

# Accreditation and Life-long Learning – New Issues in Geoinformatics Education

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**Key words:** Continuous Lifelong Learning (CLL), Masters Study Programme, Accreditation, Interdisciplinarity, Curriculum.

## SUMMARY

The paper describes the development of a postgraduate master's degree programme in geoinformatics at Fachhochschule Mainz University of Applied Sciences. The programme was designed in accordance with the harmonisation process of the European education systems as defined by the European Ministers for Education. The general concept of the curriculum follows an interdisciplinary approach and targets people owing an academic first-level degree in either of the geospatially related disciplines. The study course takes the needs of working people in account which regularly are confronted with the demands of working and studying concurrently. Details of the accreditation process as currently performed in Germany are discussed in general and in the context of the concrete study programme. The programme got the accreditation signet of the German Accreditation Council as the first German study programme in geoinformatics. The first cycle of studies started in March, 2002. The experiences obtained so far are reported.

## ZUSAMMENFASSUNG

Der Beitrag beschreibt die Entwicklung eines postgradualen Master-Studiengangs Geoinformatik an der Fachhochschule Mainz. Das Ausbildungsprogramm wurde in Übereinstimmung mit dem Harmonisierungsprozess der europäischen Ausbildungssysteme entwickelt, wie ihn die europäischen Bildungsminister vereinbart haben. Das allgemeine Konzept verfolgt einen interdisziplinären Ansatz und richtet sich an Personen, die bereits über einen ersten akademischen Abschluss in einer der raumbezogenen Disziplinen verfügen. Das Kursprogramm berücksichtigt die Bedürfnisse Berufstätiger, welche die Anforderungen von Studium und Beruf miteinander in Einklang bringen müssen. Die Einzelheiten der Akkreditierung von Studiengängen, wie sie zur Zeit in Deutschland durchgeführt wird, werden allgemein und speziell im Zusammenhang mit dem vorgestellten Studienprogramm diskutiert. Als erster Studiengang im Bereich Geoinformatik hat das vorgestellte Programm das Akkreditierungsverfahren bereits erfolgreich durchlaufen. Der erste Kurs hat im März 2002 begonnen. Über die seither gemachten Erfahrungen wird berichtet.

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## 1. GEOINFORMATICS, AN INTERDISCIPLINARY SCIENCE

Geoinformatics as a science deals with acquisition, management, modelling, analysis and presentation of geospatial data, thus touching many different disciplines being involved in such tasks. In the last few decades several disciplines invested in the development of geoinformatics, among which geography, geodesy and general information science shall be noted by name. The contribution of the science of geography can be seen mainly in the sector of data analysis. Geodesy provides the methods of data acquisition and of the different georeferencing methods. The general information science offers methods, algorithms and tools needed to model and to process huge graphic and alphanumeric data sets in an integrated and sophisticated way.

From a overall point of view, Sursock (2002) states: ‘None of us has a crystal ball that would allow us to peer into the future but we do know that, considering the long history of higher education, disciplinarity has been an organising feature of universities for only a relatively short time (mostly in the 19th and 20th centuries). We also know that intellectual creativity requires a certain degree of interdisciplinarity and that this trend is increasing.’ and ‘For me, methods organised along disciplinary lines are indicative that we are evaluating the university of the past rather than that of the future; that – by focusing on its constituent parts – we are not promoting the institution of the 21st century.’ Even if this statement is given only with respect to evaluation it obviously can be applied to the whole field of geoinformatics, which from its very origin has been an interdisciplinary science.

When checking the present situation in Germany with regard to the question, if and which established study programmes in the field of geoinformatics are available, one gets the following picture: the disciplinary curricula of many of the related sciences contain some components concerned with this issue. However, with very few exceptions, a comprehensive education in geoinformatics is not yet included in the study courses leading to a first academic degree in Germany. Having in mind the time consuming process of changing a curriculum substantially this situation is expected to persist more or less unchanged within the next couple of years.

Having all these facts and trends in mind it sounds natural to develop a study course focusing on a well-founded comprehensive education in geoinformatics which should be open to graduates of all mentioned and other related disciplines.

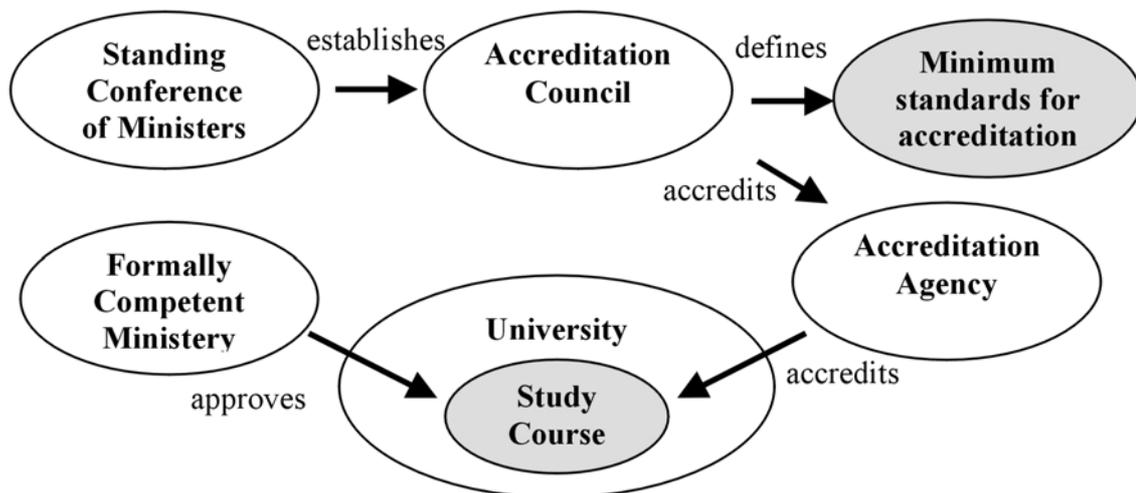
## 2. TWO CYCLE ACADEMIC EDUCATION SYSTEM IN EUROPE

### 2.1 The Bologna declaration

In June 1999, the Ministers of Education of 29 European countries signed a joint declaration, the so-called Bologna Declaration with the aim 'to reach in the short term, and in any case within the first decade of the first millennium' a list of essential objectives, among which the 'Adoption of a system essentially based on two main cycles, undergraduate and graduate' is of particular interest for the development of university degree programmes. The declaration states: 'Access to the second cycle shall require successful completion of first cycle studies' and 'The second cycle should lead to the master and/or doctorate degree as in many European countries.'

### 2.2 Introduction of the two cycle system in Germany

Actually, in Germany higher education institutions may introduce on a test-period basis the internationally accepted degree programmes leading to Bachelor's and Master's (BA/MA) degrees. To ensure quality and to provide orientation and enhance transparency for students, employers and higher education institutions alike, an institution called Accreditation Council (Akkreditierungsrat) was set up in accordance with the resolution of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder of the Federal Republic of Germany (Kultusministerkonferenz – KMK). This council's task is to accredit agencies which – on their part – accredit the new Bachelor/Master degree programmes in turn. These agencies as well as the degree programmes accredited by them will bear the quality label of the Accreditation Council. Figure 1 shows the accreditation and approval process which a new curriculum currently has to pass.



**Figure 1** Current approval and accreditation procedure in Germany

### **2.3 Genuine vs. Hybrid Master's degree courses**

The German Accreditation Council distinguishes various types of Master's degree courses, namely the so-called "genuine Master's degree courses" and the so-called "hybrid Master's degree courses" (Accreditation Council, 2001). A genuine Master's degree course means that this course is offered within a consecutive BA/MA-concept and in the same disciplinary field, either as a specialisation or an extension which both stand equally for continuation of the studies at a higher level as compared with the first-cycle studies. A hybrid Master's degree course provides an additional specialist perspective to an existing disciplinary base which is documented at least by a Bachelor's degree. A Master's degree course of that kind must not only provide knowledge from another discipline; but it must also lead to a new quality for the existing knowledge base. In that way of thinking, the computing skills and methodological knowledge delivered by a geoinformatics Master's degree course and linked to the geospatial applications performed in all related disciplines qualify such a course to be called a hybrid Master's programme. The new course programme presented here is designed to be more application-oriented rather than being strictly research-oriented. That is why, in accordance with the current preferences as stated by the accreditation council, for the programme the degree 'Master of Engineering' was awarded.

### **3. LIFELONG LEARNING**

In the same way as all other IT related disciplines do, the field of geoinformatics permanently undergoes substantial changes in methods and techniques. The half-life time cycle of much knowledge acquired in whatever geoinformatics education programme, therefore, is relatively short. To keep themselves up to date professionals in the geoinformatics field have to upgrade their professional knowledge on a more or less regular basis. Software and GI systems suppliers provide for training courses to support their own products and, in that way, simultaneously satisfy the educational needs in a particular sector. Universities and other non-profit institutions offer workshops, seminars and conferences to transfer their knowledge to the professional community as well. Also, governmental efforts to face unemployment problems by supporting continuous education courses have to be noticed in that context.

An educational approach which has the goal to establish a dedicate geoinformatics curriculum leading to a formal academic degree may also incorporate such continuous education aspects. The questions to be addressed in that case are mainly concerned with organisational issues, like design of time schedules, presence vs. distance learning units etc, where as the contents themselves may not be affected deeply. If the organisational conditions are fixed in an appropriate way full- or part-time employed professionals simultaneously may follow the courses and improve their knowledge while performing - theoretically - their every-day work without much change. One approach how to catch this goal will be described in the following sections.

## **4. MASTER'S DEGREE PROGRAMME AT FACHHOCHSCHULE MAINZ UNIVERSITY OF APPLIED SCIENCES**

Having all the topics discussed so far in mind, namely interdisciplinary approach, European developments and lifelong learning aspects, a Master's degree programme in Geoinformatics was developed at Fachhochschule Mainz, University of Applied Sciences. Some details of the accreditation procedure, the target group addressed by the study programme and, finally, the contents and organisation of the curriculum will now be described.

### **4.1 Accreditation Procedure**

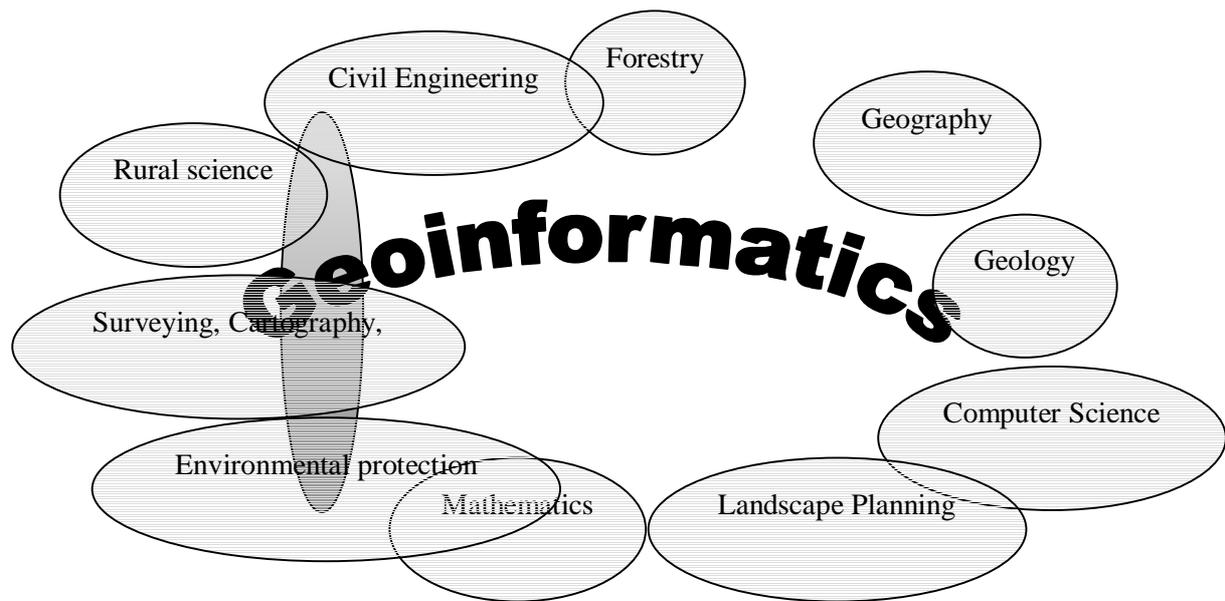
To perform the accreditation procedure as defined by the German Accreditation Council (see above) for the new study course programme the first accredited German agency, namely the Central Evaluation and Accreditation Agency of Hanover (ZEVA, 2002) was chosen by the university. According to the 'Basic standards and criteria' as formulated by the German Accreditation Council (1999) the application for the accreditation of the programme had to contain information on the justification for the introduction of the degree programme, on its structure and its quality and content standards, on available infrastructure (academic staff, equipment for teaching and research, physical facilities, premises), on quality assurance measures and on scope and kind of academic co-operation with other institutions. The comprehensive application package was prepared in the year 2000 (Hotzel and Müller, 2000) and served as the base for the review process carried out on the basis of specialist-content criteria. This means that all questions of whether the degree course provides a logical and coherent picture as far as the goals are concerned have to be addressed. These goals have been set by the competent institutions and are to be achieved.

The peer review took place in February, 2001, consisting of in-depth discussions with the heads of the university and the department, with the leaders of the study programme, with the teaching staff and with students. Considering the votes of the reviewers the designed programme got the accreditation signet as the first German study programme in geoinformatics in May, 2001. As already discussed even such an accredited programme still needs to be approved in the conventional way. The state approval for the examination regulations was given by the formally competent ministry in August 2001 (Staatsanzeiger, 2001).

### **4.2 Target Group of the Master's Degree Programme**

The admission to the master's degree programme is open to all persons owing a first level university degree in one of the specified disciplines and a professional experience of at least one year. Specified disciplines in this context are Rural Science, Civil Engineering, Forestry, Geography, Geology, Computer Science, Landscape Planning, Mathematics, Environmental Protection and others, e.g., Surveying and Cartography. It depends highly on the specific working area of the professional individuals how much the new geoinformatics knowledge and skills on the one hand and the genuine disciplinary knowledge base already available on the other hand overlaps. The longer a person has been working in different professional environments, the more specific is the professional profile of that person. That is why, after

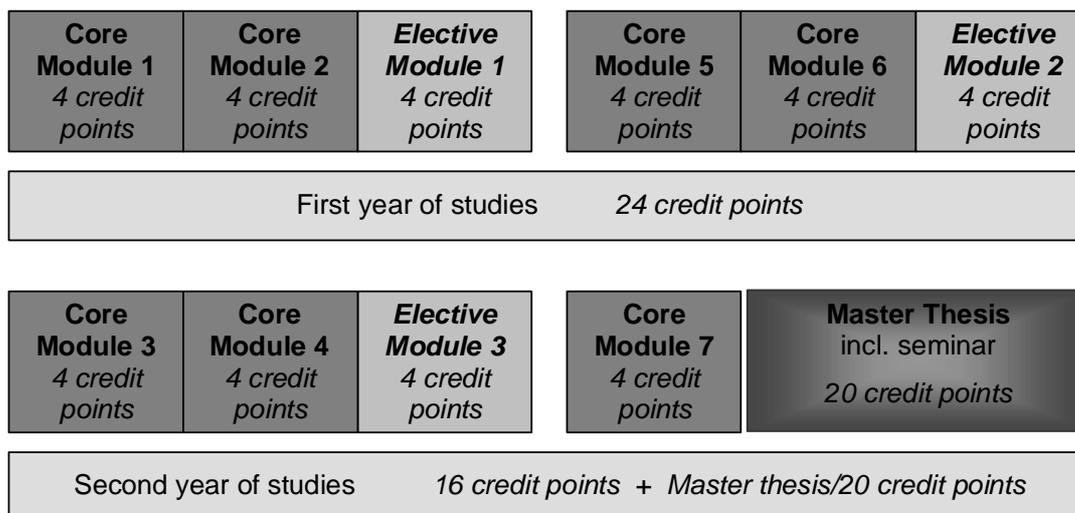
having completed some years of professional practice, the potential benefit to be gained from the study programme for different people owing a degree in the same discipline may be very much different. The target group of the programme, therefore, is not only defined by the type of degree held by the applicants but also by the type of their professional practice as well. The second criterion will be the more important, the larger the volume of that professional practice is. Figure 2 shows graphically the relation between geoinformatics and the related base disciplines.



**Figure 2** Geoinformatics and its related disciplines

### 4.3 Course Contents

The curriculum comprises of a number of study modules (see Figure 3), for which a specified number of credits according to the European Credit Transfer System ECTS are granted. Module contents deal with general computer science methods and with special methods for data capture, data management, data analysis and data presentation of geospatial data as well.



**Figure 3** General framework of the study course programme

The core modules, as this indication states, form the constituent parts of the curriculum and, therefore, are mandatory for the students. This is the list of core module contents:

- Core Module 1*      Photogrammetry, remote sensing
- Core Module 2*      Spatial information systems, satellite positioning, co-ordinate systems
- Core Module 3*      Software engineering , data base systems
- Core Module 4*      Spatial modelling and analysis
- Core Module 5*      Digital image processing
- Core Module 6*      Interactive visualisation, Internet
- Core Module 7*      GIS projects

The elective modules, again, as this name indicates, may be elected by the students from a wide variety of courses offered at the university. These courses are collected in four groups, namely business management, planning, media design and land information. In that way, the students may enhance their skills in an individual area seen to be most appropriate for their current or intended personal careers.

Preferably, the students shall prepare their master thesis on a subject and in a way, which generates the highest benefit from the synergy between their knowledge gained in their first level study discipline, their skills acquired by individual on the job training and, finally, by their latest skills earned from the geoinformatics course programme.

#### 4.4 Course Organisation

Besides interdisciplinary approach and establishment of a two cycle system the third goal of the programme is its openness to part-time students. The lecture hours of all mandatory core modules as well as those of a sufficient number of elective modules concentrate on

weekends. This helps working professionals and children raising people to arrange working and study times in a manageable way.

The complete workload which is expected to be necessary to complete the whole study programme is calculated in the following way:

*First year of studies*

Lecture and laboratory times for 6 modules à 4 hours per week x 15 lecture weeks	360 h
Own study times	360 h

*Second year of studies*

Lecture and laboratory times for 4 modules à 4 hours per week x 15 lecture weeks	240 h
Own study times	240 h

Preparation of Master thesis including seminar 24 weeks à 25 hours per week	600 h
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<i>Complete workload for the master's programme</i>	1.800 h
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Comparing these numbers with normal professional working hours shows the total amount to be approximately the same as for one year of fulltime work. In other words, the students have to invest about half of their normal working time over a two years time period to complete the study courses. Even when taking reasonable amounts of overtime into account the programme, therefore, asks for a part-time work rather than for a simultaneous full-time job during the study period.

## 5. CONCLUSIONS

The master's degree programme in geoinformatics at Fachhochschule Mainz University of Applied Sciences was designed to address academic professionals of all disciplines related to the processing of geospatial data. The programme got the accreditation signet of the Accreditation Council as the first German study programme in geoinformatics. The first cycle of studies started in March, 2002. The experiences obtained so far and to be obtained in future will be used to check and to further improve the concept.

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## **BIOGRAPHICAL NOTES**

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