

# **ASIIN Accreditation Report**

# Master Study Programmes Software Systems Engineering Media Informatics (Re-accreditation) Life-Science Informatics (Re-accreditation)

offered by **Rheinisch-Westfälische Technische Hoch schule Aachen** (RWTH Aachen University) and **Bonn University** 

Last update: 10 December 2010

ASIIN Accreditation procedure with on-site audit for

the Master degree programmes Software Systems Engineering Media Informatics (Re-accreditation) Life-Science Informatics (Re-accreditation)

offered by

Rheinisch-Westfälische Technische Hochschule Aachen

(RWTH Aachen University)

and

**Bonn University** 

on 20 October 2010

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## A Preliminary Remark

On 20 October 2010 the audit of the above-mentioned study programmes was held at Rheinisch-Westfälische Technische Hochschule Aachen. Before the audit, in the evening, the audit team discussed the self assessment report of the higher education institutions (HEI). On this occasion, the impressions of the individual auditors were collected and the questions for the audit were prepared. The responsibility for the accreditation procedure for the programmes in question is with the Technical Committee 04 – Informatics. Prof. Mayr was appointed chair of the audit team.

The <u>Master Study Programmes Media Informatics</u> and <u>Life Science Informatics</u> had previously been granted accreditation on 18 March 2005.

The following representatives of the Higher Education Institutions took part in person during the audit:

Directors: Prof. Dr. Achim B. Cremers (vice-rector Bonn University); Prof. Dr. Aloys Krieg (vice-rector RWTH Aachen University); Simona Constantinescu (department of planning of RWTH Aachen University);

As responsible co-ordinators of the programmes: Prof. Dr. Martin Hofmann-Apitius, Prof. Dr. Matthias Jarke, Prof. Gerhard Lakemeyer, Ph.D., Dr. Jürgen Rapp, Dr. Alexandra Reitelmann, Dipl.-Inform. Stefan Schiffer, Prof. Dr. Dr. h.c. Otto Spaniol;

as lecturers and others: Prof. Dr. C. Bauckhage, Prof. Dr. Thomas Berlage, Prof. Dr. Jan Borchers, Prof. H.-G. Heinzel, Dr. Christian Kandt, Prof. Dr. Leif Kobbelt, Prof. Dr. Stefan Kowaleswki, Prof. Dr. Bastian Leibe, Prof. Dr. Thomas Rose, Prof. Dr. Bernhard Rumpe, Prof. Dr. Dr.h.c. Wolfgang Thomas, Prof. Dr. Klaus Wehrle, Prof. Dr. Berthold Vöcking.

Additionally, the auditors had the opportunity to speak with a total of 17 students of the Master study programmes to be accredited.

The audit team was accompanied by an EQANIE review team, which had the task to monitor the on site visit as well as the whole accreditation process on occasion of the application of ASIIN to receive authorisation to award the Euro-Inf Quality Label.

**The following chapter B** relates to the report of the Higher Education Institutions from May 2010 and to the information gathered during the on-site visit of the auditors as well as to the examples of exams and final theses provided during the on-site visit.

Unless specified otherwise, the terms used in the following always refer to both female and male persons.

## **B** Auditing Report

#### **B-1 Formal Aspects**

1. Name	<ol> <li>Profile according to national legis- lation (KMK)</li> </ol>	3. Consecutive / fur- ther education	4. Degree	5. Regular period of study and CP	6. Begin of study and year of commencement	7. Target enrolment
Ma Software Systems Engi- neering	Science oriented	consecutive	M.Sc.	4 Sem. 120 CP	Winter semes- ter; Winter semes- ter 2010/11	Appr. 35 p.a.
Ma Media Informatics	Science oriented	consecutive	M.Sc.	4 Sem. 120 CP	Winter semes- ter; Winter semes- ter 2002	Appr. 35 p.a.
Ma Life Science Informatics	Science oriented	consecutive	M.Sc.	4 Sem 120 CP	Winter semes- ter; Winter semes- ter 2003/04	25 p.a.

Re 1. In the case of the Master study programmes Media Informatics and Life Science Informatics, the auditors found the name of the study programmes for adequate. In the case of the Master study programme Software Systems Engineering, the auditors expressed doubts if the name of the study programme adequately reflects its educational objectives and curriculum. The auditors found that the study programme, in its objectives and content, resembles more a standard informatics (or computer science) Master degree programme. Above all, they did not see aspects of engineering contained in the studies which might justify the name Software Systems Engineering. (Cf. below, "Curriculum"). Therefore, the auditors found that the name might be misleading. Persons interested in studying this programme might come to the wrong conclusions about its objectives and its content. The programme responsible coordinators argued that the name Software Systems Engineering was established about ten years ago with the design principle to substitute the effort for a "Anwendungsfach" (application oriented field of study) by more software engineering subject matter. Potential students would connect concrete expectations with it (which the programme coordinators argued would be met by the current educational objectives and curriculum). The auditors objected that the problem consists exactly in these expectations which, in their view, might not correspond to the objectives and contents of the study programme.

**Re 2.** With regard to the educational **Profile**, the auditors confirmed that the study programmes are research-oriented. They concluded this from current and recent research projects and the mandatory participation of students in these projects. Furthermore, the Master's Programmes aim to impart substantial theoretical knowledge in order to prepare students for a research career.

**Re 3.** The auditors considered the master-programs to be **consecutive study-programs**.

**Re 4.** The auditors considered the degree awarded to graduates of the study programmes to be adequate (if unusual).

**Re 5. bis 7.** The auditors noted the information provided. They took it into account for their overall assessment of the study programmes.

A tuition fee of 500 EUR is charged per semester.

The auditors took note of this information.

#### **B-2** Objectives and Demand

According to the HEI, the **overall objectives of the study programs** are defined for each program and are accessible to students and other stakeholders. As stated in the report, the objectives are as follows:

For graduates of the Master's programme <u>Software Systems Engineering</u>: Graduates of the programme have command of subject-related and social skills which enable them to identify, analyse and solve complex tasks in many fields of applications with means of informatics in given technical, economical and social contexts. The overall objective of the study process is to enable graduates for individual research work with the aim to master complex tasks by scientific means even beyond the actual limits of knowledge.

For graduates of the Master's programme <u>Media Informatics</u>: Graduates of the programme are able to master new technical-economical challenges in the field between Informatics and media. This means innovative application in communication as well as enhanced possibilities of simulation, animation and virtual reality. In opposition to many other programmes in Media Informatics, this study programme has a focus on informatics (rather than on media design). This enables graduates to acquire a broad and flexible competence for the constantly changing application in Media informatics. The study programme is closely connected with fundamental and application-oriented research of the cooperating Fraunhofer institutes and private companies of the region and comprises four focal points: Digital interactive media; internet infra-structures for the management of information, communication and security; mobile and shared cooperative work and management of knowledge; visualistic and virtual engineering on the basis of enhanced reality.

For graduates of the Master's programme <u>Life Science Informatics</u>: The interdisciplinary programme educates students to successfully master the novel technical and economic challenges at the crossroads of biotechnology, medicine, pharmaceutics, and computer science. The programme is distinguished by its international orientation, its focus on both natural science and IT competence, and its high level of integration of research and teaching. The master's programme in Life Science Informatics consists of three main blocks: Computer Science and Mathematics for natural scientists; basic principles of Life Science Informatics; Biology of the cell and systems Biology. Graduates have acquired knowledge in Informatics in the field of Biology and Chemistry. They are able to apply essential state-of-the-art methods from Life Science Informatics. They are supposed to possess key competences with regard to method skills and social skills.

The overall objectives are published on the internet.

As to the intended **learning outcomes** of the programme <u>Software Systems Engineering</u> the HEI define that graduates are able to successfully apply, to critically question and to further develop the acquired methods in informatics in order to define and solve complex tasks in research and development in industry or scientific institutions. According to the HEI graduates have acquired various technical and social competences in order to be prepared for leadership. Thus, graduates are very well prepared not only for tasks in the field of research and development, but also for carrying out other demanding tasks and assuming leadership positions in enterprises and administrative organizations.

As to the intended learning objectives of the programme <u>Media Informatics</u> the HEI define that graduates should possess knowledge and competences in the fields of (object-oriented) software technique, foundations of communication- and internet-technologies and information security. Graduates are able to competently handle diverse media of presentation, storage and communication and to construct own media with the help of software, especially computer graphics and multimedia. Graduates are able to successfully design interactive media and to systematically assess the usability of given media solutions. Also, they are able to assess the role of media in the cultural sphere and in economy.

As to the intended learning outcomes for the programme <u>Life Science Informatics</u> the HEI define that graduates are prepared for an academic career as well as for a career as scientist in the sphere of private enterprises. The ability to work scientifically and independently is in any case defined as key learning outcome to be attained. Thus, the study programme aims to communicate the necessary key capabilities with the aim to develop creativity, independent scientific thinking as well as rational processing in the generation of working hypothesis and the design of approaches of validation.

These learning outcomes have not been published.

The **objectives of individual modules** are published in the module descriptions in the form of attainable competences. The module descriptions are available electronically.

The auditors determined that the formulation of the overall objectives and learning outcomes was not always formulated in terms of knowledge, skills and competences. Moreover, they noted that the overall objectives and learning outcomes were formulated in a very generic

way. However, the auditors understood from their talks with the representatives of the HEI what the overall objectives and learning outcomes are supposed to be. Thus, the auditors found the overall objectives and learning outcomes valid and appropriate for the study programmes. In their view, the level of objectives and outcomes corresponds to the national Qualification Framework for German Degree Programmes (Qualifikationsrahmen für Deutsche Hochschulabschlüsse). The qualification goals cover the areas of scientific capability and capability to take up a qualified employment, as well as the capability for engagement in civil society and individual development. According to the HEI, the results of the surveys of career patterns of graduates were taken into consideration when designing the Master's Programmes Media Informatics and Life Science Informatics. The auditors used these objectives and outcomes as reference for the analysis of the curricula of the programmes. They stated that the overall objectives and learning outcomes must be formulated in written form according to the information derived from the talks during the audit; students and other stakeholders must be able to refer to the overall objectives and learning outcomes. The overall objectives and learning outcomes must be always formulated in terms of knowledge, skills and competences. The auditors recommended that the learning outcomes of the study programmes should be published such that they are well accessible for all relevant parties.

The **demand** for the study programmes stems from the fact that Informatics can be considered a key discipline with very good career prospects for graduates. The representatives of the HEI pointed to the demand for foreign (non-German) graduates by German enterprises with international orientation. Also, the connection to institutions of scientific research is mentioned. The representatives of the HEI pointed to the very promising prospects for graduates of the Master's Programme in <u>Media Informatics</u> due to the presence of many globally acting enterprises in the region of North Rhine-Westphalia. The demand for graduates of the MEI, excellent, due to the presence of internationally active and potential enterprises in the region.

The auditors confirmed that the study programs prepare for the immediate application of skills attained in the fields of study. They found that the reasons for offering the Master's Programmes to be accredited are very well-founded. They observed that the study programs are well accepted in industry and that they correspond to the demand from industry and research institutions.

#### **B-3 Educational Process**

The **entry requirements** for the study programmes are defined in the examination regulations. Applicants for the Master's Programmes are required to hold a Bachelor's degree (for the Master's Programme <u>Software Systems Engineering</u> applicants are required to hold a Bachelor's degree in Computer Science). Furthermore, applicants are required to command English language according to TOEFL iBT 80 (PBT 550), or IELTS 6.0, or Cambridge Test CAE. Applicants for the Master's Programmes have to undergo an aptitude test. The auditors discussed the entry requirements with the representatives of the Higher Education Institutions. They came to the conclusion that the entry requirements have a positive influence on the quality of the study programmes. However, it became not clear to the auditors which Bachelor study programmes might be considered as a foundation for studying and as precondition for the admission to the Master's Programmes. They asked that the HEI should provide a list of Bachelor programmes whose graduates would be considered as target candidates for studying the Master's Programmes to be accredited.

The auditors appreciated that the entry requirements do not make a differentiation any more between graduates of universities and universities of applied sciences (Fachhochschulen).

The **curriculum** of the Master study programme <u>Software Systems Engineering</u> contains modules, which should be studied in the regular time of four semesters. During the first, second and third semesters, students are supposed to study modules in five categories: Theoretical Computer Science (minimum 12 CP), Communication, Data- and Information Management, Applied Computer Science, and Software Engineering (minimum 16 CP). Usually, students choose one of the five categories, of which they study several related modules. Usually, the master thesis (30 CP) in the fourth semester covers this chosen field of study.

The **curriculum** of the Master study programme <u>Media Informatics</u> contains modules, which should be studied in the regular time of four semesters. During the first, second and third semesters, students are supposed to study modules in five categories: Computer- and Communication Technology (minimum 20 CP), Multimedia Technology, Use and Implications of Multimedia (minimum 10 CP), Media Informatics Internships, Competences of Communication. The master thesis (30 CP) has to be done during the fourth semester.

The **curriculum** of the Master study programme <u>Life Science Informatics</u> contains modules, which should be studied in the regular time of four semesters. During the first, second and third semesters, students are supposed to study modules in three categories: Foundations of Life Science Informatics (30 CP), Life Science Informatics Methodology (30 CP), Biological and Chemical Specialisation (30 CP). The master thesis (30 CP) has to be done during the fourth semester.

According to the auditors, the curricula of the Master study programmes <u>Media Informatics</u> and <u>Life Science Informatics</u> correspond with the aforementioned educational objectives and with the general regulations of German legislation. The curricula make sure that students acquire technical knowledge, interdisciplinary knowledge, as well as methodological and generic competences. During the conversations with the representatives of the Higher Education Institutions, the auditors learned that the curriculum of the Master study programme <u>Media Informatics</u> follows a more technical (and not "creativity"-oriented) approach, putting a stronger emphasis on the acquisition of competences of Human-Computer-Interaction than on design.

As mentioned above, the auditors stated that the curriculum of the Master study programme <u>Software Systems Engineering</u> does not correspond to the title and the objectives of the study programme. The auditors found that the study programme, in its objectives and content, resembles more a normal informatics (or computer science) programme without "Anwendungsfach". They did not see from the curriculum that engineering-competences, which might explain the name <u>Software Systems Engineering</u>, are aimed at.

All study programs contain elements of practical training and research.

The auditors gained the impression that sufficient practical training and research is included in the curricula and that it is carried out according to ASIIN standards.

According to the self-report, the **didactic concept** comprises the following elements: Students study full time. Usually, modules comprise classroom lectures, lab courses, and also seminars.

The auditors judged the didactic concept overall appropriate for the achievement of the educational goals and for the entrance of the graduates into the labour market.

The study programmes have been **modularised** and make use of a **credit point system**. Partly, the modules are studied exclusively by students of the given study programmes, partly modules are also offered in other study programmes. For the whole study process, 120 CP are awarded. For each module, usually between four to twelve CP are awarded. In some cases up to 18 CP are awarded. According to those responsible for the study programmes, the amount of CP for each module correlates with the factual work load of students.

The auditors found that the criteria of ASIIN for the awarding of credit points have been met. The auditors pointed out the fact that, according to current German legislation, modules must contain at least five CP. Exceptions from this must be explained. Due to the fact that the contract about the process of accreditation with ASIIN was made before this legislation was put into force, the auditors recommended to revise the existing modularization in the future. Modules should have the extent of at least five credit points. Exceptions thereof should be justified with technical reasons or with regard to the objectives of the study programme.

Also, the auditors found that the correlation of CPs to individual modules is not always clear. It seemed to them that in some cases the terminology in the module descriptions should be corrected: For some "modules", up to 18 CP are awarded. However, it became clear during the discussions with the representatives of the Higher Education Institutions that what was meant in these cases are clusters of modules. According to the auditors, this must be made clear in the module descriptions. The module descriptions must be reworked accordingly. Also, the auditors noted that module descriptions contain inconsistent or incomplete information, that the descriptions of competences are not always formulated in an outcome-oriented way and that the module descriptions are not always available. The auditors stated that these aspects must be corrected.

**Examinations** include written and oral tests. Also, a combination of written and oral tests is possible. The Master thesis is combined with an obligatory colloquium. Failed examinations may be repeated twice within one year. Modules are offered in a yearly rhythm. The organi-

sation and implementation of examinations is described in the self-report. It is laid down in the presented regulations.

The auditors discussed the implementation of examinations with teaching staff and students. The students confirmed that the implementation and organisation of examinations allow them to continuously check the progress made, so that less preparation for the final exams is needed.

The auditors found the organization of the examinations suitable, in principle, for a successful implementation of the programmes and for achieving the programme objectives.

The **examination regulations** for the study programmes are presented in versions which have been put into force. They specify the average periods of study, the course of studies, examinations and other aspects of the study programmes. The final grades are given as a relative grading scale according to the ECTS grading system. **Changing between new and old study structures** is not possible. The recognition of externally acquired aspects of study is defined in the examination regulations.

The auditors noted the given examination regulations. They noted that several amendments in the examination regulations for the <u>Master study programme Life Science Informatics</u> are listed separately. They asked to be provided with a revised version of the examination regulations, containing all amendments. Also, the auditors noted that the examination regulations are not available to students in an English version. This had already been noted during the first accreditation procedure for the <u>Master study programmes Media Informatics</u> and <u>Life Science Informatics</u>. The representatives of the Higher Education Institutions explained that the English versions of the examination regulations are not available currently due to a technical problem. The auditors pointed to the fact that the examination regulations must be available to students in an English version.

The award of a **Diploma Supplement** is mandatory according to the self-report. A specific template for each of the three study programme in English language is attached to the self-reports.

The auditors noted of the templates of the Diploma Supplement. They pointed to the fact that in addition to the German final grade, statistical data according to the ECTS- Users Guide must be included in the Diploma Supplement (or in the certificate).

#### **B-4** Resources

With regard to the **academic context** as well as to the **internal** and **external cooperation** the following can be derived from the self-report and from the discussions on site: The <u>Master study programme Software Systems Engineering</u> is provided by the department of computer science (Fachgruppe Informatik) of RWTH Aachen University. According to the self-report of the Higher Education Institutions, the variety of fields of study offered by the department of computer science with many co-operations with almost all faculties of RWTH Aachen University offers students good opportunities for their individual choice of study. The

department of computer science delivers teaching service to different study programmes of RWTH Aachen University in the field of natural sciences and engineering. The external cooperations of the department are described in the self-report.

The <u>Master study programme Media Informatics</u> and the <u>Master study programme Life Science Informatics</u> are offered by the so called B-IT Universities Institute, a co-operation of the Faculty of Mathematics, Informatics and Natural Sciences of RWTH Aachen University, the Institute for Computer Science of Bonn University together with the Fraunhofer Institute for Applied Information Technology (FIT) and the Fraunhofer Institute for Intelligent Analysis and Information Systems (IAIS). The B-IT Universities Institute of Bonn-Aachen International Center for Information Technology (B-IT) is a shared scientific institution of RWTH Aachen University and Bonn University. The task of B-IT consists in developing and implementing new, research-related supplies in teaching, studying and further studying in the sphere of information and communication technology. The <u>Master study programme Media Informatics</u> is formally offered by RWTH Aachen University. The external co-operations of RWTH Aachen University, Bonn University and both Fraunhofer Institutes are described in the selfreport.

The auditors considered the internal and external co-operations as a solid basis for the successful implementation of the presented programmes.

The following **committees** are responsible for the organization of the study programmes:

At both RWTH Aachen University and Bonn University there are Vice-deans for teaching who make sure that there is sufficient teaching staff available for all study programmes. They are also responsible for monitoring student evaluations. The Master examination board organises and implements the examinations and is responsible that the examination regulations are adhered to. The examination board has to deal with all appeals. The examination board gives input concerning the reform of the examination regulations and the study plan. At both universities, there are commissioners for quality of teaching.

At B-IT Universities Institute there is a common board each for the <u>Master study programme</u> <u>Media Informatics</u> and the <u>Master study programme Life Science Informatics</u>. These boards coordinates the organisation co-operation of all partners with regard to the implementation of the study programmes. At the same time, these boards take over the function of examination boards. Also, there exists an international advisory board, with the function of strategic monitoring.

The auditors had no further comments on this organizational structure.

For the <u>Master study programme Software Systems Engineering</u>, a total of 24 professors and 47 scientific staff are involved in the teaching process. This staff is part of the department of computer science of RWTH Aachen University or being funded by the Bonn-Aachen International Center for Information Technology (B-IT) respectively. For the <u>Master study programme Media Informatics</u>, overall seven professors and 6,5 scientific staff are involved in the teaching process. This staff is part being funded by the Bonn-Aachen International Center for Information Technology (B-IT). Also, 17 professors and 35 scientific staff of University Bonn, as well as 24 professors and 53,5 scientific staff of RWTH Aachen University are involved in the teaching process.

For the <u>Master study programme Life Science Informatics</u>, three professors and four scientific staff are involved in the teaching process. This staff is part being funded by the Bonn-Aachen International Center for Information Technology (B-IT). Also, 17 professors and 35 scientific staff of University Bonn, as well as 24 professors and 53,5 scientific staff of RWTH Aachen University are involved in the teaching process.

RTWH Aachen University offers its teaching staff courses on advanced didactics in its Center for Learning and Knowledge Management. Another central institution at RWTH Aachen University is the Centre for Integrative Concepts of Teaching and Learning. Its tasks consist in establishing and maintaining an integrative teaching and learning portal, basing on the programmes CAMPUS and CAMPUS-Office. The objective is to include aspects of e-Learning into the teaching process. Apart of that, questions of didactic skills are considered important criteria during the process of hiring new teaching staff.

At the Institute for Computer Science of Bonn University, special trainings on teaching techniques are offered to the teaching staff. Apart of that, with its programme "Information, qualification, and founding of enterprises", Bonn University offers a variety of (didactic) further education on techniques of management, human resources management, marketing and presentation.

The auditors discussed the **personnel resources** with the representatives of the Higher Education Institutions with respect to the qualification of the teaching staff. The auditors considered the available staff resources to be sufficient for the successful implementation of the programs. They found that the overall quality of the teaching staff is good,

The auditors also recognized that the teaching staff members have sufficient opportunities to further develop their didactic capabilities and that they make good use thereof.

With regard to the **physical** and **technical equipment** and **resources** the self report refers to available resources (lecture halls, seminar capacities, workplaces, laboratory equipment, library etc.) and financial funds (for staff and investments).

The auditors judged that the technical equipment and the facilities available are appropriate for the implementation of the program with regard to ASIIN standards. They found the number and size of the lecture halls and seminar rooms to be sufficient for the implementation of the program and their assignment well organized as to satisfy the requirements of the course of studies. The auditors also were shown the technical equipment and visited the laboratories. They came to the conclusion that laboratories are of adequate standard for the support of teaching and studying. According to the self assessment reports, **academic guidance** of students is secured by the following means: The information and guidance of students of the international Master study programmes at RWTH Aachen University and Bonn University is organised and implemented by scientific staff especially designated for this task. Also, there is a central office of academic guidance and information of students at RWTH Aachen University. Information at University Bonn is also provided by the International Office. Guidance and information of students is also provided by the teaching staff of both Universities.

On the basis of the self assessment reports and the discussions with representatives of the HEI as well as students, the auditors considered the measures undertaken as being sufficient. However, the auditors learnt in the discussions with students that the opportunity to take part in courses of German language are very limited. The auditors recommended that the offer of courses of German language teaching at BI-T and Bonn University is improved.

RWTH Aachen University follows a broad approach of gender- and diversity-management with the objective to create structural equality of opportunities in all spheres, with special regard on faculties and study programmes with a low level of representation of women. The concept of gender- and diversity-management at RWTH Aachen University is described in the self-assessment report.

Bonn University also follows the aim of gender-mainstreaming. There is a bureau and an advisory board on gender-mainstreaming.

The auditors noted that measures are undertaken to realize the concept of gender mainstreaming at both Higher Education Institutions.

Special needs of students with physical handicaps are considered in the examination regulations.

The auditors noted that the needs of students with physical handicaps are considered. It is laid down in the examination regulations that they have the right of consideration of their needs with regard to examinations.

#### B-5 Attainment of objectives

The <u>Master Study Programmes Media Informatics</u> and <u>Life Science Informatics</u> had been accredited before on 18 March 2005. The Master Study Programme Media Informatics was accredited without requirements. The Master Study Programme Life Science Informatics was accredited with the one requirement which was met in due time. For both study programmes, one recommendation was pronounced. It was recommended to better inform students about the objectives of the study programme.

The auditors took note of the recommendation. As already indicated above, the auditors still found it necessary to underline that students and other stakeholders must be able to refer to the overall objectives and learning outcomes. The auditors recommended that the learning outcomes of the study programmes should be published somewhere accessible.

The Higher Education Institutions present the following data about the attainment of objectives for each of the three study programmes: Number of students commencing their studies each semester, total number of students per semester, number of graduates and drop-outnumbers.

The auditors took note of the data presented. For their final assessment, the auditors asked to be provided with information regarding the outcome of feedback given by graduates.

During the on site visit, the Higher Education Institutions present a number of **final theses** as well as exemplary module **examinations**.

The auditors judged that the level of the material presented corresponds to the level required for Master's programmes.

Students of the <u>Master study programmes Media Informatics</u> and <u>Life Science Informatics</u> (which are in the process of re-accreditation) have submitted a written statement concerning their opinion about the study programmes.

The auditors gained the impression that the students are content with the study programmes and with the conditions of study. The few critical comments or wishes the students expressed are dealt with in different sections of this report.

The auditors had the opportunity for interviews **with students**. The students expressed an all-in-all positive view about their respective choice of Higher Education Institution and study programme.

The auditors found that the students generally have a very positive attitude towards the Higher Education Institutions and their study programs. Further conclusions from the discussions with the students were taken into account and integrated in the respective sections of this report.

#### **B-6 Quality Assurance Measures**

The **Quality Assurance** for the study programmes shall be implemented by the following means: Evaluation during the process of study is implemented by student's evaluations of each teaching module at the end of each semester. The procedure of evaluating is described in a special regulation. The procedure at Bonn University follows that of RWTH Aachen University. A template evaluation form was attached to the self assessment reports.

The evaluation of the attainment of objectives of the study programmes at RWTH Aachen University is secured in a three-step procedure: (1) a project group on evaluation is established for each technical field; an internal evaluation report is formulated; (2) discussion about the contents and implementation of teaching with external moderation; establishing of a catalogue of measures for the improvement of the quality of teaching; (3) controlling of the implementation of measures. The evaluation of the attainment of objectives of the <u>Master study programme Life Science Informatics</u> at Bonn University follows a series of indicators, laid down in the self assessment report. These indicators are: The numbers of graduates; the

success of graduates on the labour market and their performance in research while working on their Master's thesis; the performance of excellence students as paid part-time auxiliary staff.

The Higher Education Institutions give detailed information about the procedures for securing the further development of the study programmes.

Measures implemented as a result of the quality assurance concept for the <u>Master study</u> <u>programmes Media Informatics</u> and <u>Life Science Informatics</u> undergoing the process of reaccreditation are amongst others: the examination regulations have been substantially revised; at RWTH Aachen University, a special working group has developed a concept for teaching in the future. One feature of this concept is that a two-step process of selfassessment for school students, providing them with information and orientation about possible studies at RWTH Aachen University. Another outcome of quality assurance resulted in the careful selection of applicants. This, in turn, resulted in an constant improvement of the ratio of successful graduates and a decline of the drop-out-rate.

The auditors detected strong elements of a quality assurance system already put into practice including extensive feedback loops. However, it remained unclear to the auditors how the results of the various instruments of quality assurance are being used, what responsibilities are defined and what the consequences of the process of quality assurance are. To be able to draw a conclusion and to define their final assessment, the auditors asked that they should be provided with further information on the procedures established according to the quality assurance concept (responsibilities and possible consequences defined in the procedure of the improvement process).

## **C** Additional Information

Before preparing their final recommendation, the auditors asked that the following missing or unclear information should be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

- Results and conclusions of the graduates' feedback; information on the procedures established according to the quality management concept (responsibilities and possible consequences defined in the procedure of the improvement process).
- 2. A list of typical Bachelor study programmes, which might be considered as a foundation for studying and as precondition for the admission to the Master's Programmes.
- 3. For the <u>Master study programme Life Science Informatics</u>: a revised version of the examination regulations containing all amendments.

## D Comment from the Higher Education Institution (30.11.2010)

On 30 November, the Higher Education Institutions hand in a comment on the auditors report. Also, the Higher Education Institutions hand in information concerning the required "additional information".

#### (1) General Issues

**Consecutive or Non-Consecutive Master Program? (Sec. B-1 of ASIIN Report)** The report considers the master programs as consecutive study program. The universities have considered the programs non-consecutive in the sense that they are not primarily intended for study by the own bachelor graduates but address mostly international students. Both universities offer accredited consecutive Master Programs in Informatics/Computer Science in addition, and have designed the three study programs for other purposes, namely to address international bachelor graduates.

**Changes in Content of Exam Regulations (MPO).** The implementation of an aptitude test procedure in the examination regulations of the Master program "Software Systems Engineering" results from former claims of the accreditation agencies to define professional and qualitative selection criteria for the admission to the Master program. In the revised version of the Common structural guidelines of the Länder for the accreditation of Bachelor's and Master's study courses, 10 October 2003 as amended on 4 February 2010, this selection is no longer obligatory.

According to a decree of the NRW Ministry of Innovation, Science and Research from November 2010 following a number of relevant high-court decisions, the aptitude test procedure must be withdrawn from the examination regulations. Instead, the examination board will determine whether the candidates fulfill the admission <u>requirements</u> of the examination regulations. Attached please find the decree of the Ministry of Innovation, Science and Research. This will require a number of changes in the admission regulations of all three master programs.

**English versions of Exam Regulations (Sec. B-3)**. Due to the frequent recent changes in MPO regulations, RWTH Aachen University has decided to wait with official new English translations until early 2011 when the adaptations to all these context changes are completed. Therefore, no English versions have been available on the external Internet since over a year. To solve this problem temporarily, unofficial translations made in the CS department itself are distributed to all students upon their start of studies, and also available on a website only accessible to registered master students. Interested applicants are individually sent these translations upon request, with the necessary caveats. As soon as the new official translations are completed, they will be published again on the program website to be visible also to interested parties in general.

**Statistical data (Sec. B-3)**. The statistical data according to the ECTS-Users Guide are in preparation after a significant basis of empirical data exists. A revised version of the Diploma Supplements for Media Informatics and Software Systems Engineering will be supplied later.

#### (2) Software Systems Engineering

We appreciate the reviewer comments in the oral discussion and in the draft report that the focus on the theme Software Systems Engineering (SSE) – although present in practice through our mentoring process – is not formally enforced in the examination rules (MPO) and made sufficiently clear in the submitted accreditation materials. We agree that, looking at the materials, it would be theoretically possible to follow the written rules and still pursue a general computer science program rather than one focused on SSE. This is obviously not our intention, given that we believe to have been the first major university in Germany to introduce a program by this name.

Immediately after the audit, we have started to discuss possible clarifications of the MPO and have produced an extended version of the relevant §15 which is attached as Annex S.A. In the meantime the Computer Science committee within the Faculty of Mathematics, Informatics, and Natural Sciences has already approved these changes which are marked in red and underlined in the attached excerpt of the MPO which is already in your possession as a whole.

The clarifications address three points that were discussed in the audit:

- The required courses in Theoretical Computer Science (12 ECTS) cannot be chosen freely but must be selected from a catalog of courses directly related to Theoretical Foundations of Software Systems Engineering.
- Similarly, the 12 ECTS required in the field of Software Systems Engineering in addition to the obligatory project management course, have to be chosen from a catalog of courses representing the in our opinion most important application domains of SSE, namely administrative (database-intensive) information systems, embedded systems, and the model-based/generative engineering of general large-scale bespoke systems and their quality assurance.
- It is also clarified that at least one of the two required seminars must be taken within one of the two above-mentioned area.

Together with the software lab course which is typically synchronized with the project management course, students must thus take at least 39 out of the 83 CS-related teaching credits directly in the theory and practice of general SSE, but they can of course take significantly more. We feel this to be a good compromise for master level students with a lot of own judgment, ensuring both a solid basis in general SSE knowledge and the freedom to pursue specializations and additional breadth courses of interest. We hope that the reviewers agree with this opinion.

Given agreement by the ASIIN/EQANIE reviewers, the further administrative decision process on these changes (Fachbereichsrat, Senat, Rectorate) will follow in the course of this winter semester, together with the other required MPO changes initiated by the NRW Ministry, as mentioned under General Issues above.

#### (3) Media Informatics (Re-Accreditation)

We thank the reviewers for their helpful comments. Below please find answers to audit comments and questions for post-deliverables

"Results and conclusion of the graduates' feedback; information on the procedures established according to the quality management concept." (sec. C, q.1)

The quality management procedures at RWTH Aachen University have been described in the selfassessment report. A detailed description how they are implemented in Media Informatics, and six examples of improvements made in response to student feedback are given in Annex M.A.

As described in the Media Informatics Annex to the self-report, RWTH Aachen University has recently begun to distribute detailed official questionnaires to all graduates 12-18 months after their graduation. Perhaps because this process was not known to students at their time of graduation, there have been no responses to the 44 questionnaires sent out to Media Informatics graduates so far. The Annexes to the self-report did also include informal feedback statements as well as employer information from our master graduates. The feedback concerning quality and relevancy has generally been quite positive, and the employer list and very short time between graduation and job entry demonstrates the job prospects of the programs. With agreement by the alumni, example excerpts from such statements are also published in the B-IT Annual Report.

" a list of Bachelor programs whose graduates would be considered as target candidates for studying the Master's Programs to be accredited." (sec. C. q.2)

Example bachelor programs include *computer science/informatics, computer/information/software engineering, information technology/ infor-mation systems, communication engineering or even ap- plied mathematics.* Because we are really more interested in the contents than the label, we have not entered this long (and still incomplete) list in the MPO but this can be done if desired.

"The auditors determined that the formulation of the overall objectives and learning outcomes was not always formulated in terms of knowledge, skills and competences." (sec. B-3)

The generally accessible website publishes the general goals of the program, the kernel areas, a list of central topics, and links to English-language module descriptions -- see <a href="http://mi.b-it-center.de/">http://mi.b-it-center.de/</a> "General Description of the Programme". In Annex M.B, we have revised the goal-outcome matrix in our self-assessment report in terms of knowledge, skills, and competences; we plan to publish the English version in the internal Media Informatics Forum website accessible to all registered students.

We have also included the two missing module descriptions (German language course and a missing media-science course) in the module handbook (cf. reviewer comment in sec. B-3). See Annex M.B.

#### (4) Life Science Informatics (Re-Accreditation)

The programme of Life Science Informatics thanks the reviewers for the productive audit on October 20, 2010 and their suggestions in part C of the preliminary report.

"Results and conclusions of the graduates' feedback; information on the procedures established according to the quality management concept (responsibilities and possible consequences defined in the procedure of the improvement process)." (sec. C, q. 1)

The Teaching Evaluation is carried out at the end of each semester. The Master Programme of Life Science Informatics emphasizes to members of the teaching staff that the Teaching Evaluation is aimed at improving academic teaching. It is not meant to single out members of the teaching staff and to make reproaches in case they have poor teaching marks. In case of teaching problems members of the teaching staff are offered help instead. The head of the programmes communicates this regularly in an oral and written form to the LSI faculty. Examples of feedback results and their impact are given in Annex L.A and in the separate Attachments A, C and D cited therein.

"A list of typical Bachelor study programmes, which might be considered as a foundation for studying and as precondition for the admission to the Master's Programmes." (sec. C, q. 2)

The Exam Regulations list in §3.2 typical Bachelor Programmes which can be precursors for Life Science Informatics: *Computer science, Biology, Biotechnology, Pharmacy, Medicine, Chemistry, Mathematics*, or a degree from a related course of study.

This list is also available on the LSI Service Website "FAQ for Applicants" at <u>http://www.b-it-center.de/Wob/en/view/class211 id1091.html</u>. Degrees of related courses of study from which a few students have also been accepted include, for example, *Bioinformatics, Computational Biology, Computational Molecular Biology, Biomedical Informatics, Biomathematics, Biophysics, Biostatistics, Medical Informatics Chemoinformatics, and Biochemistry.* 

*"… a revised version of the examination regulations containing all amendments." (sec. C, q. 3)* 

Done. Attachment B to this document and the LSI Students' website <u>http://www.b-it-center.de/Wob/en/view/ class211\_id1141.html</u> contain an integrated version of the Examination Regulations in German and English with all amendments in one document.

### E Final Assessment of the auditors (06.12.2010)

The auditors considered the following aspects as particularly **positive**:

- The international approach of the Study programmes with an exclusively english teaching process.
- > The highly motivated students.

- The quality of the Study Programmes both with regard to the structure and content of the curricula.
- > The advisory service and mentoring of the (international) students.
- The excellent equipment for students provided by the B-IT and the Higher Education Institutions involved.
- The wide offer of both cooperating partners from industry and projects for the acquirement of practical skills.
- The high-class professors involved in the teaching process for the <u>Master Study Pro-grammes Media Informatics</u> and <u>Life Science Informatics</u>.
- The focusing of the curricula in the <u>Master Study Programmes Media Informatics</u> and <u>Life Science Informatics</u> appears to be done consequently and transparent.

In a first, internal assessment the auditors considered that the following aspects need to be taken into consideration:

The module handbook needs to be corrected and completed; the overall objectives and learning outcomes must be formulated in written form according to the information derived from the talks during the audit; the examination regulations are not yet available in an English version; currently, statistical data according to the ECTS-Users Guide is not included in the certificate or the Diploma Supplement. For the <u>Master Study Programme Software Systems</u> <u>Engineering</u>, the name, the objectives and the curriculum do not correspond sufficiently.

The auditors commented the **additional information** provided by the Higher Education Institutions as follows:

(1) The auditors took note that the Higher Education Institutions did not hand in the required information about the graduate feedback. For the <u>Master Study Programme Media Informatics</u>, the auditors did not find any responses to the feedback-questionnaire (attachment D of the additional information of the Higher Education Institution was not handed in).

(2) The auditors took note that a list of typical Bachelor study programmes, which might be considered as a foundation for studying and as precondition for the admission to the Master's Programmes has been handed in for the <u>Master Study Programmes Media Informatics</u> and <u>Life Science Informatics</u>.

(3) The auditors took note of the revised version of the examination regulations with all amendments for the <u>Master study programme Life Science Informatics</u>.

The auditors appreciated the **comments** given by the Higher Education Institutions.

In the first, internal assessment, the auditors considered that the name, the objectives and the curriculum of the <u>Master study programme Life Science Informatics</u> need to be better adjusted with each other. After the comments and the additional information provided by the Higher Education Institutions, the auditors found that the focus on Software Systems Engi-

neering has become much more obvious. After these changes, the name Software System Engineering, therefore, seemed adequate to the auditors. The module Software Project Management has been integrated into the module Software Engineering, and curricular aspects of theoretical informatics have been formulated more precise as Theoretical Foundations of Software Systems Engineering. These changes need to be reflected in the module handbook which needs to be revised anyway in the view of the auditors. (Amongst other missing aspects, the auditors still could not find theoretical foundations of UML and theoretical foundations of Distributed Systems in the module handbook).

One of the auditors criticized the requirement of compulsory attendance for students in the examination regulations of the <u>Master Study Programmes Media Informatics</u> (§ 10, 6). This critique is further endorsed by feedback in students' evaluations.

One of the auditors pointed to the fact that RWTH Aachen University intends to award the Degree "Master of Science awarded by RWTH Aachen University". It is unclear if the Accreditation Council could assess by now if this is formally possible or not.

One of the auditors declared his opinion only credit points in whole numbers should be awarded.

Based on the self-report and on the onsite discussions, the auditors recommended that the <u>Master Study Programmes Media Informatics</u> and <u>Life Science Informatics</u> of Rheinisch-Westfälische Technische Hochschule Aachen (RWTH Aachen University) and Bonn University will be accredited with reservation under requirements for one year. Upon fulfilment of the requirements within the set time, the accreditation is extended for the full period until 30.09.2018.

The auditors recommended that the <u>Master Study Programme Software Systems Engineer-</u> ing of Rheinisch-Westfälische Technische Hochschule Aachen (RWTH Aachen University) will also be accredited with reservation under requirements for one year. Upon fulfilment of the requirements within the set time, the accreditation is extended for the full period until 30.09.2016.

#### Requirements

- 1. A revised module handbook must be handed in. Inconsistent and incomplete module descriptions must be corrected and completed; the correlation of credit points to individual modules must be corrected (clusters of modules should not be named as "modules"); the competences should in all cases be formulated in an outcome-oriented way; modules of Bachelor study programmes should not be defined as prerequisites for studying modules; lacking module descriptions must be delivered (lectures of German language). The module handbook must be always available to students and other stakeholders.
- 2. The overall objectives and learning outcomes must be formulated in written form according to the information derived from the talks during the audit; students and other stakeholders must be able to refer to the overall objectives and learning outcomes. The overall

objectives and learning outcomes must be always formulated in terms of knowledge, skills and competences.

- 3. The examination regulations must be available to students in an English version.
- 4. In addition to the German final grade, statistical data according to the ECTS- Users Guide must be included in the certificate or in the Diploma Supplement.
- 5. The quality assurance concept must be further realized and its results be used for continuous improvements. Graduates must be regularly questioned concerning the quality of their education and a database be established in order to demonstrate the successful realisation of the educational outcomes at re-accreditation.

#### Recommendations

- 1. It is recommended that the course offerings of German language teaching at BI-T and Bonn University is improved.
- 2. It is recommended that the learning outcomes are published.
- 3. It is recommended to revise the existing modularization in order to create modules with the extent of at least five credit points. Exceptions of this should be justified with technical reasons or with regard to the objectives of the study programme.

# F Assessment of the Technical Committee 04 – "Informatics" (08.12.2010)

The Technical Committee 04 – "Informatics" has discussed this accreditation report on 1 December 2010. The Technical Committee takes note of the final votes of the auditors after 6 December 2010.

The Technical Committee followed the critique of one of the auditors concerning the compulsory attendance of students of the <u>Master Study Programmes Media Informatics</u>. It recommended that the requirement of compulsory attendance is eliminated.

The Technical Committee asked the Accreditation Commission to assess whether it is allowed to award the Degree "Master of Science awarded by RWTH Aachen University".

It recommended the Accreditation Commission to accredit the <u>Master Study Programmes</u> <u>Media Informatics</u> and <u>Life Science Informatics</u> of Rheinisch-Westfälische Technische Hochschule Aachen (RWTH Aachen University) and Bonn University with reservation under requirements for one year. Upon fulfilment of the requirements within the set time, the accreditation is extended for the full period until 30.09.2018.

The Technical Committee also recommended to accredit the <u>Master Study Programme Soft-</u> <u>ware Systems Engineering</u> of Rheinisch-Westfälische Technische Hochschule Aachen (RWTH Aachen University) with reservation under requirements for one year. Upon fulfilment of the requirements within the set time, the accreditation is extended for the full period until 30.09.2016.

#### Requirements

- 1. A revised module handbook must be handed in. Inconsistent and incomplete module descriptions must be corrected and completed; the correlation of credit points to individual modules must be corrected (clusters of modules should not be named as "modules"); it should be defined in the module descriptions how the number of awarded credit points is calculated; the competences should in all cases be formulated in an outcome-oriented way; modules of Bachelor study programmes should not be defined as prerequisites for studying modules; lacking module descriptions must be delivered (lectures of German language). The module handbook must be always available to students and other stake-holders.
- 2. The overall objectives and learning outcomes must be formulated in written form according to the information derived from the talks during the audit; students and other stakeholders must be able to refer to the overall objectives and learning outcomes. The overall objectives and learning outcomes must be always formulated in terms of knowledge, skills and competences.
- 3. The examination regulations must be available to students in an English version.
- 4. In addition to the German final grade, statistical data according to the ECTS- Users Guide must be included in the certificate or in the Diploma Supplement.
- 5. The quality assurance concept must be further realized and its results be used for continuous improvements. Graduates must be regularly questioned concerning the quality of their education and a database be established in order to demonstrate the successful realisation of the educational outcomes at re-accreditation.

#### Recommendations

- 1. It is recommended that the course offerings of German language teaching at BI-T and Bonn University is improved.
- 2. It is recommended that the learning outcomes are published.
- 3. It is recommended to revise the existing modularization in order to create modules with the extent of at least five credit points. Exceptions of this should be justified with technical reasons or with regard to the objectives of the study programme.
- 4. It is recommended that the attendance of students of the <u>Master Study Programmes Me-</u> <u>dia Informatics</u> is not defined as compulsory.

## G Decision of the Accreditation Commission for Study Programmes (10.12.2010)

The Accreditation Commission for Study Programmes discussed the votes of the auditors, and of the Technical Committee. The Accreditation Commission for Study Programmes followed the recommendations of the auditors and of the Technical Committee. However, it decided to implement the following editorial changes:

Requirement 1: The Accreditation Commission could not follow the intention of the Technical Committee to include the following sentence: "It should be defined in the module descriptions how the number of awarded credit points is calculated." The Accreditation Commission found that the intention of the sentence is not clear.

Requirement 2: The Accreditation Commission could not follow the auditors and the Technical Committee concerning the following sentence: "Students and other stakeholders must be able to refer to the overall objectives and learning outcomes." The Accreditation Commission found that the intention of this sentence is already communicated by recommendation 2.

The original requirement 4 is omitted: As the final grades are given as a relative grading scale according to the ECTS grading system, the Accreditation Commission disclaimed with regard to its basic decision about the conflicting specifications of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic (KMK) from the original requirement.

The Accreditation Commission implemented editorial changes with regard to recommendations 1 and 2.

The Accreditation Commission decided to omit recommendation 4. The Accreditation Commission found that the intention of this recommendation to be too input-oriented.

The Accreditation Commission decided to accredit the <u>Master Study Programmes Media</u> <u>Informatics</u>, <u>Life Science Informatics</u> and <u>Software Systems Engineering</u> of Rheinisch-Westfälische Technische Hochschule Aachen (RWTH Aachen University) and Bonn University with reservation under requirements for one year. Upon fulfillment of the requirements within the set time, the accreditation for the <u>Master Study Programmes Media Informatics</u> and <u>Life Science Informatics</u> is extended for the full period until 30.09.2018; for the <u>Master</u> <u>Study Programme Software Systems Engineering</u> until 30.09.2016.

#### Requirements

 A revised module handbook must be handed in. Inconsistent and incomplete module descriptions must be corrected and completed; the correlation of credit points to individual modules must be corrected (clusters of modules should not be named as "modules"); the competences should in all cases be formulated in an outcome-oriented way; modules of Bachelor study programmes should not be defined as prerequisites for studying modules; lacking module descriptions must be delivered (lectures of German language). The module handbook must be always available to students and other stakeholders.

- The overall objectives and learning outcomes must be formulated in written form according to the information derived from the talks during the audit. The overall objectives and learning outcomes must be always formulated in terms of knowledge, skills and competences.
- 3. The examination regulations must be available to students in an English version.
- 4. The quality assurance concept must be further realized and its results be used for continuous improvements. Graduates must be regularly questioned concerning the quality of their education and a database be established in order to demonstrate the successful realisation of the educational outcomes at re-accreditation.

#### Recommendations

- 1. It is recommended to improve the course offerings of German language teaching at BI-T and Bonn University.
- 2. It is recommended that the overall objectives and intended learning outcomes are published.
- 3. It is recommended to revise the existing modularization in order to create modules with the extent of at least five credit points. Exceptions of this should be justified with technical reasons or with regard to the objectives of the study programme.