

**Report on RS/GIS Module Development  
Staff Capacity and Curriculum Development Activity  
For the Duration of 7.9.04-29.10.04**

## **1. Introduction**

The following presents the report on the activity concerning the RS/GIS Module Development from the perspective of staff capacity and curriculum development between 7.9.04-29.10.04.

## **2. Objectives of the RS/GIS Module**

The objective of the RS/GIS Module is to impart the skill in relating basic conceptual notions in geo-information science to the geographical reality through understanding the processes of geo-data capture, storage and handling/processing and presentation. A RS/GIS teaching module with the staff capacity to implement this, as mentioned in the PEATWISE Conceptual Report, was required in order to realize this objective. The prerequisite for this was the Staff Capacity Development.

The proposed Module, from the PEATWISE Conceptual Report, consists of essentially two independent subject areas as follows for which course material has to be developed.

1. Remote Sensing
2. Geographical Information Systems

## **3. Meeting the Objectives of the RS/GIS Module**

The two interrelated activities, mentioned below, are necessary to be carried out in attain the said objectives.

### **3.1 Staff Capacity Development**

This involves the following a natural progression of learning till capacity is the desired capacity is attained. It is essential to learn and understand the subject matter of the topics required for the curriculum first and then be guided in further developing and adapting materials with the local examples. It was necessary, initially, to follow, as pre-determined, a teaching course at WUR.

### **3.2 Curriculum Development**

It was initially essential to define the scope of the curriculum. It is imperative to refer to the discussions of the First RS/GIS Module Preparation Meeting on the 7.9.2004 in the Minutes attached as Appendix I regarding this. Following this then was making the selection of required topics and organising these into a curriculum.

It was evidently apparent from the scope of the module that to meet the stated requirements the, predetermined, immediate teaching course at WUR i.e. the GRS-10306 Introduction to Geo-information Science would, with the necessary modifications, serve as the template on which to base the module.

## **4. Commencement of the Capacity Acquisition and Curriculum Development Effort.**

The effort at staff capacity and curriculum development commenced from the First RS/GIS Module Preparation Meeting on the 7.9.2004 (see Minutes attached as Appendix I).

## **5. Basis of the Module Structure of the RS/GIS Module**

The GRS-10306 Introduction to Geo-information is to serve as the template, with the necessary modifications, on which to base the module. The details of this course are available at <http://www.geo-informatie.nl/courses/grs10306>.

## **6. Study of the GRS-10306 Introduction to Geo-information Science Course**

## **6.1 Brief Introduction to the Course**

### **6.1.1 Subject Areas of the Course**

This course consisted of essentially three subject areas and the respective practical work as follows:

1. Geo-referencing
2. Remote Sensing
3. Geographical Information Systems

A different team of specialist taught the theory and practical exercises/modules of each of these sections. They included remote sensing scientists, surveyors, geographical information system specialist and the necessary computing backup.

### **6.1.2 Mode of Delivery**

The mode of delivery of the concerned topics is given in Table 1 further below.

### **6.1.3 Course Material**

Lectures, course notes and practical exercises/modules manual were part of the course instruction. These form the essential basis of the transfer of knowledge. It must be mentioned that a minor variance was observed (as is normally expected) between materials given in the power point presentations during lectures and the materials given in a notes or manual format in some cases.

## **6.2 Capacity Acquisition and Curriculum Formation**

### **6.2.1 Participation in the GRS-10306**

#### **(a) Full-time Involvement**

It was essential to attend all the lectures and practical periods of all the topics of the above course to understand the theory and practical work and, subsequently, in order to make the selection of required topics.

#### **(b) Work Flow**

The course required re-focusing as it progressed through three different subject areas (as stated in 6.1.1). The pace of practical work increased from mid-way through the course causing the latter part to be intensive. The practical time and facilities were (beneficially) shared with course students and individual work was possible after personal excess to premises after office hours/weekends was available in October. For the ArcView Modules the PC was a factor as the software mandated use of only the same one.

#### **Note**

- 1: WUR has a very strict after working hours and weekend excess to premises policy. Open excess is restricted to between 8 a.m. and 4.30 p.m. on working days (Mon – Fri). Only privileged excess, upon request, allows entry at 7 a.m. to 10.00 p.m. (Alterra) and 10.45 p.m. (ILRI) during working days and 10.00 a.m. to 5 p.m. (Alterra) and 7.45 a.m. to 5 p.m. (ILRI) on weekends.
- 2: The work activity involved two venues (located 2–3 km apart). Learning was done at the Alterra Building while the workspace (and computer facility) was at ILRI.
- 3: A testimony of the popularity of the subject areas was evident by the over subscription to the course.

### **6.2.2 Topics Selected**

The topics selected from the GRS-10306 (and their mode of delivery mentioned in 6.1.2 above) are given in Table 1 below.

TOPICS ACCORDING TO CHAPTERS IN GRS-10306	MODE OF DELIVERY
Part 1	
Chapter 2 Spatial Modelling	Self study
Chapter 3 Georeferencing.	Self study
Part2	
Chapter 6 What is Remote Sensing?	Power point contents
Chapter 7 Spectral Signatures.	Power point contents
Chapter 8 Aerial Photography	Self study.
Chapter 9 Introduction to Visual Image Interpretation	Self study.
Chapter 12 Introduction Digital Image Processing.	Power point contents
Part 3	
Chapter 13 Data Integration 1: Data handling, Querying and Data-Action Model.	Power point contents
Chapter 14 Data Integration 2: Transforming and Processing.	Power point contents
Chapter 15 Data Integration 3: Digital Elevation Models.	Power point contents

**Table 1 Selected Topics from GRS-10306**

The sequence these may be organised for the RS/GIS Module is as in Table 2 below.

Reorganised Sequence of Topics	Chapter in GRS-10306
1. Spatial Data Acquisition	
1.1 Introduction to Remote Sensing	6
1.2 Aerial Photography	8
1.3 Multi-Spectral Scanning	10
2. Maps and Geo-Referencing	3
3. Spatial Image Interpretation	
3.1 Introduction to Visual Image Interpretation	9
3.2 Introduction to Spectral Image Interpretation	
(a) Spectral Signatures	7
(b) Introduction to Digital Image Processing	12
(c) Introduction to Digital Image Classification	12
4. Introduction to G. I. S.	
4.1 Spatial Modelling	2
5. Data Integration in G. I. S.	
5.1 Data Handling, Querying and Data Action Model	13
5.2 (a) Transforming and processing 1	14
(b) Transforming and processing 2	
5.3 Digital Elevation Models	15

**Table 2 Proposed Syllabus for the RS/GIS Module**

The proposed module will therefore be covering three different subject areas that in WUR were handled by different teams. Persons very well versed with the *Idrisi* and *ArcView* software these conducted the practical work.

### 6.3 Work Involved in connection with Course Material

The following was necessary to be able to follow and adapt the course material.

#### 6.3.1 Course Notes

The course notes form the basis of the transfer of knowledge as they present the tangible form of course content. As the mode of delivery of a number of topics was Self-Study so these took on an added significance. The Table 3 below lists the type of work done on these. This consumed a significant amount of time.

Chapter in GRS-10306	Work Done
6 8 10	Material added Some Reorganisation and Material added/ elaborated -
3	Rephrasing and Material added/elaborated
9 7 12	Some Rephrasing and material added Some Rephrasing (part pending) (part pending)
2	Reorganisation, Rephrasing and Material added/ elaborated
13 14 15	Some Formatting, Reorganisation & Material Added Some Formatting and Reorganisation & Material Added Pending

\*Pending: Material yet to be adapted

**Table 3 Work performed on GRS-10306 course notes**

These have been submitted for checking. The parts still presenting a challenge have been indicated on these hardcopies.

### 6.3.2 Practical Exercises/Manuals

The written practical exercises/modules also form the basis of the transfer of knowledge as stated in 6.3.1 above. These take on an added significance as these are meant to explain the theory (and the use of with software is not meant for the latter to serve as a black box. The Table 4 below lists the type of work done on these. This consumed a significant amount of time

Chapter in GRS-10306	Practical	Work Done
6 10	Current and Future Missions for Earth Observations Interpretation of optical remote sensing images	- Rephrasing
3	Transforming an image to a map projection plane	Rephrasing
9 7 12 12	The derivation of reflectances from aerial photographs" Determining reflectances and spectral signatures with the Cropscan" IDRISI exercise "Digital Image Processing" IDRISI exercise "Image Classification"	- - Rephrasing Rephrasing
2		
13 14 15	<b>ArcView Training: Practical Manual</b> <b>Module 1:</b> Getting to Know ArcView <b>Module 2:</b> Data Structure and Digitising <b>Module 4:</b> Queries <b>Module 3:</b> Transformations <b>Module 8:</b> Operations 1 <b>Module 9:</b> Operations 2 <b>Module 5:</b> Map Presentation 1 <b>Module 10:</b> Digital Elevation Models	Rephrasing

**Table 4 Work performed on GRS-10306 written practical material**

These have been submitted for checking in softcopy form.

### 6.4 Topics Based on Self-Study

The following topics, in Table 5, were studied based on self-study of course materials.

TOPICS ACCORDING TO CHAPTERS IN GRS-10306
Part 1 Chapter 2 Spatial Modelling
Chapter 3 Georeferencing.
Part2 Chapter 8 Aerial Photography
Chapter 9 Introduction to Visual Image Interpretation

**Table 5 Self-study Topics**

## 6.5 Summary of Requirements from GRS-10306

### 6.5.1 Course Materials

Topic	Chapter in GRS-10306	NOTES	POWER POINT	PRACTICALS
1. Spatial Data Acquisition				
1.1 Introduction to Remote Sensing	6	x	x	x
1.2 Aerial Photography	8	x		
1.3 Multi-Spectral Scanning	10	x	x	x
2. Maps and Geo-Referencing	3	x	x	
3. Spatial Image Interpretation				
3.1 Introduction to Visual Image Interpretation	9	x		
3.2 Introduction to Spectral Image Interpretation				
(a) Spectral Signatures	7	x	x	x
(b) Introduction to Digital Image Processing	12	x	x	x
(c) Introduction to Digital Image Classification	12	x	x	x
4. Introduction to G. I. S.				
4.1 Spatial Modelling	2	x		
5. Data Integration in G. I. S.				
5.1 Data Handling, Querying and Data Action Model	13	x	x	x
5.2 (a) Transforming and processing 1	14	x	x	x
(b) Transforming and processing 2		x	x	x
5.3 Digital Elevation Models	15	x	x	x

**Table 6 Requirements from GRS-10306**

### 6.5.2 Software for Practical Work

*Idrisi* and *Arcview* used in GRS-10306 are selected so far for use in 2005. The limitations of their handling are mentioned in Item 8.1.2 below.

## 7. An Extra Subject Area.

Section 6 above mentions the subject area of Georeferencing. This presented the undertaking of an extra subject area.

## 8. Unmet Requirements

### 8.1 Plugging Deficiencies Still Persisting in Knowledge Acquisition

There is still a deficiency in the knowledge acquisition that is considered necessary for the effective teaching of the topics mentioned above. This deficiency, although encompassing both theory and practical work, is mainly related to the practical requirements. These deficiencies are due to various reasons as follows:

1. The need for learning these
2. Inadequacy or lack of knowledge in a specific area
3. Insufficient opportunity/time to be able to cover the course material

#### 8.1.1 Deficiency in Theory

Table 7 below list the various deficiencies.

Topic	Chapter	Requirement
3. Spatial Image Interpretation 3.2 Introduction to Spectral Image Interpretation (a) Spectral Signatures (b) Introduction to Digital Image Processing (c) Introduction to Digital Image Classification	7 12 12	Sect. 7.6.2: Indices Sect.12.4.3:Supervised Classification
5. Data Integration in G. I. S. 5.1 Data Handling, Querying and Data Action Model	13	Clarifications on Contents

**Table 7 Deficiencies in Theory**

The aspects of Topic 3 in Table 7 above found brief mention as they were to be taught in the subsequent full fledged course GRS-20306 Remote Sensing

### 8.1.2 Deficiency in Practical Exercises

Table 8 lists the deficiencies.

Topic	Chapter	Need
3. Spatial Image Interpretation 3.1 Introduction to Visual Image Interpretation 3.2 Introduction to Spectral Image Interpretation (a) Spectral Signatures (b)Introduction to Digital Image Processing (c)Introduction to Digital Image Classification	9 7 12 12	IDRISI exercise "Digital Image Processing" IDRISI exercise "Image Classification" Very limited handling of <i>Idrisi</i> software Relating practical results and questions to theory to explain results
4. Introduction to G. I. S. 4.1 Spatial Modelling	2	Transforming an image to a map projection plane Understanding the theory (This part of the self-study topic)
5. Data Integration in G. I. S. 5.1 Data Handling, Querying and Data Action Model 5.2(a) Transforming and processing 1 (b) Transforming and processing 2 5.3 Digital Elevation Models	13 14 15	A few elementary "Data Action Models" exercises <b>ArcView Training: Practical Manual</b> <b>Module 1:</b> Getting to Know ArcView <b>Module 2:</b> Data Structure and Digitising <b>Module 4:</b> Queries <b>Module 3:</b> Transformations <b>Module 8:</b> Operations 1 <b>Module 9:</b> Operations 2 <b>Module 5:</b> Map Presentation 1 <b>Module 10:</b> Digital Elevation Models Relating practical results and questions to theory to explain results

**Table 8 Deficiencies in Practical Work**

It is apparent that the exercises in the ArcView modules are the basis for understanding the G. I. S. data handling functions so they acquire immense importance. These will, undoubtedly, be considered later on in specialised for courses students of the GRS-10306.

### 8.2 Development of New Material

The content of the module, as stated in the Peatwise Inception Report (Item No. 5. Content on page 34), requires the generic aspect of the module to be gradually focus on the subject, namely, tropical peatlands. This has not been possible in the present stint of curriculum development.

It is evident from the amount of work involved detailed above that a significant period is necessary for the development of the curriculum. In this regard, the Detailed Action Plan of the Peatwise Inception Report (page 42) specified duration of Jan-Oct., 2004 for Curriculum development for GIS and Remote Sensing is a prudent estimate.

**Appendix**

I. Minutes of First RS/GIS Module Preparation Meeting