



A HARMONIZED GIS COURSE CURRICULUM FOR SWEDISH UNIVERSITIES

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INTRODUCTION

Background

- A network of Swedish university lecturers 2004
- Implementation of the Bologna declaration
 - “Adoption of a system of easily readable and comparable degrees”
 - “Promotion of mobility by overcoming obstacles”
- University lecturer network was included as a section of education in the Swedish Cartographic Society 2006
- Since then, one of the main working questions of the section has been to follow up and facilitate the implementation of courses and programmes related to geographical information according to the Bologna declaration



INTRODUCTION

Background

- In Sweden, basic GIS courses are given at several universities and in a wide range of study programmes
- Although, from a general competence development point of view this is desirable, sometimes it may cause problems when students want to continue studying at another university or when employers try to evaluate their skills
- A textbook on GIS and related fields (Eklundh, 2003) is now under its 4th revision, and along with implementation of the Bologna declaration by Swedish universities and request of harmonization forced by the Swedish Government, this gives opportunity for a broader discussion of course curricula

Current situation in Sweden (2006)

- 23 universities
- ~150 courses
- Thematic content differ
- Basic to advanced levels based on different criteria
 - BSc/MSc programmes
 - Tool-kit courses
 - Basic GIS, but scientifically advanced

University	No. of courses	ECTS Credits	Adjusted no. of courses	Adjusted ECTS Credits	Levels	Adjusted GIT level
Lund University	26	276.0	17	127.5	A-D	A-D
University of Gävle	13	97.5	12	90.0	A-D	A-D
Linköping University (Linköping)	15	112.5	9	67.5	A?-D	A-D
Luleå University of Technology	9	67.5	9	67.5	A-B	A-B
Royal Institute of Technology	8	60.0	8	60.0	B-D	A-D
Umeå University (Lycksele & Ö-vik)	6	60.0	6	60.0	A-C	A-C
Umeå University (Umeå)	8	120.0	3	52.5	A-D	A-C
Karlstad University	7	75.0	7	45.0	A-C	A-C
Södertörn University College	3	45.0	3	45.0	A	A-B
Högskolan Dalarna	6	82.5	3	30.0	A-D	A-B
Stockholm University	5	52.5	2	30.0	?	A-B
Mälardalen University	4	45.0	2	30.0	A-D	A-B
Göteborg University	4	45.0	2	30.0	A	A-B
Linköping University (Norrköping)	5	28.5	4	24.0	A-C	A-C
University of Kalmar	3	37.5	1	15.0	A-C	A-B
Uppsala University	3	30.0	2	15.0	?	A-B
SLU (Umeå)	3	22.5	2	15.0	A-C	A-B
Mid Sweden University	2	22.5	1	15.0	A-B	A-B
Gotland University	3	22.5	2	15.0	A	A-B?
Blekinge Institute of Technology	2	15.0	2	15.0	B-C	A-B
SLU (Skinnskatteberg)	2	15.0	2	15.0	B	A-B
University of Skövde	2	15.0	2	15.0	A	A-B
SLU (Uppsala)	2	10.5	2	10.5	A-B	A
University West	1	7.5	1	7.5	B	A
Växjö University	1	7.5	1	7.5	B	A
Chalmers University of Technology	1	6.0	1	6.0	A	A
Malmö University	1	4.5	1	4.5	A	A



INTRODUCTION

Aim

- To smooth the progress of Bologna implementation
- How? To formulate a general course curriculum for a basic course in GIS that most of the Swedish universities can agree upon
- Irrespectively the different nature of the programmes within the course is given
- This facilitates further studies at other universities



INTRODUCTION

Methods

- Lecturer network meetings
- Comments on course curriculum draft

BOLOGNA IMPLEMENTATION

Bologna...

- Three cycles:
 - undergraduate (bachelor)
 - graduate (master)
 - post graduate (doctorate)

- Credit transfer system
 - 60 ECTS equals one year of studies
 - In Sweden 60 ECTS equals 40 old credits

- Grading system
 - A, B, C, D, E, Fx and F
 - Relative scale: 10% A, 25% B, 30% C, 25% D, 10% E for those who receive a passing grade
 - This is not mandatory for Swedish universities
 - In Sweden a goal related grading system must be used – Problems?

BOLOGNA IMPLEMENTATION

Bologna...

- Content of course curricula
 - description of course content
 - learning outcomes
 - prerequisites
 - teaching methods
 - recommended reading
 - etc.
- Based on the course curriculum, the individual transcript, and the course information with the grading template, a students' *employability* can be evaluated
- Note that a course curriculum may appear to be the same at different universities, but implemented differently as described in the examination of the goals according to the grading template

BOLOGNA IMPLEMENTATION

Learning outcomes

- Bloom's taxonomy

Level	The cognitive process dimension		Remember	Understand	Apply	Analyze	Evaluate	Create
	The knowledge dimension							
A	Factual knowledge <i>(Basic element of discipline)</i>							
B	Conceptual knowledge <i>(Basic elements and their interrelationship)</i>							
C	Procedural knowledge <i>(Knowledge of methods and criteria for using them)</i>							
D	Metacognitive knowledge <i>(Awareness of one's own cognitive)</i>							

- By combining the knowledge dimension and the cognitive dimension, learning outcomes can be expressed in a straightforward manner

BOLOGNA IMPLEMENTATION

Learning outcomes

- The knowledge dimension gives the “noun”
- The cognitive dimension gives the “verb” of the learning outcome
- Example: *The student will be able to explain the difference between raster and vector format*

	The cognitive process dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
Level	The knowledge dimension						
A	Factual knowledge <i>(Basic element of discipline)</i>		x				

places “difference between raster and vector format” together with “explain” on the A level in the box marked with an X

BOLOGNA IMPLEMENTATION

Grading the learning outcomes

- Learning outcome is equal to minimum requirements (E or pass)
- Not all learning outcomes have to be graded in the same way
 - A, B, C, D, E, Fx and F
 - Pass/Not pass
 - VG/G
 - etc.
- Total grade is a weighted combination of the above
- Grading criteria should not be described in the course curriculum, but in the attached course information package
- Only the expressed learning outcomes should be examined

COURSE CURRICULUM

Resulting course curriculum

■ General

Level: Basic (First cycle)

Depth of study: Introductory

Course code: xxx

ECTS: 7.5

Moment (note that this is just a suggestion)

– Written examination 2.5 ECTS

– Exercises 5 ECTS

Education area: xxx (e.g. geography, geomatics, etc.)

Subject area: xxx (e.g. technology, social science, etc.)

COURSE CURRICULUM

Resulting course curriculum, cont.

■ Learning outcomes

The purpose with this course is to give the student knowledge of and training in geographical information technology. Xxx.

Upon completion of the course, the student will:

1. understand how geographical information systems work
2. be able to explain the difference between raster and vector format
3. understand how geographical data are gathered and stored
4. describe the basics of how geographical databases work and are built up
5. be able to perform simple overlaying in both raster and vector environment
6. be able to perform simple network analyses
7. be able to describe and give a basic analysis of economical and organisational aspects where GIS is included
8. be able to evaluate when raster or vector format is to prefer
9. be able to evaluate quality and usability of different data sources for different GIS applications and analyses
10. be able to critically evaluate the use of GIS for different types of applications
11. xxx
12. xxx



COURSE CURRICULUM

Resulting course curriculum, cont.

■ Course content

- geographical data and databases
- analyses in raster and vector environment in GIS
- cartographical presentation techniques
- economical and organisational aspects
- reference systems and map projections
- creation of maps ready for printing or digital publishing
- topology
- xxx
- xxx

Other things that are not examined, but treated in the course, should also be listed here – e.g. use of satellite images or elevation models in different application areas

COURSE CURRICULUM

Resulting course curriculum, cont.

■ General cont.

Tuition forms: Lectures, exercises and own studies

Prerequisites: Basic eligibility for university studies

Examination: The student must receive a passing grade on the written examination as well as all exercises

Grading: The ECTS grading scale, A, B, C, D, E, FX and F, is used where FX and F mean fail

Limitations: xxx

Other: xxx

Course literature: xxx

Reference literature: xxx

COURSE CURRICULUM

Course literature

- "Eklundh, L. (Ed.), 2003: Geografisk Informationsbehandling – metoder och tillämpningar"
 - This was decided upon the lecturer network meeting
 - This facilitates more detailed reading directions
- Other textbooks may also be used, especially for programmes in non-technical areas
- If the course is given in a special context, further literature may be included

COURSE CURRICULUM

Comments on course curriculum

- Note - this is the first version of a template which, certainly, is due to revision
- At least 50% of the course content should be common, independent of which university that gives the course, and the remaining up to 50% can be given according to own preferences
- The listed learning outcomes should be included irrespectively of the institution, programme or subject that gives the course
- Besides the listed learning outcomes, more specific ones can be added – e.g. introduction to RS, GIS in a specific type of organization, cartography, use of GPS, etc.
- Thanks to the expected learning outcomes, the potential employer can more easily estimate the student's acquired qualities

COURSE CURRICULUM

Comments on course curriculum, cont.

- Content must not be 100% equal at all universities
 - they would not be appealing to all types of study programmes
 - specialisation is hindered
- Number of learning outcomes
 - In Sweden, normally five to eight learning outcomes are listed
 - the advantage of including more than eight should have a positive effect on making the course enough general so that it can be used as a prerequisite for most of Sweden's more advanced GIT courses
- “Double classification” should be used if e.g. a course treats basic GIS, but requires deep knowledge of another subject
- A harmonized course curriculum will aid new lecturers in GIS education to produce their own curricula