, it is the responsibility of the Council of Higher Education and the Interuniversity Council to see to it that a national system of quality assurance with a structure and function comparable to its transnational counterparts is established and implemented. In their last meeting, both the Council and the Board have expressed their willingness to establish a national quality assurance system and re-acknowledged that the establishment of this action line has top priority in their agenda after being briefed about the existing practices by some higher education institutes in Turkey.
The pioneering higher education institutions in search of international recognition of some of their programmes invited ABET (Accreditation Board for Engineering and Technology-USA) in the first half 1990's. Most of the engineering programmes of 4 universities were evaluated by ABET at different times and received "substantial equivalence" from ABET (ABET's only accreditation for countries outside the USA). These universities have since then been co-operating with ABET for quality assurance of their engineering programmes and more higher education institutions followed them afterwards. This co-operation has also motivated all the engineering faculties to establish a national system quality assurance for engineering programs. The meetings and the workshops of the deans of all the engineering faculties, which started in late 1990’s, gave birth to a national accreditation system of engineering programmes- MÜDEK n 2002 as similar to ABET.

A pilot project, named “Turkish University Quality Assessment Project” was conducted by the Council of Higher Education in 1997 in co-operation with the British Council, Ankara and the UK Higher Education Management Consultants, Universitas. The selected 13 departments of the 8 universities, none of which were agricultural engineering, participated in the Project. The Project covered a wide variety of programmes and higher education institutions but did not result with the establishment of a national quality assurance system. As stated in the report to the Council of Higher Education “the objective of the Project was the development of an academic assessment mechanism and structure, and eventually leading to the establishment of a model accreditation and quality assurance system similar to the OECD and EU countries. The general purpose of quality assessment in Turkey was a combination of accountability, improvement, information and accreditation. Particularly, it was aimed to base the Turkish system on the convergence on self-evaluation, peer review, supporting performance measures, published report and national agency”. The report concluded that, “there is a need felt by the government, society, the employment sector and the Council of Higher Education (YÖK) to promote and secure Turkish universities’ reputation internationally, particularly, within other OECD and EU countries”. The 2001 regulations for quality assurance accepted by the Interuniversity Board, the practices and the pilot project mentioned above now provide a solid background to establish a national system, including all the desired elements in it, like international participation, co-operation and networking.

YÖK regulation in 2005 set up YÖDEK, a body responsible for implementing university quality assurance in the country, mainly by setting quality criteria together with YÖK, and by approving quality assurance agencies. YÖK’s involvement in quality oversight and its link to both universities and government through its membership, could be a potential cause for concern with regard to the independence of quality judgments, as called for in the “Standards and Guidelines for Quality Assurance in the European Higher Education Area”. The success of quality assurance systems depends on the involvement and commitment of all members of the university community. However, their willingness to contribute to ongoing quality enhancement depends very much on the transparency of the system and on regular feedback on actions taken in response to weaknesses. Internal quality assurance committees are reported to function at all universities, but the system lacks a mandatory external element, which means that an
essential feature for making quality assurance effective and external accountability reliable, is missing [1,2].
Within the scope of National Quality Assurance, Universities accelerated their studies on the Academic Assessment and Quality Evaluations and reports on these issues by the commissions (ADEK) at faculty and department level. MUDEK became the seventh agency Authorized by ENAEE to award the EUR-ACE label in 2009. The main objectives of MUDEK follow [3].
1. Accreditation of first cycle (4 years bachelor's) and second cycle (master's) engineering programs administered by engineering schools in Turkey.
2. Selecting and training program evaluators,
3. providing information to and training program administrators (deans and program chairs) and academic staff on program accreditation
4. Reviewing and updating program accreditation criteria and procedures.
MUDEK at present accredits only first cycle programs. Organization chart of MUDEK is depicted in figure 1.

**Figure 1. Organizational structure of MÜDEK**

MAK runs the accreditation process and makes the final accreditation decisions and consists of eight members
- One representative of the Union of Chambers of Engineering and Architects of Turkey (TMMOB)
- One representative of the Turkish Society for Quality (KalDer)
- Two representatives of industry
- Four representatives of academia
- Membership closed to current deans of engineering schools and upper administration of HEI's
- Members serve for two years, limited to three consecutive terms
- 3 of its members are the Chairman; Deputy Chairman (Chairman elect) and Previous Chairman
MÜDEK accredited a total of 76 four year first cycle engineering programs that belong to 15 different universities in Turkey so far. In the case of Ege university, only computer, electrical and electronic, food, chemical, textile and mechanical engineering programs were accredited by this independent and non-governmental platform founded in 2002. As a consequence of accreditation it is expected that the quality of engineering education in Turkey will be enhanced.

2. European Qualification Framework and EUR-ACE accreditation Procedures

MÜDEK assessment procedure concerning the first cycle studies is as following:
1. Higher Education Institutions (HEI) send statement of intent to MÜDEK for the programs that will apply for accreditation
2. HEI’s send Self–Assessment Reports (SAR’s) for each program to MÜDEK
3. Evaluation teams are formed by MÜDEK
4. Teams study SAR’s and request additional documents
5. Teams visit HEI’s (3 day institution visit)
6. Teams submit draft reports to MÜDEK
7. Reports are finalized after consistency and editorial checks
8. Accreditation decisions are made by MÜDEK MAK; results and final reports are sent to the HEI’s
9. List of accredited programs is updated and published on the MÜDEK website http://www.mudek.org.tr/

MÜDEK program outcomes are:
Engineering programs must demonstrate that their graduates have acquired:
(a) An ability to apply knowledge of mathematics, science, and engineering
(b) An ability to design and conduct experiments, as well as to analyze and interpret experimental data
(c) An ability to design a system, component, or process to meet desired needs
(d) An ability to function on multidisciplinary teams
(e) An ability to identify, formulate, and solve engineering problems
(f) An understanding of professional and ethical responsibility
(g) An ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

MÜDEK has not accredited any 1st cycle studies in Agricultural and Biosystems Engineering programs so far. Actually, some modifications on the directive on policies and procedures for evaluation and accreditation of MÜDEK were made on the 20th of March, 2010. The change that will allow the accreditation of the faculties of Agriculture
and departments under their umbrellas such as Agricultural and Biosystems programs is the one in article 4 on the policy. 
Along with MÜDEK, the establishment of national accreditation system of Agricultural related programmes ZİDEK is planned. But there is no sign of approval of this council by YÖK.
Turkish Accreditation Agency TÜRKAK established in 1999 in accordance with law 4457, related with the Prime Ministry, subject to private law provisions, with its headquarters in Ankara, as a legal entity having administrative and financial autonomy, to accredit the local and international bodies rendering laboratory, certification and inspection services, ensure them to operate in accordance with established national and international standards, and thereby ensuring international recognition of product / service, system, personnel and laboratory certificates.

Duties and authorities of the Agency are as follows:
a) Make arrangements regarding the activities of the Agency, establish the criteria and measures related with accreditation, implement and, when required, modify, revise and annul the same,
b) Evaluate the private and/or public agencies and organizations, which carry out activities on laboratory, product/service, system, personnel and similar certification issues, applying for accreditation according to relevant standards and criteria and decide whether to accredit such organization as a result of this evaluation, monitor accredited organizations, suspend the decision of accreditation temporarily or permanently, when required, and provide coordination among all agencies and organizations that will carry out activities in these fields,
c) Make arrangements encouraging the use of markings and certificates issued by accredited organizations,
d) Establish relationships and cooperate with international and regional accreditation bodies and those of other countries,
e) Ensure the confidentiality of information obtained in relation with the application, evaluation and accreditation of the organizations applying for accreditation,
f) Carry out activities promoting the importance of accreditation and the consciousness of quality,
g) Carry out training, research and publication activities on issues within its terms of reference,
h) Purchase services on the issues within its scope of activities,
i) Purchase, build, sell, lease and put lien and mortgage on movables and immovables required for carrying out the services,
j) Perform other duties related with its field of activity.
Applying to MÜDEK and TURKAK for the purpose of accreditation is voluntary but it is not known that the accreditation of the Faculties of Agriculture will be carried out by ZİDEK or MÜDEK. But ZİDEK has not been recognized by the council of Higher Education yet.
3. Analysis of Agricultural/Biosystems Engineering Programs based on EurAgEng Recognition Template

The current education in the Faculties of agriculture restructured three times in the last decade. However, these restructuring processes have not been done in accordance with the Bologna or any other system [1]. In 2009, students were accepted to the following departments through the central placement examination. Hence the curriculum given in Appendix is new and ECTS credits have not been assigned yet as in the example of Ege University. It is planned that the ECTS credits will be determined based upon the workload (as a percentage of lab assignments, term projects, exams etc.) soon and so that comparisons with FEANI requirements can be made.

**Agricultural Machinery**

Farm Structures and Irrigation

Horticulture Sciences

Plant Protection

Landscape Architecture

Dairy Technology

Agricultural Economics

Field Crops

Soil Science

Animal Science

The first two departments given above are considered to be the ones that form Agricultural Engineering program.

4. List of Institutions that can participate in the Biosystems Engineering EUR-ACE academic accreditation or recognition procedure under the umbrella of EurAgEng

Uludag University, Faculty of Agriculture, Department of Agricultural Machinery, Bursa. Contact Person: Kamil Alibas – Department chairperson, http://www20.uludag.edu.tr/~tarmak/indexen.htm

Gaziosmanpaşa University, Faculty of Agriculture, Department of Agricultural Machinery, Tokat. Contact Person: Ali Kasap – Department chairperson, http://ziraat.gop.edu.tr/bolumler/tarimmak/akadro.asp

Namik Kemal University, Faculty of Agriculture, Department of Agricultural Machinery, Tekirdag. Contact Person: Birol Kayıosglu – Department chairperson, http://ziraat.nku.edu.tr/index.php?option=com_content&task=view&id=33&Itemid=53

5. References:


Appendix

First Cycle, I. semester

<table>
<thead>
<tr>
<th>Course Name</th>
<th>Credit</th>
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<tbody>
<tr>
<td>Chemistry</td>
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</tr>
<tr>
<td>Botany</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Computer Science</td>
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</tr>
<tr>
<td>Landscape Architecture</td>
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<td>General Economics</td>
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First Cycle, II. Semester

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<tr>
<td>Zoology</td>
<td>2</td>
</tr>
<tr>
<td>Soil Science</td>
<td>2</td>
</tr>
<tr>
<td>Measurement Techniques</td>
<td>3</td>
</tr>
<tr>
<td>Statistics and Experimental Design</td>
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<tr>
<td>Technical Drawing</td>
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First Cycle, III. Semester

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<tr>
<td>Plant Nutrition</td>
<td>2</td>
</tr>
<tr>
<td>History of Agriculture and Deontology</td>
<td>2</td>
</tr>
<tr>
<td>Agricultural Mechanization</td>
<td>3</td>
</tr>
<tr>
<td>Plant Protection</td>
<td>3</td>
</tr>
<tr>
<td>Genetics</td>
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</tr>
<tr>
<td>General Microbiology</td>
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First Cycle, IV. Semester

<table>
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<tbody>
<tr>
<td>Agricultural Economics</td>
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<tr>
<td>Agricultural Irrigation and Drainage</td>
<td>2</td>
</tr>
<tr>
<td>Food Science and Technology</td>
<td>3</td>
</tr>
<tr>
<td>Horticultural Crops and Growth Principles</td>
<td>3</td>
</tr>
<tr>
<td>Field Crops and Growth Principles</td>
<td>3</td>
</tr>
<tr>
<td>Animal Breeding</td>
<td>3</td>
</tr>
<tr>
<td>Agricultural Ecology</td>
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<tr>
<td><strong>TOTAL</strong></td>
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</table>
### Education and Research in Biosystems or Agricultural and Biological Engineering in Europe; a Thematic Network (ERABEE-TN)

**Project Number:** 134306-LLP-1-2007-1-GR-ERASMUS-ENW

#### First Cycle, V. semester

<table>
<thead>
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<td>Elective Course</td>
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<td>Material Science</td>
<td>2</td>
</tr>
<tr>
<td>Strength of Materials and machine Components</td>
<td>3</td>
</tr>
<tr>
<td>Thermodynamics and Climatization</td>
<td>3</td>
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<tr>
<td>Fluid Mechanics</td>
<td>2</td>
</tr>
<tr>
<td>Engineering Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Agricultural Electrification</td>
<td>2</td>
</tr>
<tr>
<td>Earthmoving Machinery</td>
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#### First Cycle, VI. semester

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<td>Elective Course</td>
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</tr>
<tr>
<td>Elective Course</td>
<td>2</td>
</tr>
<tr>
<td>Computer Aided Design</td>
<td>3</td>
</tr>
<tr>
<td>Mechanical Technology</td>
<td>3</td>
</tr>
<tr>
<td>Automation, Control and Measurement Systems</td>
<td>3</td>
</tr>
<tr>
<td>Greenhouse Mechanization</td>
<td>2</td>
</tr>
<tr>
<td>Livestock Husbandry Machinery</td>
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<tr>
<td>Plant Protection Machinery</td>
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#### First Cycle, VII. semester

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<td>Diploma Thesis</td>
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<tr>
<td>Biological Materials and Crop Processing Techniques</td>
<td>3</td>
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<tr>
<td>Agricultural Tractors</td>
<td>3</td>
</tr>
<tr>
<td>Irrigation Mechanization</td>
<td>2</td>
</tr>
<tr>
<td>Operations Research</td>
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<tr>
<td>Engineering Principles of Agricultural Machines-I</td>
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#### First Cycle, VIII. semester

<table>
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<td>Social Affairs</td>
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<tr>
<td>Diploma Thesis</td>
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<tr>
<td>Conveying and Storage of Agricultural Materials</td>
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<tr>
<td>Agricultural Mechanization Management</td>
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<tr>
<td>Operational and Maintenance Techniques of Farm Machinery</td>
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<td>Precision Farming</td>
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<td>Engineering Principles of Agricultural Machines-II</td>
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<td>Project</td>
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QUALITY ASSURANCE AND ASSESSMENT FRAMEWORKS OF BIOSYSTEMS ENGINEERING STUDIES IN UNITED KINGDOM

W. A. Rowley
Harper Adams University College, Newport, Shropshire, TF10 8NB
United Kingdom

Abstract
Both academic and professional accreditation for engineering courses exist in the United Kingdom. The Qualifications and Credit Framework (QCF) is a new system of recognising and comparing different skills and qualifications in the UK education sector. It replaced the existing National Qualifications Framework in England, Northern Ireland and Wales from September 2008. The QCF is a national framework that is referenced to the European Qualifications Framework (EQF). For some time the UK has been moving to the use of competences, learning outcomes etc as a means of assessing the quality and functionality of courses at various levels and therefore the adoption of the EQF will have little impact on quality assurance and assessment procedures in the UK.
In the UK, the Engineering Council is able to award the EUR-ACE label to first and second cycle engineering degrees that meet the required standard. Degree courses accredited by a licensed professional engineering institution since 2006 automatically meet the EUR-ACE standard and are eligible to be considered.
The current 1st cycle courses in Agricultural Engineering in the UK would not meet the FEANI requirements for recognition because of the heavy emphasis on Engineering Science and Applied Agricultural Engineering.

1. Tools for Quality Assurance and Assessment Frameworks of Biosystems Engineering Studies
The Quality Assurance Agency for Higher Education (QAA) was established in 1997 to provide independent assessment of how higher education institutions in the UK maintain their academic standards and quality. Each University may set its own procedures but these must be approved by the QAA. Course provision must be subject to a validation or re-validation procedure every five years to ensure courses are up to date and maintaining appropriate standards.
Harper Adams Engineering Department uses a system common to many other Universities. A validation committee is established which will include members from other University Engineering departments, members from other departments at Harper Adams and members from manufacturing companies in the agricultural and off-road vehicle sectors. There will be 2 or 3 people in each category. There will also be representatives from the Harper Adams quality assurance committee. This committee will visit the University for 2 to 3 days to carry out the validation procedure (longer for a
large course provision). There is a wide range of factors to be investigated by the committee but the main items can be summarised as follows.

a) Does the University have the physical resources in place to deliver the proposed courses?
b) Does the University have appropriately qualified staff to deliver the proposed courses?
c) Is the department carrying out appropriate research activity to underpin the course provision?
d) Do the proposed courses meet the needs of the appropriate industry (evidence from surveys would be required as well as submissions by the industrial representatives).
e) Have the courses been running satisfactorily for the last five years? eg
   • Are there adequate pass rates for the course under consideration?
   • What are the views of the external examiners of the courses and have their comments been heeded by the course team?
   • What are the views of past and present students and have their views been considered by the course team?

In addition to the academic ‘validation’ procedure explained above there is also an ‘accreditation’ procedure carried out by the appropriate professional body (the Institution of Agricultural Engineers in the case of Harper Adams engineering degrees) with a representative from the national body – The Engineering Council. This is not compulsory, but as few students will ever wish to study a course that is not ‘accredited’ by an Engineering Council professional institution it is in the best interests of University departments to ensure that their engineering courses are indeed ‘accredited’. Courses must have 80% engineering content and thus accreditation would not be sought for courses such as a ‘combined studies’ degree eg engineering and modern languages.

2. European Qualification Framework (EQF)
   a) Impact of the EQF on national quality assurance and assessment procedures for 1st and 2nd cycle studies.
   For many years the UK has been moving to the use of competences, learning outcomes etc as a means of assessing the quality and functionality of courses at various levels and therefore the adoption of the EQF will have little impact on quality assurance and assessment procedures in the UK.

   b) Describe qualifications at structured 3rd cycle level as related to EQF.
   The descriptor for 3rd cycle qualifications as agreed for the Bologna process matches the learning outcomes for level 8 of the EQF.

   c) Explain the interpretation and implementation of the EQF in your country and its relationship to the National Qualification Framework.
   The Qualifications and Credit Framework (QCF) is a new system of recognising and comparing different skills and qualifications in the UK education sector. It replaced the existing National Qualifications Framework in England, Northern Ireland and Wales
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from September 2008. The QCF is a national framework that is referenced to the European Qualifications Framework (EQF).

d) Explain the interpretation and implementation of the EQF in the case of Agricultural and Biosystems Engineering programs.
Following the adoption of the QCF referenced to the EQF (as explained above) then 1\textsuperscript{st}, 2\textsuperscript{nd} and 3\textsuperscript{rd} cycle courses will be assessed against the appropriate EQF learning outcomes in terms of knowledge, competencies etc.

3. EUR-ACE academic accreditation procedure

a) The status of professional accreditation in your country
The Engineering Council is the umbrella organisation for all the individual professional engineering bodies eg Institution of Mechanical Engineers, Institution of Agricultural Engineers, Institution of Civil Engineers and so on. The Engineering Council has agreed a universal specification of what engineering courses should contain in terms of knowledge, competences and learning outcomes (UK-SPEC) which can be viewed on their website. This can be appropriately interpreted by individual Institutions who carry out the accreditation of courses on behalf of the Engineering Council.

b) The status of academic accreditation in your country. Does an independent academic agency exist?
As explained in section 1 the Quality Assurance Agency for Higher Education (QAA) was established in 1997 to provide independent assessment of how higher education institutions in the UK maintain their academic standards and quality. Each University is responsible for organising the academic accreditation (usually referred to as ‘validation’) but to procedures approved by the QAA.

c) What is the relationship between professional and academic accreditation in your country?
There is no direct relationship, the academic and the professional accreditation which are often carried out at different times although on occasions they might be carried out jointly.

d) What are the pre-conditions for the EUR-ACE academic accreditation?
In the UK the Engineering Council is able to award the EUR-ACE label to first and second cycle engineering degrees that meet the required standard. Degree courses accredited by a licensed professional engineering institution since 2006 automatically meet the EUR-ACE standard and are eligible to be considered.

e) Describe briefly the National accreditation procedure which is necessary for the EUR ACE label.
Covered in section 1 and section 3 d) above.

f) If there is no independent accreditation agency which organisation could implement the academic accreditation?
Not applicable
g) If no academic accreditation exists is there a comparable procedure to formally accredit Biosystems Engineering or related programmes at a National level?  
Not applicable

h) Will there be changes in the near future?  
No

4. Analysis of programme of studies in Agricultural Engineering
   a) Specify which modules are active  
The attached spreadsheet shows the module proportions
   b) Compare the ECTS to the FEANI requirements  
The spreadsheet shows a number of areas where the Harper Adams course in Agricultural Engineering does not meet the FEANI requirements. Specifically, the course does not meet the minimum requirements in Basic Sciences in Maths or Chemistry. Neither does it meet the minimum requirements in Agricultural or Biosystems sciences. As might be expected under those circumstances, the course exceeds the maximum ECTS in Engineering Sciences and Applied Agricultural Engineering.
   c) Are there any changes foreseen for the near future to comply with the FEANI requirements?  
It is unlikely that changes of a sufficient magnitude to the BEng (Hons) Agricultural Engineering course would be made in the near future. It is a popular course which is meeting the needs of the manufacturing industry within the UK. However, the Engineering Department at Harper Adams has longer term plans to introduce a Biosystems Engineering degree and it is this course which is most likely to meet the FEANI requirements.
### FEANI summary Template completed for: B Eng (Hons) Agricultural Engineering

#### B Eng (Hons) Agricultural Engineering

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<tr>
<th>ECTS Range</th>
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<td>MAX</td>
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<tr>
<td>BASIC SCIENCES</td>
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