STUDY GUIDE 1997-1998

Professional Masters courses in:

- **Forest Survey**
- **Forestry for Rural Development**
- **Rural and Land Ecology Survey**
- **Socio-economic Information for Natural Resource Management**
- **Geoinformation for Sustainable Soil Resource Management**

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Table of Contents

Introduction

The staff of the Department of Land Resource and Urban Sciences (LARUS) welcome you to the Netherlands and to ITC in particular. We are pleased that you have come to ITC. We hope that you will have a pleasant time and that you will benefit from the course that you have just started.

The information in this Study Guide provides basic information on the 12-month Professional Master (PM) courses in Forest Survey (FOR.3), Forestry for Rural Development (FRD.3), Rural and Land Ecology Survey (RLE.3), Socio-economic Information for Natural Resource Management (SIG.3) and Geoinformation for Sustainable Soil Resource Management (SOL.3). For more general information on ITC and living in Enschede, we refer to the introduction booklet provided by the Department of Student Affairs.

Chapter I of this guide outlines the general structure of the PM-courses. Chapter II outlines the objectives of the five courses. In Chapter III the contents of the individual modules in the PM courses are presented. Finally, Chapter IV provides important information on general organisational and administrative course matters.

Please do not hesitate to contact your Director of Studies if you still have questions

We wish you a happy time and a successful course!

Staff of LARUS Department

Chapter I General Structure of the PM-courses

In all PM-courses of the LARUS Department have a 3-week module structure is followed. Before the first module starts there is one week introduction to Enschede and ITC (week 36). At the end of the course one week closing is scheduled. (week 35). Each course consists of 16 modules of three weeks. The 3-week modular structure gives you possibilities to choose between modules of courses. Each module means 3 credit points. One credit point means a weekly study load of 4- to 45 hours. The whole PM-course implies 50 credit points (one credit point for one week introduction, (16 x 3) 48 credit points for the modules and one credit point for the closing week). Detailed information on the content of each module will be provided in Chapter III. The course structure is outlined below:

3-week module structure of the PM courses

<table>
<tr><th></th><th>Week</th><th>FOR</th><th>FRD</th><th>RLE</th><th>SOL</th><th>SIG</th></tr>
<tr><td>-</td><td>36</td><td colspan="5">Introduction week</td></tr>
<tr><td>Module 1</td><td>37-39
8/9-26/9</td><td colspan="5">Natural Resource Management (NRM) (pp. 10)
Computer handling (remedial teaching) (pp. 11)</td></tr>
<tr><td>2</td><td>40-42
29/9-17/10</td><td colspan="2">Forest and tree resources management (pp. 12-13)</td><td>Land ecology (pp. 14-15)</td><td>General pedology and related basic subjects (pp. 16)</td><td>Problem analysis (pp. 17)</td></tr>
<tr><td></td><td></td><td colspan="5">Computer handling (remedial teaching) (pp. 11)</td></tr>
<tr><td>3</td><td>43-45
20/10-7/11</td><td colspan="5">Maps and geographical databases (pp. 18)</td></tr>
<tr><td>4</td><td>46-48
10/11-28/11</td><td colspan="4">Remote sensing (pp 19)</td><td>Information systems (pp.20)</td></tr>
<tr><td>5</td><td>49-51
1/12-19/12
*</td><td rowspan="3">Survey for the conservation and management of forest resources (pp. 21)</td><td>FRD core module (pp. 22)</td><td>Mapping land cover (pp. 23-24)</td><td>Soil inventory concepts and methods -1 (pp. 25)</td><td>Land and land use data (pp.20)</td></tr>
<tr><td>6</td><td>2-4
5/1-23/1</td><td></td><td>Survey and hypothesis statistics (pp.28-29)</td><td rowspan="2">Soil inventory concepts and methods -2 (pp. 30)</td><td>Socio-economic data analysis and statistics (pp. 27)</td></tr>
<tr><td>7</td><td>5-7
26/1-13/2</td><td>Socio-economic data collection (pp. 31)</td><td>Mapping cover related aspects (pp. 32-33)</td><td>Socio-economic data collection (pp.31)</td></tr>
</table>

	Week	FOR	FRD	RLE	SOL	SIG
8	8-10 16/2-6/3	Spatial analysis and modelling *(pp. 34)*				Cost benefit analysis and environmental impact assessment *(pp. 35)*
9	11-13 9/3-27/3	Land evaluation *(pp.36-37)*				Institutional analysis for implementing solutions *(pp.38)*
10	14-16 30/3-17/4	Land use planning *(pp.39)*				
11	17-19 20/4-8/5	Forest monitoring *(pp. 42)*	Rural energy *(pp. 43)*	Final project and personal study topic	Final project-1. *(pp. 40)*	Decision support systems and evaluation techniques *(pp. 41)*
12	20-22 11/5-29/5	Final project and personal study topic	Fieldwork		Final project-2: fieldwork	Project planning *(pp. 41)*
13	23-25 1/6-19/6					Fieldwork and personal study topic
14	26-28 22/6-10/7		*(pp. 49))*			
15	29-31 13/7-31/7		Personal study topic		*(pp. 45)*	
16**	32-34 3/7-21/7	*(pp. 44)*	*(pp. 52)*	*(pp. 47-48)*	Personal study topic *(pp. 54)*	*(pp. 50)*
-	36	CLOSING week				

pp = page reference in this study guide

* Week 52 and 1: holiday Christmas and New Year

** At the end of module 16 an exit workshop of several days is scheduled for all courses.

Chapter II Objectives of the PM courses

The Professional Master Degree courses aim at the formation of professionals who, individually or as members of a multi-disciplinary team, actively contribute to decision making on the sustainable use and management of the (semi)natural and/or built environment. Specifically, the Professional Master student should be able to analyse problems and identify and structure relevant information. In addition, the Professional Master student is able to design, plan, supervise and execute surveys involving the acquisition and analysis of geographical data and the presentation of the resulting geographical information.

The objectives of the PM-courses FOR.3, FRD.3, RLE.3, SIG.3 and SOL.3. are outlined below.

II.1 Forest Survey (FOR.3)

The Professional Master Degree course in Forest Survey concentrates on the acquisition and use of geographical information for decision support in sustainable forest management, to combat deforestation and forest degradation, to conserve biodiversity, promote environmental protection and achieve social and economic development.

The course aims to provide participants with specialist knowledge and technical skills to enable them to design and lead the execution of survey projects involving the acquisition and analysis of geographical data to support forest resource management and land use planning.

Objectives of the Course:

Upon completion of the course, participants should be able to:

1. Analyse problems in the sustainable use and management of the rural environment and identify geographical information related to forestry for the solution of these problems. Specifically, participants will be able to outline and analyse decision making processes and information flows within a forest management agency, and identify and analyse requirements for spatial information to support forest management in defined problem areas;
2. design and supervise forest surveys with a geographical component. Specifically, participants will be able to analyse data requirements; design a survey and select appropriate tools and techniques; plan a survey (time, costing, etc.); supervise the work of survey parties; co-ordinate the work of survey parties; evaluate the survey process; control the quality of the survey results;
3. execute forest surveys with a geographical component. Particular attention will be devoted to the use of GIS-based spatial decision support systems for the acquisition of data; analysis of data; presentation of information for forest management and land use planning;
4. participate in multidisciplinary teams. Specifically, participants will develop participatory and flexible approaches to forest surveys, together with the written and oral communication skills required to enable functioning in a multidisciplinary team.

II.2 Forestry for Rural Development (FRD.3)

The Professional Master Degree course in Forestry for Rural Development concentrates on the acquisition and use of geographical information for decision support to strengthen the role of trees and other woody plants for local communities and for sustainable rural development.

The FRD.3 course aims at the formation of professionals who, individually or as members of a multidisciplinary team, actively contribute to decision making on the sustainable use and management of the (semi)natural and/or built environment. Specifically, the Professional Master should be able to analyse problems and identify and structure relevant information. The professional is able to design, plan, supervise and execute surveys involving the acquisition and analysis of geographical data and the presentation of the resulting geographical information.

Objectives of the Course:

Upon completion of the course, participants should be able to:

1. analyse problems and identify information requirements to support decision making for sustainable use and management of the environment; identify the actors and analyse the decision making process; analyse the information flow; analyse the spatial component of the information;
2. design and supervise surveys with a geographical component, on the basis of a participatory multi-step approach in forestry for rural development; analyse data requirements; design a survey integrating remote sensing and rapid rural appraisal methods, including the selection of tools; make a survey plan including timing, cost and staff); supervise and co-ordinate the work of survey parties; evaluate the survey-process and control the quality of the product;
3. execute surveys with a geographical component: collection of data; processing and analysing data; presenting data in a form suitable for interpretation by the actors involved;
4. participate in multi-disciplinary teams: develop a participatory attitude/behaviour; develop a flexible approach; develop a critical mind; develop communicative skills (both written and oral).

Please note that the FRD.3 course will not be offered during the 1997/1998 course year. Module 11 (rural energy) will be offered and is open for all students.
The next FRD.3 course will start in September 1998.

II.3 Rural and Land Ecology (RLE.3)

The ‘green cover’ of the Earth includes both agricultural crops and natural vegetation. Crops and natural vegetation provide materials to meet basic human needs like food, fuel, fibre and shelter. Continuous change of the green cover takes place due to changing demands of the population.

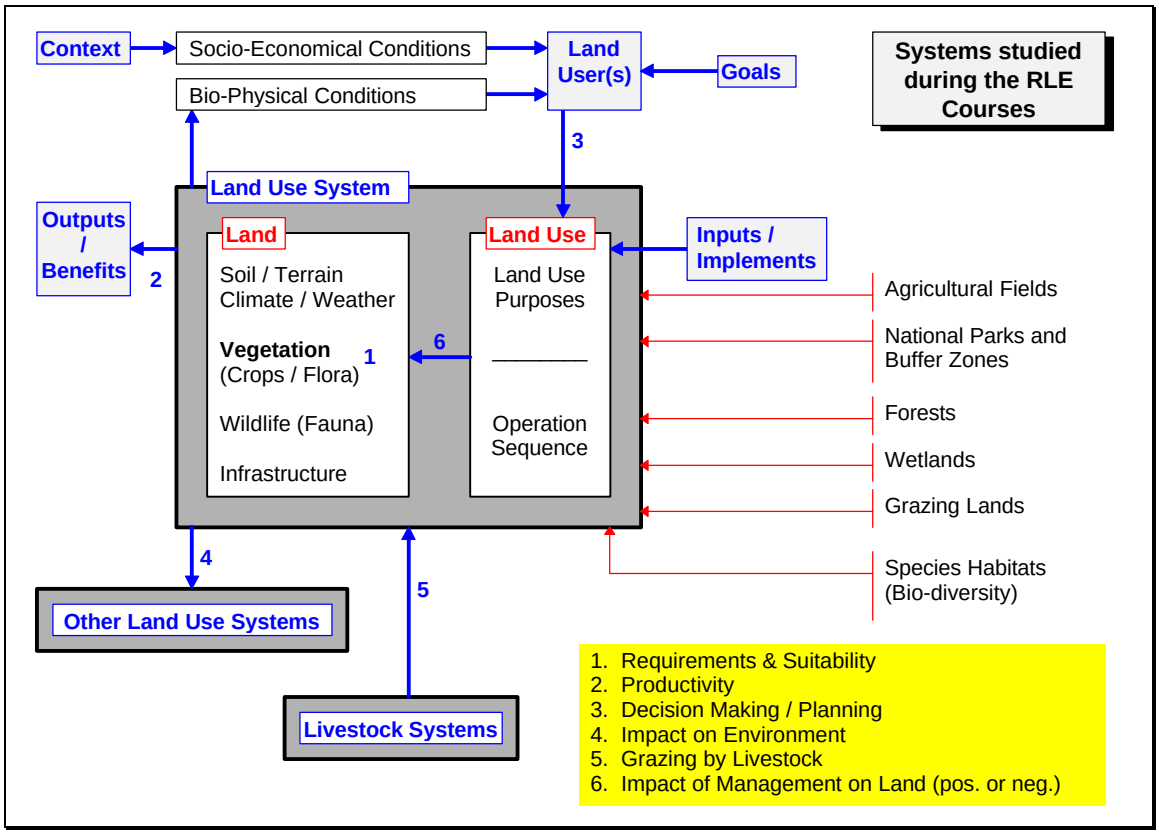
Changes of the 'green cover' occurs mainly through impacts by land use. The impacts may be desired or undesired, direct or indirect. Land use has also impacts on other land aspects (infrastructure, soil, climate, fauna) through for instance

erosion, pollution or climate change. Changes in land resources influences possible future land uses and threatens bio-diversity and natural habitats.

Up-to-date knowledge on the state of the green cover of the earth and on the land use that affects it, is essential for sustainable development of agricultural land and for conservation of our natural heritage.

The survey of the green cover and studying the way it is exploited, using modern techniques like Remote Sensing (RS) and Geographical Information Systems (GIS), is the focal point of the Rural and Land Ecology Survey (RLE) courses. Geo-referenced information is generated for natural resource management (NRM) purposes. NRM studies are carried out to support (multi-sectoral) Land Use Planning.

Each NRM study has it's own specific objectives that address well-specified problems. Each study may focus on different types of land use systems, different objects within the systems or on functional relationships within or as related to context aspects of the systems. Accordingly, each NRM study has it's own typical system diagram. A generalised system diagram is shown below.



A RLE PM-student will study remote sensing techniques, geographical information systems, system analysis and spatial modelling techniques (e.g. land evaluation), to support land use planning and to solve NRM problems. The Professional Master is educated to design, plan, supervise and execute vegetation and land use surveys, to interpret geo-referenced data on vegetation and agricultural land use, and to structure and present the resulting geographical information and findings both verbally as in writing.

The RLE Professional Master course (RLE.3) is primarily the responsibility of the division of Vegetation and Agricultural Land Use Survey (VAS). The VAS division is responsible for education, research and consulting regarding the collection, analysis, evaluation and integration of geo-referenced information on vegetation and agricultural land use for sustainable crop and livestock production, for bio-diversity and habitat studies, and for environmental impact analysis.

Aims of the Course:

- The development of skills to survey vegetation and agricultural land use, in rural areas with aerospace products in the context of NRM/LUP issues and institutes.
- The development of skills in relating vegetation and the agricultural land use data to geo-referenced data on other natural resources or environmental conditions in a GIS.

Objectives of the Course:

Upon completion of the course, participants should be able to:

1. identify geographical information on vegetation and agriculture land use to analyse problems in support of decision making for sustainable use and management of the rural environment;
2. design, execute and supervise vegetation and agricultural land use surveys with a geographical component, i.e.:
   - analyse the data requirements;
   - acquisition of secondary data and literature;
   - design a survey and select appropriate tools and techniques;
   - plan a survey (time, costing, etc.);
   - supervise and co-ordinate the work of survey parties;
   - evaluate the survey process;
   - control the quality of the survey results;
   - analysis and presentation of vegetation and agricultural land use survey data;
3. participate in multidisciplinary teams.

II.4 Socio-economic Information for Natural Resource Management (SIG.3)

The Professional Master Course Socio-economic Information for Natural Resource Management (SIG.3) is for professionals working at regional and local administrative levels who are in charge of information collection, processing and representation to support decision making processes within natural resource management.

Examples of the typical institutional context in which these professionals work are land use planning, rural and agricultural development, nature conservation, physical planning and environmental management.

Common elements of the decisions and problems in this context are the strong spatial dimension and the multiple stakeholders, interests and sectors involved.

The work of the professionals consists of practical advice, action management, decision preparation, all under conditions of limited time and resources and uncertainty.

The SIG-PM course aims at:

- increasing the practical knowledge and raising the operational skills of the participants
- introducing tools and techniques appropriate for information identification and management to support decision making within NRM
- assessing the relevance of the introduced tools and techniques in the working environment of the participants

Objectives of the course:

Upon completion of the SIG-PM course, participants should be able to:

- analyse and structure problems in a decision making context of NRM *(problem finding)*
- identify and appraise alternative solutions *(solution finding)*
- compile, process and present the required information for the forgoing activities
- plan for the implementation of the identified solution

In terms of skills, participants should be able to play an executive/ active, coordinating role in all these activities

Course structure:

The course is structured according to a number of steps which are considered to represent the typical actions performed by the target group.

Step 1 Decision and Problem Analysis
Step 2 Information Requirements
Step 3 Information Collection, Analysis and Representation
Step 4 Identification and appraisal of alternative solutions
Step 5 Planning of solutions

II.5 Geoinformation for Sustainable Soil Resource Management (SOL.3)

Soil information varies widely in quality and quantity and from country to country. The nature, location and value of soil resources are still unknown for large regions. Available information is frequently inappropriate and insufficient when compared with the objectives of land use planning, especially at local and regional levels.

Simultaneously, the development of soil data bases, geographical information systems (GIS) and modelling is creating an increasing need for more and improved soil data. Training in soil survey and related soil science fields is therefore vitally important.

Objectives of the Course:

Upon successful completion of the course, participants should be able to:

1. analyse problems in sustainable use and management of the rural and/or urban environment;
2. identify geographical information with regard to soil resources for the solution of these problems;
   design and supervise, as a survey party leader, soil surveys for different purposes. This includes the following steps:
   a) analyse data requirements
   b) design a survey and select appropriate tools
   c) plan and monitor a survey including survey logistics and cost analysis
   d) supervise and co-ordinate the work of survey parties
   e) evaluate the survey process
   f) control the quality of the survey results
4. execute soil surveys for different purposes including acquisition of data; analysis of data and presentation of data;
5. participate in multi-disciplinary teams for the multi-purpose utilisation of soil information in land evaluation, land resource conservation planning, land use planning and environmental management.

Chapter III Content of PM courses

In this chapter detailed information on each individual module is given. The modules are presented in chronological order. The course(s)s for which the module has been designed is here indicated in the heading of each module description.

Module 1 : Natural Resource Management (8-26 Sep) **Contact staff member : Dr. Wouther Siderius** **Course : FOR, FRD, RLE, SIG, SOL**	
Brief description	The Natural Resource Management (NRM) Module is the common start of five courses of the Department of Land Resource and Urban Sciences. The complexity of NRM will be emphasised and the analysis focuses on the multiple actors in NRM and factors influencing NRM. Special attention will be paid to participation and multi-disciplinarity in NRM. Participants will have to contribute actively on the basis of their own experiences in NRM. A short field excursion nearby Enschede is used as a concrete case to illustrate the key aspects identified. The module finishes by relating findings of the module with the content of the remaining part of the course.
Objectives	On completion of this module students should be able to: • outline steps in NRM • recognise the complexity of NRM (multiple actors and factors) • recognise the role of participation and multi-disciplinarity in NRM • identify factors for success and failure in NRM
Contents	The subject covers the following topics: • Natural resources and natural resource management • Steps in Natural Resource Management • Complexity of NRM - factors and actors • Role of participation and multi-disciplinarity in NRM • Success and failure in NRM • Course specific topics
Study method and study load	lectures : 5 periods)* self study : 5 periods) small group work : 23 periods) ⇒ 3 credit points excursion (incl. preparation) : 6 periods)
Teaching/ learning material	books : - FAO/UNEP (1996), Our Land, Our Future, A new Approach to land use planning and management, Rome, ISBN 92-5-103906-2 - Group of Development and Environment, Institute of Geography, University of Berne (1995), "Sustainable Use of Natural Resources", Development and Environment report no.14 handouts : Conceptual Overview and Guide to NRM Module, including background material
Assessment	Participants will have to satisfactorily complete the various assignments given during the module

* one period is 2 to 2 1/4 hours

Remedial teaching : Computer handling (8 Sept - 17 Oct)
Contact staff member : Ir. Wim Klunne
Course : FOR, FRD, RLE, SIG, SOL

Brief description	Remedial teaching computer handling
Objectives	At the end of this module students should be able to: • work with a computer • have a basic understanding of MS DOS and Windows • navigate and work on the departmental computer network • send, read and handle e-mail messages • surf the Internet and retrieve relevant information • search for literature using VUBIS • write and layout a report with MS Word • organise data and perform calculations and functions within MS Excel
Contents	The subject covers the following topics: • basics • DOS • Windows • network • e-mail • Internet • VUBIS • MS Word • MS Excel
Study method and study load	lectures : 6 periods practical : 28 periods self study : 21 periods (evenings)
Teaching/ learning material	hand-outs
Assessment	none
Pre-requisites	students who are already computer literate may skip (part of) lectures/practicals as desired

Module 2 : Forest and Tree Resources Management (29 Sep - 17 Oct) **Contact staff member : Michael Weir, MSc** **Course : FOR**	
Brief description of module	Following the NRM module, this module focuses in depth upon those aspects of NRM specifically related to the conservation and management of forest and tree resources. Particular emphasis is placed on key issues and problems together with concepts and new theories of forest management. The module will be partly followed together with participants in the FRD.3 courses. Additionally, part of the module is devoted to further developing computer handling skills.
Objectives	Upon completion of the module, participants will be able to : • describe the role of forests and trees in natural resource management • describe current global forest and tree resource management issues, benefits and threats • outline approaches to the conservation and management of forest resources • analyse and present requirements for spatial information to support the conservation and management of forest resources.
Contents	The module covers the following topics: • diagnosis of participants' experiences and work situation • global forestry issues • institutional aspects • relationship between local people and forest mangers • approaches to forest resource conservation and management • information requirements for forest resource management Note: part of this module is devoted to computer handling.
Study method and study load	lectures : 14 periods) workshops : 18 periods) field excursion : 4 periods) ⇒ 3 credit points self study + computer handling : 24 periods)
Teaching/ learning material	reader: Global Forestry Issues (Y. Hussin)
Assessment	Participants will have to satisfactorily complete the various assignments given during the module.
Pre-requisites	Participation in NRM module

Module 2 : Forest and Tree Resources Management; new approaches **Contact staff member : Robert Albricht** **Course : FRD**	
Brief description	This module will address the concepts and major issues in Forestry for Rural Development. This concerns in particular the identification of the social and institutional groups (i.e. the stakeholders) who interact in the existing land use systems and their role in planning and decision making. The development of a systematic participatory multi-step approach for forestry for rural development concludes this module.
Objectives	Upon completion of this module participant should be able to: • describe the role of forests and trees in natural resource management and identify the social and institutional groups which interact with these resources; • describe current global forest and tree resource management issues, benefits and threats; • explain and develop a participatory multi-step approach (for use at district level) which involves all stakeholders; • analyse and present requirements for spatial information to support the conservation and management of forest and tree resources
Contents	• diagnosis of participants' experiences and work situation; • global forestry issues • indigenous knowledge; • woody biomass; • institutional aspects; • relationship between local people and forest managers; • information requirements for forest and tree resource management; • development of a participatory multi-step action approach to forestry for rural development. note: part of this module is devoted to computer handling
Study method and study load	lectures : 14 periods) small group work : 26 periods) excursion : 4 periods) ⇒ 3 credit points self study + computer handling : 16 periods) total : 60 periods)
Teaching/ learning material	reader : Forestry for rural development; New Approaches, Groenendijk Global Forestry Issues, Hussin handouts
Assessment	summative assessments
Equipment	
Pre-requisites	Participation in NRM module

Module 2 : Land Ecology (29 Sep.-17 Oct.) **Contact staff member : Dr. Herman Huizing** **Course : RLE**	
Brief description	Basic concepts as required for studying (agro-) eco-systems is taught. The most relevant land and management aspects that influence the productivity, sustainability and stability of eco-systems as occur in many parts of the world are discussed. Recent developments and new approaches to study the systems are reviewed during discussions of the concepts. Actual development trends of systems or aspects of bio-physical relationships within selected systems will be studied through computer practicals. One field trip is organised to acquire field-skills in assessing the impact of soil and terrain characteristics on plant growth.
Objectives	Learning aims: Basic understanding of vegetation ecology and agro-ecology. Learning objectives: • understanding of concepts required to study (agro-) eco-systems. • knowledge of impacts of land and management aspects on the functioning of eco-systems. • skills in reviewing and presenting eco-system data through tables and graphs. • development of skills to assess in the fields eco-system aspects.
Contents	1. Ecology and Systems Theory: - Introduction to 'land ecology' and 'eco-systems'. - Ecological factors versus plant (vegetation) growth. 2. Climate and Eco-Systems: - Weather factors versus plant (vegetation) growth. - Agro-Ecological Zones (+ other zoning methods). 3. Soils and Eco-Systems: - Soil / Terrain factors versus plant (vegetation) growth. - 'Field' indicators to assess soil qualities. 4. Vegetation and Eco-Systems: - Ecology of natural eco-systems. - Vegetation types and ~ classification schemes (end products). 5. Land Use and Eco-Systems - Agro-ecology: agricultural land uses. - Agro-ecology: rangeland ecology. - Habitat management (incl. Park- and conservation ecology). 6. Land Ecology versus NRM Aspects • Examination and evaluation
Lecturers	1, 2. H. Huizing 3. P. Driessen, H. Huizing 4. H. van Gils 5. H. Huizing, H. van Gils 6. H. Huizing, K. de Bie

Study method and study load	1. 29,30 Sep. 8 periods 2. 2, 3 Oct. 8 periods 3. 6 Oct. 4 periods 7 Oct. 4 periods **Fieldwork** 'soil quality assessment indicators' 4. 9, 10 Oct. 8 periods 5. 13, 14, 16 Oct. 12 periods 6. 17 Oct. (am) 2 periods Group discussion • 17 Oct. (pm) 1 period **Examination** 17 Oct (pm) 1 period - written evaluation - staff-student meeting on modules 1,2 + Comp. handling. • 29 Oct (pm) 1 period **Re-examination** lectures : 11 periods practicals / reading assignments : 29 periods fieldwork : 4 periods group discussion : 2 periods self study : 12 periods examination : 1 period others : 1 periods --- total : 60 periods ⇒ 3 Credit Points
Teaching/ learning material	• DRIESSEN, P.M. AND N.T. KONIJN, 1992. *Land-Use Systems Analysis*. Wageningen Agricultural University, Department of Soil Science & Geology, Wageningen. • UNEP, 1997. *Global Environmental Outlook*. Oxford University Press. New York. • RUS 11: Introduction to Agro-ecology.
Assessment	A short written exam (1 hour) with 1 questions from each of the 5 subjects. The questions will all have an equal weight and can be open ended, multiple choice, based on a provided graph or table, or based on materials as provided in the required learning materials.

Module 2 : General Pedology and related basic subjects (29 Sept. - 17 Oct.) **Contact staff member : Dr. W. Siderius and Ir. E. Bergsma** **Course : SOL**	
Brief description	Soil resource inventories require thorough knowledge and understanding of both general and spatial properties of the soil itself, the underlying soil forming processes and the different factors responsible for spatial soil variation. A general introduction to pedology and related (basic) subjects early in the course is therefore indispensable. This introduction includes general and spatial characteristics of soil, soil forming processes and factors *(General Pedology)*. The different soil forming processes are further elaborated in a separate lecture set *(Aspects of Soil Formation)*. Finally, participants receive basic training in general data analysis using statistics *(General Statistics).*
Objectives	Yet to be specified (for constituting subjects and module as a whole)
Contents	- Introduction to Module 2 - General Pedology and Related Basic Subjects - k6-I - General pedology - k6-I - Aspects of soil formation - k1 - General Statistics I - g1
Lecturers/ supervisors	Prof. A. Zinck/Ir. G.R. Hennemann - Introduction to module 2 - General Pedology and Related Basic Subjects Prof. A. Zinck/Ir. G.R. Hennemann - General pedology Dr. P. van Reeuwijk (ISRIC) - Aspects of Soil Formation Mr. D. Shrestha MSc - General Statistics I
Study method and study load	⇒ 3 credit points
Teaching/ learning material	- do -
Assessment	- do -
Equipment	- do -

Module 2 : Problem Analysis (29 Sep-17 Oct) **Contact staff member : Dr.Ing. W.H. Erik de Man** **Course : SIG**	
Brief description	This module will position the role of problem analysis within the broader framework of 'objective oriented project planning' (OOPP) which covers as well the phases of objectives analysis, strategy analysis and intervention planning. Problem analysis addresses the questions 'what *do we know* and what *don't we know* about the problem' and, consequently, identifies *uncertainties* as well as triggers *information requirements*. In workshops, problem analysis will be applied to problematic cases with increasing levels of complexity.
Objectives	Upon completion of this module students should be able to: • recognise the need and function of problem analysis for the identification and articulation of *information needs* in view of: 1. problem finding 2. solution finding; and 3. the implementation of the found solution. • identify and define the *scope* of a problem situation as subject of further analysis; • analyse the interconnected roles, functions and interests of those who affect and/or are affected by (planned) interventions for solving this problem (*stakeholder analysis*); • identify and describe the structure of the problem as a hierarchy of *cause-effect relations*; • identify major gaps in knowledge for adequately describing and understanding the problem (*generic information requirements*).
Contents	The subject covers the following topics: • problem analysis • stakeholder analysis • objective oriented project planning • information requirements
Study method and study load	lectures : 12 periods self study : 12 periods small group work : 12 periods --- total : 36 periods ⇒ 3 Credit points
Teaching/ learning material	book : Paul Lewis, "Information-Systems Development", Pitman, London, 1994 reader : to be distributed handouts : Euroconsult (1996): Objective Oriented Project Planning (OOPP); Logical framework; Stakeholder Analysis
Assessment	Participants will have to complete satisfactorily an individual writing assignment.

Module 3 : Maps and geographical databases (20 Oct - 7 Nov) **Contact staff members : Ir. Bart Krol and Michael Weir MSc.** **Course : FOR, FRD, RLE, SIG, SOL**	
Brief description	Maps are an important means of information presentation in land resource surveys and an essential data source in many land resource management applications. This module aims to provide participants with the basic knowledge and accompanying skills to work with maps and to store and organise both spatial and non-spatial data, presented in maps, in a geographical database, as part of a geographical information system (GIS) for land resource management.
Main objectives	On completion of the module, students should be able to: • Explain the need for geographical information in land resource management and identify the main information sources. • List the main components and elements of a geographical information system (GIS). • Explain the main properties of a map and perform simple measurements on a map. • Demonstrate the use of a topographic map for positioning and navigation, taking into account its map projection and co-ordinate system. • Summarise the basic concepts of the Global Positioning System (GPS). • Explain vector and raster spatial data structures and execute the main steps in cartographic digitising. • Describe the main steps in database development • Use the basic cartographic rules to compose a simple map.
Contents	The subject covers the following topics: • Geographical information for land resource management • Maps and map reading • Co-ordinate systems and map projections • Positioning and navigation • Computer handling of geographical data • Spatial data and data structures, spatial data input • Attribute data management • Integrated handling of spatial and attribute data • Basic cartography • Optional subjects (course specific)
Study method and study load	lectures : 28 periods) practical : 60 periods) self study : 24 periods) ⇒ 3 credit points field trip : 8 periods)
Teaching/ learning material	handouts
Assessment	• Procedure: 'summative' assessment (written examination) of the theory of modules 3 & 4 together, formative assessment of performance during exercises • Date: week 48, Friday 28 November 1997 • Date of resit: week 50, Wednesday 10 December 1997
Pre-requisites	knowledge: basic understanding of the need for geographical information in land resource management skills: basic computer handling (Windows 95, text processing, spreadsheets)

Module 4 : Remote sensing (10 - 28 Nov) **Contact staff members : Ir. Bart Krol and Michael Weir MSc.** **Course : FOR, FRD, RLE, SOL**	
Brief description	Remotely sensed data are an important data source in many fields of land resource management. The main concepts of aerial photography and satellite remote sensing are introduced to provide participants with the basic knowledge and skills to visually extract information about earth surface features.
Main objectives	On completion of the module students should be able to: • Describe the main principles of remote sensing. • Explain the basic concepts of aerial photography and photogrammetry • Explain the basic concepts of satellite remote sensing in the optical, infrared and microwave domain. • Compare and contrast the main available satellite platforms and sensor systems. • Explain and apply the basic principles of colour theory and the main techniques for satellite image enhancement. • Describe and apply the main principles of aerial photo and satellite image interpretation. • Describe and apply the main steps in georeferencing. • Estimate the relative costs and benefits of alternative methods for aerospace data acquisition.
Contents	• Basic concepts of remote sensing • Spectral reflectance of earth surface features • Photogrammetry • Aerial photography • Principles of aerial photo interpretation • Colour theory • Image visualisation and interpretation • Remote sensing sensor systems • Remote sensing platforms • Georeferencing of remotely sensed imagery • Radio detection and ranging: radar • Costs and ordering of remotely sensed products
Study method and study load	lectures : 20 periods) practical : 23 periods) self study : 8 periods) field trip : 4 periods) ⇒ 3 credit points workshop : 2 periods) question hour : 1 period) exam + evaluation : 2 periods)
Teaching/ learning material	book: Lillesand, T.M. and R.W. Kiefer, Remote sensing and image interpretation, 3rd edition, 1994, New York, John Wiley & Sons Inc. hand outs
Assessment	• Procedure: 'summative' assessment (written examination) of the theory of modules 3 & 4 together, 'formative' assessment of performance during exercises • Date: Friday, week 48 • Date of re-sit: Wednesday, week 50
Pre-requisites	knowledge: basic understanding of the need for geographical information in land resource management skills: basic computer handling (Windows 95, text processing, spreadsheets)

Module 4 : Information Systems (10 Nov-28 Nov) **Contact staff member : Drs. Johan de Meijere** **Course : SIG**	
Brief description	This module introduces the concept of Information System as the total of data, procedures, people, tools and organisation. The participants will be trained in the assessment of an information system in the institutional and organisational context with the help of the problem trees from the second module on Problem Analysis. The analysis of the tools as used in the third module on Maps and Spatial Databases will show that GIS is a tool for a particular set of data. In this module the requirements for problem definition and solution finding will be further analysed. Use will be made of semantic analytical tools and diagram techniques to perform the data and process analysis. Participants will be trained to separate between process and data descriptions. Finally the basic concepts of data base design will be given in order to store and retrieve the data required for problem definition and solution. Practical exercises in groups and individually play an important role in the module.
Objectives	Upon completion of this module students should be able to: • analyse a problem in terms of a system, composed of processes and data which reflect the real world at an abstract level • distinguish between institution, organisation and intervention • explain concepts as information system, process and data models • apply semantic modelling to identify user requirements • outline the difference between maps and databases • apply a number data analysis and data querying (SQL) techniques • apply a number of diagram techniques (entity-relationship; data flow; Rich)
Contents	The subject covers the following topics: • Information Systems, Data models, Databases, Data analysis • Institution, organisation and Intervention • Semantic analysis to formulate user requirements • Systems analysis • Diagram techniques
Study method and study load	lectures : 24 periods) practicals : 24 periods) ⇒ 3 credit points self study : 12 periods)
Teaching/ learning material	book : Paul Lewis (1994), "Information-Systems Development", Pitman, London, 1994 recommended literature : Howe (1989), Data Analysis for Database Design, Edward Arnold, second edition, London handout : extract from Howe (1989)
Assessment	one exam in third week. All practical work, group as well as individual, will be assessed
Pre-requisites	knowledge: basic GIS concepts as taught in module 3 skills: basic computer handling

Module 5 + 6 + 7 : Survey for the conservation and management of forest resources (1 Dec - 13 Feb.) **Contact staff member : Ir. J.M. Remeijn** **Course : FOR**	
Brief description of module	In modules 1 and 2 of the course, participants analysed requirements for spatial information. Forest surveys are undertaken to acquire the spatial data to support forest management planning. The design and supervision of forest surveys requires a sound working knowledge and practical skills in a broad range of methods and techniques. Modules 5, 6 and 7 form the core of the forest survey PM course. During these modules, participants will learn how to select and apply appropriate methods and techniques for the inventory and mapping of forest resources. Considerable attention will be devoted to managerial aspects (quality control, planning and costing) of forest survey projects.
Objectives	Upon completion of the module, participants will be able to support the conservation and management of forest resources by: • selecting and applying appropriate methods and techniques for the inventory and mapping of forest resources • designing and managing district-level forest inventory and mapping projects
Contents	The module covers the following topics: • interpretation of aerial photographs (12 periods) • measurements from aerial photographs (12 periods) • forest mensuration (8 periods) • land registration and cadastre (4 periods) • land surveying (10 periods) • photogrammetric mapping (16 periods) • inventory design (4 periods) • statistical analysis (24 periods) • sampling design (20 periods) • biomass survey (12 periods) • participatory forest inventory (2 periods) • management and costing of forest surveys (14 periods)
Study method and study load	lectures : 52 periods) workshops : 40 periods) practicals : 46 periods) ⇒ 9 credit points self study : 42 periods)
Teaching/ learning material	ITC lecture notes on : - Measurements on aerial photography - Introduction to land surveying - Land Registration and cadastre - Statistics for land managers - Forest mensuration - Statistics in forestry - Biomass surveys - Photo-interpretation in Forestry - Photogrammetric mapping - Production of forest management, maps - Forest inventory and remote sensing - Biomass estimation using radar
Assessment	Summative assessment (examination) of theory and formative assessment of performance during practical exercises.
Equipment	Calculator, pocket stereoscope, etc.
Pre-requisites	knowledge : - information requirements for forest conservation and management (module2) - principles of remote sensing and GIS (modules 3+4) skills : - computer handling (databases and spreadsheets) - basic skills in handling maps and aerial photographs - operation of GIS and image processing software

Module : 5 and 6 : FRD Core Module **Contact staff member : Robert Albricht** **Course : FRD**	
Brief description	This module forms the core of the course. The concepts of agroforestry social forestry and community forestry will be presented in this module. During the module participants will learn how to select and apply appropriate tools and techniques for data collection and analysis of biophysical, social, economic and institutional data relevant to forestry for rural development.
Objectives	Knowledge: At the end of this module students should be able to: • explain the concepts of social and community forestry; • explain the potentials of agroforestry in forestry for rural development; • explain the need for survey and their quality requirements to identify and diagnose the spatial properties ad role of trees and shrubs in existing land use systems Skills: At the end of this module students should be able to: • select and apply appropriate data collection tools and techniques to identify and diagnose the spatial properties ad role of trees and shrubs in existing land use systems • select and apply appropriate data collection tools and techniques to identify the stakeholders ad their social, economic and institutional interests in tree and shrub functions; • develop, evaluate and implement appropriate survey methods and techniques for rural forestry planning and decision making at district level
Contents	The subject covers the following topics: • relevance of remote sensing and GIS in FRD • air photo interpretation • statistics • biomass survey • agroforestry • community, social forestry • sampling • presentation skills, reporting, literature review • self study
Study method and study load	lectures + small group work : 136 periods) self study : 36 periods) ⇒ 9 credit points excursions : 8 periods) total : 180 periods)
Teaching/ learning material	book : reader : handouts :
Assessment	summative and formative assessments
Equipment	pocket stereoscope
Pre-requisites	Forest and tree resource management: new approaches.

Module 5 : Mapping Land Cover (1-20 Dec) **Contact staff member : Dr. Bert Toxopeus** **Course : RLE**	
Brief description	Mapping land cover is based on an assumed correlation between the spectral reflectance of land cover as captured by images and actual features of cover as present. This correlation is studied through image interpretations, a subsequent field survey, and finally through data analysis. The survey methodology is fully based on the above stated assumption and given survey sequence. Since land cover is often related to terrain and both terrain as land cover can both be mapped using images, the module starts with some basics of terrain analysis.
Objectives	Learning aims: To provide the knowledge and skills required to design and execute a vegetation survey by using aerospace products, resulting in a map in the context of a NRM/LUP issue and NRM/LUP institution. Learning objectives: • Interpretation of aerial photographs and satellite imagery using vegetation (natural and crop) cover and field pattern as diagnostic characteristics. • Description, classification and delineation of terrain mapping units, based on relief and drainage patterns visible on aerial photographs. • Recording vegetation observations on the ground stratified by image interpretation maps. • Comparison of aerospace data with ground data for the mapping of the vegetation. • Producing a vegetation map. • Survey planning.
Contents	1. Terrain analysis: - Terrain / landform / cover concepts - Image interpretation exercises (digital and analogue) - Fieldwork 'terrain analysis' 2. Mapping Cover - Sampling Vegetation : - vegetation data - record sheets (forms) - vegetation data collection methods - fieldwork 'vegetation data' - Image Maps *(digital and analogue)* : - mapping procedures - air photo interpretation exercises - image sampling methods - image interpretation keys - image legend definition - Actual survey : - specifying a data collection form - specifying a sample scheme - fieldwork 'vegetation survey' - data classification - definition of cover types - preparation of the 'final' legend • Examination
Lecturers	1. A. Skidmore / K. Bronsveld 2. J. Looijen / B. Toxopeus

Study method and study load	1. 1, 2 Dec. 8 periods 3 Dec. 4 periods **Fieldwork** 'terrain analysis' 2. *Sampling Vegetation*: 4 Dec. 4 periods 5 Dec 4 periods **Fieldwork** 'vegetation data' *Image Maps*: 8, 9, 11, 12 Dec. 16 periods *Actual survey*: 15 Dec. 4 periods 16 Dec. 4 periods **Fieldwork** 'vegetation survey' 18, 19 Dec. 8 periods • 22 Dec. 1 period - question hour - submit assignments • 23 Dec. (am) 2 periods **Examination** • 23 Dec. (pm) 2 periods - written evaluation - staff-student meeting on modules 3,4, and 5 - VAS Christmas drinks. • 14 Jan. (pm) 2 periods **Re-examination** Lectures : 8 periods practicals / reading assignments : 20 periods fieldwork : 12 periods case study office work : 12 periods self study : 14 periods examination : 2 periods others 2 periods total : 70 periods ⇒ 3 Credit Points
Teaching/ learning material	KENT M. AND P.COKER, 1995. *Vegetation Description and Analysis; A Practical Approach*. John Wiley & Sons Ltd. New York.
Assessment	A written exam with questions from all given subjects. All questions will have an equal weight; they can be open ended, multiple choice, based on a provided graph or table, or based on materials as provided in the required learning materials.
Equipment	Personal computers attached to the ITC network. MAT 01 : pocket stereoscope. MAT 02 : 2 needleholders with spare needles.
Pre-requisites	Computer handling skills as taught during module 1. API and RS skills as taught during modules 3 and 4.

Module 5 : Soil Inventory Concepts and Methods - 1(1 - 19 Dec.) **Contact staff member : Prof. Dr. A. Zinck/Dr. A. Farshad** **Course : SOL**	
Brief description	The module starts with presenting a broad overview of module 5, 6 and 7 (Soil Inventory Concepts and Methods). A very general outline is given of the soil inventory approach and method including the various steps of the survey process; also the different technical procedures are briefly highlighted (*Introduction to Soil Inventory Concepts and Methods)*; it proceeds with lecture-exercise sets on the successive steps in the soil survey process; these include photo-interpretation as a basis for soil survey planning *(Photo interpretation in Soil Surveys)*, examining and describing soils *(Soil description)*, and categorising and classifying according to international taxonomic systems *(Soil classification / Soil Taxonomy, Soil classification / FAO Legend).* In addition, and integrated set of lectures and exercises on geomorphology is given *(Geomorphology)*.
Objectives	Yet to be specified (for constituting subjects and module as a whole)
Contents	Introduction to Soil Inventory Concepts and Methods - k6-II Soil description - k2 Soil classification (Soil Taxonomy) - k3 Soil classification (FAO Legend) - k4 Photo-interpretation in Soil Surveys - k9 Geomorphology - j1
Lecturers/ supervisors	Prof. Dr. A. Zinck — Geopedology (introduction) Dr. A. Farshad — Soil description Drs. D. Creutzberg — Soil classification (Soil Taxonomy) Dr. O. Spaargaren — Soil classification (FAO Legend) Dr. A.. Farshad — Photo-interpretation in Soil Surveys Dr. W. Siderius — Geomorphology
Study method and study load	$\Rightarrow$ 3 credit points
Teaching/ learning material	- do -
Assessment	- do -
Equipment	- do -

Module 5 : Land and Land Use Data (1 Dec-19 Dec) **Contact staff member : Drs. Johan de Meijere** **Course : SIG**	
Brief description	In this module the data analysed during the fourth module on Information Systems will be further specified. Land data will be reviewed in more detail. Therefore visits will be made to the different divisions of the institute which specialise in the capture of thematic land data. These visits will be analysed and data and process specifications of the discipline will be made explicit. In this way the concepts of 'scale' and 'spatial data' are further explored. Special attention will be given to information derived from the original data. Procedures such as Land Evaluation and Land Use Planning will thus be made more explicit. At the end of the module the data which are now well defined and understood will be compared with the data requirements as defined in the problem trees. It will become clear that the so called socio-economic data requirements are not yet sufficiently covered to come to problem assessment and solution finding. The specifications for further socio-economic data can now be made.
Objectives	Upon completion of this module students should be able to: • analyse land related data as captured by different disciplines and the character of the information derived from these data • analyse procedures as land evaluation and land use planning • describe by means of diagrams and presentations, the data requirements in complex land management problems • specify the requirements for socio-economic data • distinguish between spatial and non-spatial information •
Contents	The subject covers the following topics: • Land and land use data as captured by different of disciplines • Geo-information, scale and discipline. • Analysis of the character of information derived from the original data. • Analysis of procedures such as Land Evaluation and Land Use Planning. • Comparison of the land related data capture with the data requirements from problem analysis. • Specifications for socio-economic data.
Study method and study load	lectures : 16 periods) practicals : 32 periods) ⇒ 3 credit points self study : 12 periods)
Teaching/ learning material	book : Paul Lewis, "Information-Systems Development", Pitman, London, 1994 reader : extract from Howe (1989)-see module 4; basic GIS texts as distributed in module 3
Assessment	Group report and participation in the group and discussions
Pre-requisites	knowledge : some basic understanding of Remote Sensing skills : basic computer handling

Module 6 : Socio-economic data analysis and statistics (5 Jan- 23 Jan) **Contact staff member : Drs. Emile J.M. Dopheide** **Course : SIG**	
Brief description	To support decision making an image should be developed of the problems in the area concerned, their causes and effects, and the changes taking place over place and time. To develop this image participants will review and apply methods and techniques of data analysis, where special attention will be given to the socio-economic data. Data analysis consists of organising, classifying and describing data. Basics of sampling will be reviewed to understand the representativeness of collected data. For a better description and analysis of cause-effect relationships correlation and regression techniques will be treated. Time series analysis and index numbers will be applied to understand developments over time. An introduction to spatial statistics will be given to give participants an understanding of the description of spatial variability and recognition of spatial patterns and relationships. Participants will be introduced to the use of a statistical software.
Objectives	Upon completion of this module students should be able to: • organise and classify raw data • apply descriptive statistics for different type of measurements • understand the basics of sampling procedures and methodology • establish relationships between variables at different measurement scale • use a software to apply some descriptive statistics • analyse time series and use index numbers • understand some basics of spatial statistics
Contents	The subject covers the following topics: • organisation and classification • levels of measurement • frequency distributions • sampling principles and techniques • measures of central location • measures of dispersion • correlation and regression • time series analysis and index numbers • statistical software package • introduction descriptive and inferential spatial statistics
Study method and study load	lectures : 12 periods) practical : 24 periods) ⇒ 3 credit points self study : 24 periods)
Teaching/ material	reader and handouts will be distributed
Assessment	The work in the module will be assessed through a number of assignments
Pre-requisites	knowledge : basic arithmetic's skills : basic computer handling

Module 6 : Survey and Hypothesis Statistics (5-23 Jan) **Contact staff member : Dr. Jan de Leeuw** **Course : RLE**	
Brief description	To study land ecological models or to map land cover requires skills to present data in tables or figures and to test causal relationships between data through hypothesis testing. This module provides in a practical way, by teaching skills, how to prepare data summaries and how to carry out sound data interpretations.
Objectives	Learning aims: To provide the knowledge and skills required to report data in tables and figures and to test causal relationships between different types of data by formulating a hypothesis and using a range of different statistical methods. Learning objectives: • Knowledge on the relationship between sample schemes and feasible hypothesis statistics. • Skills in summarising in tables or figures both nominal as ratio data. • Skills in testing the relationship between one dependent variable and many independent variables. • Skills in testing the relationship between many dependent variables and many independent variables. • Skills in grouping and clustering data of a large data matrix. • Understanding of spatial statistics. • Skills in testing the quality of land cover and land use maps.
Contents	1. Statistics of Survey Sampling Schemes: - sampling strategies vs. survey statistics (area frame sampling). - change maps and change statistics. 2. Data Types and Data Presentation: - nominal vs. ratio data. - descriptive statistics. - tables and figures. 3. Parametric Statistics: - hypothesis testing of a land cover survey. - ANOVA, regression, t-tests, Chi-sq. tests, etc. 4. Non-Parametric Statistics: - hypothesis testing of ecological models - ordination, clustering, etc. 5. Spatial Statistics + Map Accuracy Assessments: - Spatial extrapolation techniques. - Map quality assessment methods and indicators. • Examination.
Lecturers	1, 2, 3 S. Groten / K. de Bie 4. J. de Leeuw 5. A. Skidmore

Study method and study load	1. 5, 6 Jan. 8 periods 2. 8, 9 Jan. 8 periods 3. 12, 13 Jan. 8 periods 4. 15, 16 Jan. 8 periods 5. 19, 20 Jan. 8 periods • 22 Jan. 2 periods Question hour • 23 Jan. (am) 2 periods Examination • 23 Jan. (pm) 1 period Written evaluation • 4 Feb. (pm) 2 periods Re-examination lectures : 10 periods practicals : 30 periods self study : 17 periods examination : 2 periods others : 1 period --- total : 60 periods ⇒ 3 Credit Points
Teaching/ learning material	Handouts.
Assessment	A written exam with questions from all given topics. All questions will have an equal weight; they can be open ended, multiple choice, based on a provided graph or table, or based on materials as provided in the required learning materials. Several questions will require statistical analysis work by computer.
Pre-requisites	• Computer handling skills as taught during module 1. • Skills in defining hypothesis as required to study and map land cover or to study ecological models (see modules 2 and 5).

Module 6 - 7 : Soil Inventory Concepts and Methods - 2 **Contact staff member : Prof.Dr. A. Zinck/Dr. A. Farshad** **Course : SOL**	
Brief description	Module 6 and 7 form a continuation of Module 5. The general focus is set on the geopedologic survey approach *(Geopedology / Practicals Geopedological Analysis).* This is followed by an overview of the basic concepts and procedures in the survey process *(Soil survey methods and techniques);* The lectures and exercises on photo-interpretation which were started in Module 5 are continued *(Photo interpretation in Soil Surveys)*.
Objectives	Yet to be specified (for constituting subjects and module as a whole)
Contents	Photo interpretation in Soil Surveys (continued) - k9 Geopedology - k6-II Practicals Geopedological Analysis - GP Soil Survey Methods and Techniques - k5
Lecturers/ supervisors	Dr. A. Farshad Photo interpretation in Soil Surveys (continued) Prof. Dr. A. Zinck Geopedology Various staff Practicals Geopedological Analysis Dr. D. Rossiter Soil Survey Methods and Techniques
Study method and study load	Yet to be specified $\Rightarrow$ 6 credit points
Teaching/ learning material	- do -
Assessment	- do -
Equipment	- do -

Module 7 : Socio-economic data collection (26 Jan-20 Feb) **Contact staff member : Dr. Michael K. McCall** **Course : SIG / FRD**	
Brief description	This module will introduce and review methods applied in socio-economic data collection for NRM, land use planning and spatial development planning. Of basic importance, is the selection of data collection methods which are appropriate to particular survey purposes, limitations and data types. Survey methods include secondary data acquisition and primary data collection in the field of economic and socio-cultural data concerning both individuals and institutions. There is a focus on widely-applied methods: questionnaires, interviews, rapid rural appraisal (RRA), and case studies. There is a 2 day RRA/interview rural fieldwork.
Objectives	Upon completion of this module students should be able to: • review the strengths and weaknesses of a number of socio-economic data collection methods • define the resource requirements of a number of socio-economic data collection methods • select between types and levels of survey methods appropriate to survey needs and objectives. • design and organise an overall survey in NRM or spatial development planning. • apply and implement key survey methods, including: - RRA and Participatory-RRA; interviews; questionnaires; indicators; airphotos; case studies - and their specific techniques.
Contents	The subject covers the following topics: • design and stages in socio-economic surveys. • matching of methods to data types and survey objectives. • planning and budgeting of surveys. • secondary data sources. • RRA and Participatory-RRA. • fieldwork. • indicators. • interviewing and questionnaires. • case studies • socio-economic data collection from airphotos. • presentation methods of survey data. • application of survey data to problem analysis.
Duration	lectures : 16 periods) practical : 4 periods) self study : 12 periods) $\Rightarrow$ 3 credit points small group work : 12 periods) excursion : 16 periods)
Teaching/ learning material	lecture notes/reader: Surveying Social and Environmental Conditions in Communities: using RRA and Participatory-RRA methods handouts to be distributed
Assessment	A written assignment is given during the module The RRA fieldwork output, including the assessment of the techniques used, is presented as a group exercise.
Pre-requisites	Basic principles of statistics and sampling. Basic airphoto-interpretation

Module 7 : Mapping Cover Related Aspects (26 Jan.-13 Feb) **Contact staff member : Dr. Jan de Leeuw** **Course : RLE**	
Brief description	Indirectly, many aspects of (agro-) eco-systems may be related to land cover aspects and thus also to the spectral reflectance of land cover as seen on imagery. Using this assumption, many of such aspects are reviewed, and if correlation is proven, the land use or eco-system information (e.g. bio-diversity) can be added to the legend of the studied area. Additional survey skills needed are practised (interview techniques and secondary data collection) and the problem that arises when secondary data have a different spatial basis than the prepared land cover / land use map (e.g. administrative areas) is discussed.
Objectives	Learning aims: To provide the knowledge and skills required to design and execute a survey of cover related aspects, e.g. agricultural land use, by using aerospace products, resulting in a map in the context of a NRM/LUP issue and NRM/LUP institution. Learning objectives: • skills in using a made description and delineation of mapping units for mapping land cover related aspects • skills in recording eco-system or agricultural land use (management) information • skills in handling, interpreting and classifying site-wise time-referenced data series on land use (land management) • comparison of aerospace data with ground data for mapping land cover related aspects like agricultural land use • producing an agricultural land use map • survey planning
Contents	1. Mapping land use: - land use description and classification concepts (Land Use Database) - procedures to map land use - link with land cover mapping aspects. - interview techniques. - land use legend preparation. 2. Mapping environmental aspects: - mapping erosion and hydrology (available moisture). - mapping environmental- and land quality indicators. 3. Mapping bio-diversity aspects (forest/rangeland aspects): - mapping species distribution, bio-diversity and vegetation habitats. - mapping wild-life habitats. - mapping domestic animal grazing areas. 4. Mapping management units: - mapping farming systems and other socio-economic variables / statistics, incl. admin. Boundaries, farm systems research data and recommendation domains. • Examination.
Lecturers	1. K. de Bie 2. H. van Gils 3. B. Toxopeus 4. K. de Bie

Study method and study load	1. 26, 27, 29, 30 Jan. 16 periods 2. 2, 3, 5 Feb. 12 periods 3. 6, 9 Feb. 8 periods 1 10 Feb. 4 periods • 12 Feb. 1 period - question hour - submit assignments • 13 Feb. (am) 2 periods **Examination** • 13 Feb. (pm) 2 periods - written evaluation - staff-student meeting modules 6+7. • 25 Feb. (pm) 2 periods **Re-examination** lectures : 10 periods practicals : 30 periods self study : 16 periods examination : 2 periods others : 2 periods --- total : 60 periods ⇒ 3 Credit Points
Teaching/ learning material	Handouts.
Assessment	A written exam with questions from all given topics. All questions will have an equal weight; they can be open ended, multiple choice, based on a provided graph or table, or based on materials as provided in the required learning materials.
Pre-requisites	Skills as taught in module 5.

Module 8 : Spatial analysis and modelling (16 Feb. - 6 March) **Contact staff members : Ir. Bart Krol and Michael Weir MSc.** **Course : FRD, FOR, RLE, SOL**	
Brief description	A main characteristic of geographical information systems is the provision of capabilities for spatial analysis and modelling, to produce information useful in land resource management. In this module digital image processing is applied to extract information from satellite imagery. Functions for automated spatial analysis of land resource data and modelling for land resource management objectives are introduced.
Main objectives	On completion of the module students should be able to: • Explain and apply the main steps in digital image processing. • Describe and apply the main spatial analysis functions. • List commonly applied criteria for data quality assessment and summarise how error can be propagated in spatial analysis. • Design and execute simple spatial modelling procedures for different land resource management objectives. • Distinguish among a number of selected image processing and GIS hard- and software configurations.
Contents	• Multispectral classification • Image transformation • Spatial analysis functions • Spatial modelling • Data quality assessment • RS/GIS hard- and software • Organisational aspects of RS/GIS
Study method and study load	lectures : 12 periods) practicals : 24 periods) self study : 11 periods) $\Rightarrow$ 3 credit points demonstration : 3 periods) workshop : 8 periods) exam + evaluation : 2 periods)
Teaching/ learning material	book: Lillesand. T.M and R.W. Kiefer, Remote sensing and image interpretation, 3rd edition, 1994, New York, John Wiley & Sons Inc. Hand outs
Assessment	• Procedure: 'summative' assessment (written examination) of theory, 'formative' assessment of performance during exercises • Date: week 10, Friday 06 March 1998 • Date of resit: week 12, Wednesday 18 March 1998
Pre-requisites	completion of module 4

Module 8 : Cost-benefit Analysis and Environmental Impact Assessment (16 Feb-6 Mar) **Contact staff member : Drs. Emile J.M. Dopheide and Dr. Michael K. McCall** **Course : SIG**	
Brief description	When alternative solutions or projects have been identified, these solutions will have to be appraised on a number of aspects. This module will focus on the appraisal of the solutions from an economic and environmental point of view through dealing with cost-benefit analysis (CBA) and environmental impact assessment (EIA). It is assumed that many participants are in a position to instruct the specialists on the scope and contents of the economic and environmental appraisals and/or to interpret and assess the output of the conducted studies. To take on this dual role, participants should master some basic cost-benefit principles and concepts and participants should understand the questions addressed by an EIA, the different approaches and methods employed in EIA and the responsibilities within the EIA process. Participants will understand these principles, concepts and questions by working and reviewing a number of cases. Dutch cases will be used to assess the use of CBA and EIA within decision making in the Netherlands. In this respect some visits will be paid to Dutch organisations. The Dutch experience will be related to the situation in participants' home countries. At the end participants will review a cost-benefit study as well as an environmental appraisal as conducted within the context of an EIA.
Objectives	Upon completion of this module students should be able to: • outline the function of CBA and EIA within public decision making processes • understand the main concepts and principles of CBA • compare different methods and procedures followed in EIA • to draft terms of reference for conducting CBA and EIA respectively • examine to which extent environmental aspects can be addressed in CBA • explore the use of GIS within EIA • review the output of cost-benefit studies and environmental impact assessment
Contents	The subject covers the following topics: • CBA topics: incremental analysis; discounting; decision criteria (IRR, NPV); financial vs. economic analysis • EIA processes: screening, scoping and review • EIA techniques (matrices, simple trade-offs, social impact assessment) • Application of GIS in EIA Economic valuation of environmental aspects
Study method and study load	lectures : 20 periods) group work : 20 periods) ⇒ 3 credit points self study : 16 periods) excursion : 4 periods)
Teaching/ learning material	book: NEI (1992), CBA for Non-economists, Rotterdam , The Netherlands handouts and reader to be distributed
Assessment	Participants will review individually a cost-benefit study as well as an environmental appraisal as conducted within the context of an EIA.
Pre-requisites	skills: basic computer skills

Module 9 : Land evaluation (9 - 27 March) **Contact staff member : Dr. Herman Huizing** **Course : FOR, FRD, RLE, SOL**	
Brief description	For NRM purposes, the skills acquired during the RS/GIS and core-modules need to be integrated to study the full complexity of the typical (agro) eco-systems as each course put in their study domains. Aspects of actual as potential systems need to be evaluated regarding productivity, sustainability and conservation aspects in order to continue in module 11 with the preparation of feasible development scenarios as required for land use planning
Objectives	Learning aims: To provide the knowledge and skills to select an apply models to study and evaluate agricultural land use and natural eco-systems. Learning objectives: • skills in comparing and selecting for given NRM study objectives the suitable modelling approach • skills in assessment the suitability of current and selected alternative agricultural and conservation uses per land unit • skills of making integrated use of digital methods including data bases, modelling techniques and GIS
Contents	1. Approaches in land use system/ecosystem analysis: - land capability classification - FAO's Agro-Ecological Zones methodology - FAO's framework for land evaluation (+ subsequent guidelines) 2. Case study: Land use system/ecosystem analysis (Part-1) using the FAO framework, ECOCROP, CROPWAT, and ALES in a GIS environment. Small groups will be formed to work as a team. 3. Choice from: (with exercises based on the case study) a. habitat and bio-diversity evaluation models b. site classification for forestry c. diagnosis and design methods in agroforestry d. methods based on indigenous knowledge e. methods used in conservation ecology f. advanced land evaluation methodologies g. crop growth models (PGRO, WOFOST, PS123, …) 4. Case study: land use system/ecosystem analysis (Part-2) using skills acquired under 3 for: a. (semi-) natural ecosystem analysis b. land use systems analysis 5. Presentations (use transparencies and for GIS a computer system) • Examination

Study method and study load	lectures : 8 periods practicals : 12 periods case study : 20 periods self study : 15 periods presentations : 2 periods examination : 2 periods written evaluation : 1 period ---------- ---------- total : 60 periods ⇒ 3 Credit Points
Teaching/ learning material	To be announced
Assessment	• The submitted case study assignments will be marked as a group performance assessment. • The case study presentation will be marked as a group performance assessment. • A written exam with questions from all topics followed. All questions will have an equal weight; they can be open ended, multiple choice, based on a provided graph or table, or based on materials as provided in the required learning materials.

Module 9 : Institutional Analysis for Implementing Solutions (9 Mar-27 Mar) **Contact staff member : Dr.Ing. W.H. Erik de Man** **Course : SIG**	
Brief description	This module will concentrate on interventions for solving problems that have been identified in an earlier phase of 'objective oriented project planning' (OOPP). The appraisal and selection of feasible interventions as well as conditions for their (sustained) effectiveness will be dealt with. These -mostly institutional- conditions are both within the recipient communities and within the domain of the intervening government and non-government agencies. Institutional conditions regulate the relations and interactions between the various stakeholders. Special attention will be given to conditions for and barriers to organisational and group learning. Participants will assess their own organisation accordingly.
Objectives	Upon completion of this module students should be able to: • recognise the role of interventions in problem-solving (*intervention logic*); • recognise institutional potentials and constraints for effective (public) interventions in problem solving. • identify intervention objectives following (that is to say: on the basis of) a problem analysis; • identify and appraise different possible strategies to achieve these objectives and, therefore, to remedy the problem; • appraise the effectiveness of public policy instruments; • identify institutional potentials and constraints affecting sustainability.
Contents	• intervention logic • effectiveness of policy instruments • institutional analysis • organisational and group learning
Study method and study load	lectures : 20 periods) self study : 20 periods) ⇒ 3 credit points group work : 20 periods)
Teaching/ learning material	book : Gareth Morgan (1986 or later), "Images of Organisation", SAGE, Hills/London reader : a reader on policy-instruments and local institutional development will be distributed Recommended literature : Norman Uphoff (1986), "Local Institutional Development: an analytical sourcebook with cases", Kumarian, West Hartford (Conn.)
Assessment	Participants will have to write an essay in which they assess their own organisation within the context of the module. The essay will be marked.
Pre-requisites	knowledge :

Module 10 : Land Use Planning (30 March-17 April) **Contact staff member : Dr. Herman Huizing** **Course : FOR, FRD, RLE, SOL, SIG**	
Brief description	The module on Land Use Planning (LUP) will be multi-sectoral with contributions from Production and Rural Forestry, Agriculture, Biodiversity and Environmental Conservation, Soils and Social Sciences. The module will be divided into three parts. The first part will introduce a number of alternative land use planning approaches and methods applied in regional and participatory land use planning. Some "exchange" lectures are included through which participants will be informed about each others' approaches and methods. The second part will start with the analysis and structuring of problems for a case study area. Spatial scenarios will be generated and appraised that can reduce or solve the problems identified. This will be done separately by three sector/discipline groups: • Agriculture and production forestry. • Environmental/biodiversity conservation. • Infrastructure and social services. Each discipline group will use (i) methods and skills acquired in the previous block and (ii) simple decision support techniques. In the last part of the module the selected sectoral proposals will be appraised multi-sectorally using simple decision support techniques. The module will include a one-day excursion to an organisation in the eastern part of The Netherlands that deals with aspects of land use planning.
Objectives	Upon completion of this module students should be able to: • compare different approaches and methods for land use planning and judge their applicability in specific situations in the context of NRM. • apply a number of methods/tools and other disciplinary knowledge and skills acquired in preceding parts of the course to generate and appraise alternative sectoral (spatial) solutions to identified problems. • integrate and appraise different sectoral solutions in a multi-sectoral setting using simple decision support techniques.
Contents	The subject covers the following topics: • Land use planning approaches • Methods in regional and participatory land use planning • Problem analysis and structuring • Generation and appraisal of sectoral scenarios • Sectoral and multi-sectoral appraisal • Decision support techniques • Multi-objective/criteria evaluation techniques
Duration	composition of learning methods not known yet. ⇒ 3 credit points
Teaching/ learning material	to be announced
Assessment	Throughout the module a number of exercises and assignments will have to made. The last part will be concluded by a series of presentations. The module will be closed with an examination covering the whole module
Pre-requisites	Disciplinary knowledge and skills acquired in preceding parts of each course.

Module 11	**:**	**Final Project - 1 (20 April - 8 May)** **a) Advanced subjects in Remote Sensing and GIS** **b) Specialisation subjects: Applications of soils survey Information**
Contact staff member	**:**	**D. Shrestha MSc/Drs. T. Loran**
Course	**:**	**SOL**

Brief description	The first week of this module is a continuation of **Module 8 : Spatial Analysis and Modelling**. Various subjects in this field important to the soil inventory specialist but not or insufficiently covered in Module 8 are addressed here. The second and third week are dedicated to choose subjects covering various specialisation fields to which soil information can be applied successfully. The subjects are generally of direct relevance to the participant's specialisation and final project including his personal study topic. There are 5 parallel streams from which participants can choose as follows : 1) Soil erosion and conservation 2) Soils and the environment (soil pollution) 3) Soil interpretation for non-agricultural uses 4) Analysis and assessment of land use systems 5) Soil variability The streams are taught partly in cooperation with other divisions and are open to participants from other courses.	
Objectives		
Lecturers/ supervisors	D. Shrestha - MSc/Drs. T. Loran Ir. E. Bergsma /Ir. R. Hennemann Dr. W. Siderius Prof. Dr. A. Zinck/Dr. A. Farshad Dr. A. Farshad Prof.Dr. A. Zinck	Advanced subjects in Remote Sensing and GIS Soil erosion and conservation Soils and the environment (soil pollution) Soil interpretation for non-agricultural uses Analysis & assessment of land use systems Soil variability
Study method and study load	Yet to be specified $\Rightarrow$ 3 credit points	
Teaching/ learning material	- do -	
Assessment	- do -	
Equipment	- do -	

Module 11 : Decision Support Systems and Evaluation Techniques (20 Apr-8 May) **Contact staff member : M. Ali Sharifi, Ph.D** **Course : SIG**	
Brief description	Throughout the course, participants have become aware of the complexity of the decision environment in natural resource management, involving many conflicting objectives and many stakeholders. This module will start by reviewing the basic principles of decision making processes, decision support systems and multiple objective decision making processes. The module introduces a number of evaluation techniques that have been developed to support decisions within the management of natural resources. Through theory and practical exercises using different computer software, various approaches will be taught and the link between decision support systems and GIS will be explored. Participants will apply the main types of evaluation techniques to a number of problems and choice possibilities. These choice possibilities could consist of alternative plans, strategies, scenarios, location and are described in terms of a variety of criteria with different priorities. Criteria could be measured on a qualitative and quantitative scale and are derived from the application of various techniques with different levels of accuracy and certainty. The evaluation results will be assessed and interpreted. At the end the participants will apply multi-criteria evaluation in a case study.
Objectives	Upon completion of this module students should be able to: • explain the basic principles of decision making processes and decision support systems • explain the possible link between GIS and decision support • describe the basic principles and objectives of evaluation techniques • explain the main methods of evaluation techniques • classify and compare different evaluation techniques • apply the main types of evaluation techniques in different problems • assess and interpret the results of the application of the evaluation techniques in decision making processes in NRM
Contents	The subject covers the following topics: • Introduction to decision making processes and decision support system • GIS and decision support systems • Basic principles and components of multi-criteria evaluation techniques • Utility based multi-criteria evaluation techniques • Multi-criteria evaluation techniques based on concordance-discordance analysis • Quantitative vs. qualitative multi-criteria evaluation techniques
Study method and study load	lectures : 20 periods) practical : 20 periods) $\Rightarrow$ 3 credit points self study : 20 periods)
Teaching/ material	reader: a reader with a number of articles and references will be distributed
Assessment	Participants will be assessed on the basis of a written exam (50%) and an assignment (50%)
Pre-requisites	skills: basic computer skills

Module 11 : Forest monitoring (20 April - 8 May) **Contact staff member : Dr. Yousif Hussin** **Course : FOR**	
Brief description	The dynamic nature of forests and the long term aims of management mean that monitoring of forest resources is an essential activity for forestry agencies. Remotely sensed imagery provides a particularly effective means for assessing spatial changes in the state of forest resources on a regular basis. In this module, the technical and organisational requirements for a monitoring system will be outlined. Participants will then develop skills in the application of aerial photography and satellite imagery for forest change detection. Whereas change detection examines the spatial aspects of past events, growth and yield models can be used to predict the future value of forest resources. The principles of such models will be explained and demonstrated. The module concludes with an introduction to spatio-temporal databases for analyzing and modelling forest change.
Objectives	Upon completion of the module, participants will be able to : • outline the technical and organisational requirements for a forest monitoring system • use aerial photography to detect and monitor forest changes • use satellite imagery of various types to detect and monitor forest changes • apply models for the prediction of forest growth and yield • explain the principles of systems for handling spatio-temporal data to support forest resource management
Contents	The module covers the following topics: • Technical and organisational issues • Forest monitoring with aerial photography • Forest monitoring with satellite imagery • Models for predicting forest growth and yield • Spatio-temporal databases
Study method and study load	lectures : 10 periods) practicals : 38 periods) ⇒ 3 credit points self study : 12 periods)
Teaching/ learning material	Handouts
Assessment	Summative assessment (examination) of theory and formative assessment of performance during practical exercises.
Equipment	
Pre-requisites	

Module 11 : Rural energy
Contact staff member : Ir. W.E. Klunne
Course : FRD

Brief description	Wood energy plays an important role in the rural energy situation in developing countries. During this block attention will be given to the role and importance of wood fuels, as well as the role of other types of energy. The energy demand and supply situation will be analysed and special attention will be given to the (spatial) planning and modelling of energy in a rural context.
Objectives	knowledge of: • the role and importance of wood as a fuel • energy consumption patterns • the differences between urban and rural energy situation • different forms of energy and their relationship • the importance of the reliability of data related to energy demand and supply • energy balances • the use of energy models and energy planning skills: • assessing energy demand • assessing energy supply • being able to apply simple modelling and scenario building of an energy situation (including the use of the LEAP-computer program and the APM spreadsheet application) • reading of energy balances • calculate on the conversion process from one form of energy to another form of energy • assess the reliability of data related to energy demand and supply
Contents	• experiences of participants • wood energy introduction • energy basics • energy calculations • energy demand • energy supply • biomass assessment of woodlots • short rotation forestry, energy crops • energy systems • energy balances • stakeholders • energy modelling and scenario building • computer models • solar energy • wind energy • hydropower • biogas
Duration	lectures : 22 lecture periods) practical : 8 lecture periods) self study : 16 lecture periods) ⇒ 3 credit points small group work : 2 lecture periods) excursion : 4 lecture periods)
Teaching/ learning material	hand-outs
Assessment	assignment written exam
Equipment	computer simple pocket calculator

Module 12-16 : Final project and personal study topic (11 May - 21 Aug) **Contact staff member : Ir. J.M. Remeijn** **Course : FOR**	
Brief description	The preparation and execution of a forest survey project will enable participants to put the knowledge and skills acquired during the preceding modules into practice in a field situation. An important aspect of this project is the development of experience in working as part of a team. Participants will also have an opportunity to develop more in-depth knowledge by working on a personal study topic selected from the subjects covered during the course. The course is concluded with an by a one-week exit programme designed to prepare participants to implement acquired competence in their home organisation .
Objectives	Upon completion of the module, participants will be able to : • design and execute a forest survey to meet given information requirements • supervise aspects of forest survey operations • analyse data collected during a forest survey • present the resulting information in the form of a technical report
Contents	• Selection of personal study topic • Preparation for group fieldwork • Field data collection including, where necessary, collection of data for the Personal Study Topic • Data analysis and reporting of group fieldwork • Execution of a small personal research project • Exit workshop
Study method and study load	Individual and group project work, including fieldwork 300 periods = 15 credit points
Assessment	Marks will be given for both individual and group work, based on an assessment of general performance, written work and oral presentation.

Module 12 : Final Project - 2 (11-29 May) **Contact staff member : Fieldwork coordinator** **Course : SOL**	
Brief description	The second part of the Final Project covers the regular fieldwork which consists of three phases : fieldwork preparation (this module), fieldwork execution (Module 13 and 14) and fieldwork reporting (Module 15). Preparatory work and data collection for the Personal Study Topic (Module 16) form an integral part of Module 12, 13 and 14. Module 12 deals with various preparatory operations as required for the fieldwork and the personal study topic.
Objectives	Aim: To apply under realistic conditions the conceptual knowledge, skills and techniques as acquired during the course and to demonstrate these in the planning and execution of a complete soil inventory (including land evaluation and the preparation of a survey report and maps). Upon completion of the fieldwork modules, participants will be able : To conduct a semi-detailed soil inventory including land evaluation and to prepare a survey report and maps while working as a member of a professional team.
Contents	• Planning and managing soil survey operations (lecture-exercise set of 16 periods focusing on the main logistical and financial planning aspects of soil survey / land evaluation within a project planning framework) • General familiarisation with fieldwork country and survey area • Complete photo-interpretation of survey area • Technical and operational planning of the survey execution phase including the Personal Study Topic data collection • Miscellaneous preparatory activities relating to the final project
Lecturers/ supervisors	Fieldwork staff
Study method and study load	Yet to be specified ⇒ 3 credit points
Teaching/ learning material	- do -
Assessment	- do -
Equipment	- do -
Pre-requisites	Professional knowledge and skills as acquired during the course

Module 12 : Project Planning (11-29 May) **Contact staff member : Ir. Jan Veenstra** **Course : SIG**	
Brief description	In the previous part of the course, participants have acquired knowledge and skills to analyse and structure problems and to identify and appraise alternative solutions. This module will focus on the planning and formulation of projects as a specific type of solution. The practices and procedures for project planning and formulation prevailing in the administrations in the participants' countries will be used as a starting point. In addition some attention will be paid to the practice and procedures of project planning by donor agencies. The project cycle will be spelt out and the function and responsibilities during the various phases of the project cycle will be clarified. OOPP and logical framework will be reviewed. Participants will be introduced to and trained in the use of a number of elements in the formulation of projects (e.g. terms of reference, LogFrame, budgets, timing of activities). On the basis of some background information participants will have to elaborate, present and defend a project proposal
Objectives	Upon completion of this module students should be able to: • recognise their own role and position in the project cycle • prepare and read terms of reference • translate a project proposal into a logical framework • prepare an acceptable project proposal • to decide when and how to submit a project proposal • draft a plan of operations for a project • draft and assess a project budget • explain the function of monitoring and evaluation • utilise a software to facilitate various project planning tasks
Contents	The subject covers the following topics: • Project cycle • Terms of reference • Review of OOPP • Logical framework as a tool in planning and monitoring projects • Formulation and submission of project proposals • Project budgets • Barcharts • Monitoring and evaluation
Study method and study load	lectures : 20 periods) group work : 20 periods) ⇒ 3 credit points self study : 20 periods)
Teaching/ learning material	• reader project planning • examples of project manuals of national planning and donor agencies (e.g. NEDA/Philippines, EC, DGIS)
Assessment	Participants will have to elaborate, present and defend a project proposal

Modules 11-16 : RLE.3-Final project and Personal Study Topic (PST) (20 Apr.-21 Aug) **Contact staff member : Ir. Kees de Bie** **Course : RLE**	
Objectives	Learning aim: Application and integration of the skills obtained during modules 1-10 for a defined area, NRM issue and client agency. Learning objectives: • Skills in preparation of a flow chart of data and survey activities. • Skills in design of Table of Contents of a survey report. • Skills in the area-specific interpretation of aerial photographs, satellite imagery or both. • Skills in the design of a record form for vegetation observations, a questionnaire for agricultural land use operations interviews or both for the specific area. • Skills in data collection with the record or questionnaire forms. • Skills in the correlation and classification of photo/image and ground features of plant cover or agricultural land use for map legend construction. • Skills in production of a Vegetation or Agricultural Land Use map. • Skills in carrying out individual research both in the field, through a literature review as by the preparation of a study report. • Skills in presenting survey and research results, both as a team member as individually.
Contents	1. Fieldwork preparation: - problem analysis - survey objectives definition - image processing - field record sheet preparation - sample scheme preparation 2. Fieldwork a. Groupwork: - data collection - land cover map preparation + data analysis b. Individual study topic definition: - proposal discussions and preparation - data collection for the individual study topic 3. Post-fieldwork: - finalise land cover map plus report (group work; assessed). - public group-work presentations (assessed). 4. Excursion to Lund University, Sweden. 5. Excursions to public Dutch institutions dealing with NRM issues. 6. Personal study topic (PST) - data analysis - literature review - report writing - public individual study topic presentations (assessed) - defence to RLE course board of individual study topic (assessed) 7. Exit workshop (to translate skills and knowledge acquired into individual career opportunities). 8. Capita Selecta - planning vegetation and land use surveys - 4 x advanced RS/GIS topics - report writing skills - 4 x RLE research and consultancy briefings with discussions

Lecturers	1. E. Westinga 2. E. Westinga, W. Bijker, H. Huizing 3. E. Westinga, W. Bijker 4. A.Skidmore 5. B. Toxopeus 6. Various RLE staff members 7. S. Groten 8. Various RLE staff members
Study method and study load	1. 20 Apr.- 8 May 44 periods pre-field work 8. 22 Apr. 2 periods Planning vegetation and land use surveys. 2. 11-29 May 68 periods fieldwork:17 days incl. Saturdays 3. 2-5 Jun. 16 periods group work 8. 8, 9, 10, 11 Jun. (am) 8 periods Advanced RS/GIS topics. 3. 11 Jun. Deadline map plus report submission (assessed). 12 Jun. (am) 2 periods Public group-work presentations (assessed) 4. 15-19 Jun. 20 periods Excursion to Sweden Deadline PST-proposal submission 6. 22 Jun. -4 Aug. 100 periods 8. 24 Jun. 4 periods Report writing skills. 1, 8, 15, 22 Jul. (pm) 8 periods RLE research and consultancy briefings. 6. 5 Aug. Deadline PST report submission. 5. 6, 7 Aug. 8 periods Excursions in The Netherlands 6. 11 Aug. 0,5 period Public individual PST presentation (assessed) 12, 13 Aug. 0,5 period Defence of PST (assessed) 7. 17, 18, 20 Aug. 12 periods Exit workshop • 14 Aug. (am) 1 period EDC course evaluation (written) • 14 Aug. (pm) 1 period Staff-student meeting on modules 11-16. • 21 Aug. (am) 1 period EDC course evaluation (*verbal*) • 21 Aug. (evening) RLE farewell party • end Aug. (pm) 2 periods Graduation ceremony —— field work : 130 periods excursions : 28 periods personal study topic : 110 periods exit workshop : 12 periods capita selecta : 22 periods various : 58 periods ---------- total : 360 periods⇒ 18 Credit Points
Teaching/ learning material	Maps, images, literature and secondary data pertaining to the study area.
Assessment	• Land cover map plus report (group work) 20% exam weight • Public group-work presentation 12% exam weight • Public individual study topic presentation 20% exam weight • Defence of individual study topic 48% exam weight ---------- total 100% exam weight
Pre-requisites	All skills and knowledge acquired during earlier modules.

Module 12-14 : Fieldwork **Contact staff member : Robert Albricht** **Course : FRD**	
Brief description	The fieldwork module gives the participants the opportunity to test their newly acquired skills in the field. A fieldwork program is prepared prior to the actual fieldwork during which the initial steps of the participatory multi-step approach will be applied and assessed under field conditions in a tropical country in order to gain confidence in and evaluate its applicability.
Objectives	Upon completion of this module participant should be able to: To plan, implement, evaluate and report a participatory multi-step approach for forestry for rural development in the field;
Contents	preparation of a work plan for the execution of the fieldwork; practical application of the multi-step approach in a tropical country; reporting of results and recommendations
Study method and study load	12 credit points
Teaching/ learning material	All course material
Assessment	summative and formative assessments
Pre-requisites	Participation in Forest and tree resource management; new approaches and FRD core module

Module 13-16 : Final project (1 June-21 August) **Contact staff member : Drs. Emile Dopheide** **Course : SIG**	
Brief description	The final part of the course culminates with of a fieldwork project, a personal study topic and an exit workshop. The fieldwork project consists of an assignment in which participants will apply the knowledge and skills acquired in the preceding part of the course in a realistic working typical for most of the course participants. Terms of reference for the assignment will be defined by staff in close communication with the counterpart organisations in the field. Participants will have to perform the assignment as a group. The assignment will be concluded with a final presentation for the counterpart organisation(s). The personal study topic consists of an individual assignment on a topic that falls within the subject matter of the course. The topic might be a further elaboration of elements encountered in the fieldwork project, but could also be a further investigation on a subject dealt with in the course. The output of the personal study topic will be a report that will be assessed by members of the degree assessment board. The candidate will be examined orally on the basis of the personal study topic report. The exit workshop is aimed at assisting participants in defining how their organisation at home can make best use of their new abilities.
Objectives	Upon completion of the final project students should be able to: • apply and integrate knowledge and skills acquired in the preceding part of the course; • design and prepare the fieldwork project; • identify, collect and present the required information on the basis of a given terms of reference • perform the activities in the fieldwork project as a team • report on the problem investigated in the personal study topic • evaluate the results and the methodology applied in the personal study topic • define how their organisation at home can make best use of their new abilities
Contents	The subject covers the following topics: • fieldwork preparation • fieldwork and presentation of results • Personal Study Topic • Exit workshop
Study method and study load	Fieldwork project : 6 credit points) Personal study topic : 6 credit points) $\Rightarrow$ 12 credit points
Assessment	The group as well as the individual performance during the fieldwork project will be assessed by the staff involved on a number of criteria. The assessment board will read and assess the quality of personal study topic report as an ordered and logical exposition of the knowledge, methods, and techniques in the subject of the course.
Pre-requisites	For admission to the final project, modules must have been completed with successful results, according to ITC assessment regulations, see also ITC regulation for the professional master degree of Dept. II courses.

Module 13 & 14 : Final Project II (2 June - 10 July) **Contact staff member : Fieldwork coordinator** **Course : SOL**	
Brief description	Module 13 and 14 form part of the Final Project and represent the execution phase of the fieldwork including data collection for the Personal Study Topic. The actual fieldwork lasts approximately 5 weeks and consists of planning and execution of a semi-detailed soil survey following the geopedologic approach. It is executed in an educationally suitable area located in a (sub)tropical country with acceptable fieldwork facilities. These facilities include proper accommodation, transport, access, cooperation with local soil survey institutions, availability of suitable aerial photography, satellite imagery and topographic and thematic maps.
Objectives	Aim: To apply under realistic conditions the conceptual knowledge, skills and techniques as acquired during the course and to demonstrate these in the planning and execution of a complete soil inventory (including land evaluation and the preparation of a survey report and maps. Upon completion of the fieldwork modules, participants will be able : To conduct a semi-detailed soil inventory including land evaluation and to prepare a survey report and maps while working as a member of a professional team.
Lecturers/ supervisors	Fieldwork staff
Study method and study load	Yet to be specified $\Rightarrow$ 6 credit points
Teaching/ learning material	- do -
Pre-requisites	Professional knowledge and skills as acquired during the course.

Module 15 & 16 : Personal Study Topic and Exit workshop **Contact staff member : Robert Albricht** **Course : FRD**	
Brief description	During this module participants will have the opportunity to deepen their knowledge or skills, in principle, on any of the subjects in the course. The topic will be chosen in consultation with Forest Science Division staff and a supervisor assigned depending on the topic. Supervisors outside of the Forest Science Division may also be assigned. Participants are expected to submit a 10-20 page report on the selected topic. Alternatively a practical project may be carried out to improve specific skills. The Exit workshop serves to make a link between the knowledge and skills acquired at ITC and each participants' home work situation. This is a one week workshop which concludes the course.
Objectives	to deepen the knowledge on a particular subject of interest for each participant; improve report writing and literature review skills;
Contents	literature review report writing exit workshop
Study method and study load	lectures : 162 exit workshop periods) self study : 44 periods) $\Rightarrow$ 6 credit points total : 60 periodss)
Teaching/ learning material	relevant articles as recommended by the various supervising staff
Assessment	summative assessment

Module 15 : Final Project II (13 - 31 July) **c) Fieldwork reporting** **Contact staff member : Fieldwork coordinator** **Course : SOL**	
Brief description	Module 15 forms part of the Final Project and covers the reporting phase of the fieldwork; it is largely dedicated to data processing and plotting, compilation of the final soil map and report writing.
Objectives	Aim: To apply under realistic conditions the conceptual knowledge, skills and techniques as acquired during the course and to demonstrate these in the planning and execution of a complete soil inventory including land evaluation and the preparation of a survey report and maps. Upon completion of the fieldwork modules, participants will be able : To conduct a semi-detailed soil inventory including land evaluation and to prepare a survey report and maps while working as a member of a professional team.
Contents	
Lecturers/ supervisors	Fieldwork staff
Study method and study load	Yet to be specified $\Rightarrow$ 3 credit points
Teaching/ learning material	
Assessment	

Module 16 : Final Project - 3 (3 - 21 Aug.) **a) Personal Study Topic** **b) Exit Workshop** **Contact staff member : Director of Studies** **Course : SOL**	
Brief description	a) <u>Personal Study Topic</u> In the last course module, participants work on a personal study topic enabling them to apply the knowledge and skills acquired during the course to a problem situation relating to their own professional specialisation. The subject of the study is generally based on survey data collected during the fieldwork. b) <u>Exit Workshop</u> Upon completion of the course, participants participate in a short exit workshop to prepare them to implement acquired competence in their home organisations.
Objectives	Upon completion of the module, participants will be able : Ad a) To successfully apply knowledge and skills as acquired during the course in solving a specific profession-related problem while working on a strictly individual basis. Ad b) To identify possible ways of employing their acquired professional competence in their home organisations with due attention to institutional opportunities and limitations.
Lecturers/ supervisors	Various staff
Study method and study load	Yet to be specified $\Rightarrow$ 3 credit points
Teaching/ learning material	- do -
Assessment	- do -

Chapter IV Organisational aspects

IV.1 Course Boards

Each PM-course is managed by a Course Board. The main tasks of the Course Board are to decide on aims, structure and content of the course, to establish assessment standards and to select participants in cooperation with the Department of Student Affairs.
The Course Board delegates the day-to-day management of the course to a Director of Studies (DoS).
The composition of each Course Board is listed below:

FOR.3

Name	E-mail	Tel. no.	Room
Prof.Dr.Ir. A. de Gier, *Head of Forest Science Division*	degier@itc.nl	309	4-029
Ir. J.M. Remeijn, *DoS FOR.3*		310	4-035
R.C. Albricht, MSc.	albricht@itc.nl	378	4-003
Mrs. Ir. E.M.C. Groenendijk	groenendyk@itc.nl	295	4-009
Dr. Y.A. Hussin	hussin@itc.nl	293	4-031
Ir. W.E. Klunne	klunne@itc.nl	218	4-011
M.J.C. Weir MSc.	weir@itc.nl	308	4-033

FRD.3

Name	E-mail	Tel. no.	Room
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R.C. Albricht, MSc, *DoS FRD.3*	albricht@itc.nl	378	4-003
Mrs. Ir. E.M.C. Groenendijk	groenendyk@itc.nl	295	4-009
Dr. Y.A. Hussin	hussin@itc.nl	293	4-031
Ir. W.E. Klunne	klunne@itc.nl	218	4-011
Dr. M.K. McCall	mccall@itcnl	223	3-152
Ir. J.M. Remeijn		310	4-035
M.J.C. Weir, MSc, *DoS*	weir@itc.nl	308	4-033

RLE.3

Name	E-mail	Tel. no.	Room
Prof. Dr. A. Skidmore, *Head of Vegetation and Agricultural Sciences (VAS) Division*	skidmore@itc.nl	276	4-147
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Ir. W. Bijker	bijker@itc.nl	203	4-134
Ir. M.C. Bronsveld	bronsveld@itc.nl	307	4-145
Dr. H. van Gils	gils@itc.nl	284	4-137
Dr. S. Groten	groten@itc.nl	272	4-135
Dr. H. Huizing	huizing@itc.nl	270	4-147
Dr. J. de Leeuw	leeuw@itc.nl	274	4-141
Drs J. Looijen	looijen@itc.nl	265	4-139
Dr. A.G. Toxopeus	toxopeus@itc.nl	485	4-136
Drs. E. Westinga	westinga@itc.nl	284	4-138

SIG.3

Name	E-mail	Tel. no.	Room
Prof. Dr. W van der Toorn, *Head of Social Sciences Division*	toornwh@itc.nl	527	3-138
Dr. M.K. McCall, *DoS SIG.2*	mccall@itc.nl	223	3-152
Drs. E.J.M. Dopheide, *DoS SIG.3*	dopheide@itc.nl	230	3-146
Dr. Ing. W.H. de Man	deman@itc.nl	231	3-148
Drs. J. C. de Meijere	meijere@itc.nl	226	3-142
Dr. M.A. Sharifi	ali@itc.nl	261	3-144
Ir. J. Veenstra		452	3-154
Dr. D. van der Zee	vanderzee@itc.nl	273	3-150

SOL.3

Name	E-mail	Tel. no.	Room
Prof. Dr. J.A. Zinck, *Head of Soil Science Division*	zinck@itc.nl	322	4-044
Ir. E. Bergsma	bergsma@itc.nl	301	4-043
A. Farshad, MSc	farshad@itc.nl	318	4-037
Ir. G.R. Hennemann	henneman@itc.nl	321	4-039
Drs. T. Loran		---	4-018
D.P. Shrestha, MSc	dhruba@itc.nl	264	4-048
Dr. W. Siderius	siderius@itc.nl	315	4-050

IV.2 Course Specific Rooms

Specific lecture rooms and computer clusters are reserved for the different courses. The number of these rooms are listed below.

Course	Lecture room	Computer cluster
FOR	4-004	4-034
FRD	4-024	4-034
SOL	4-040	4-036
SIG	3-139	3-131
RLE	4-146	4-146

IV.3 Lecture Periods

Lecture Period 1	08.40	-	10.20
Lecture Period 2	10.40	-	12.20
Lecture Period 3	13.40	-	15.20
Lecture Period 4	15.40	-	17.20

IV.4 Course Evaluations

The Course Board will monitor the execution of the course carefully. The opinion of students about the courses will be a crucial element of the evaluation. Therefore several times during the course the students will be invited to comment on the quality, relevance, effectiveness, and study load of the education during a formal course evaluation. The results are used to improve the course.

IV.5 Consultations on academic problems

In case of any problems relating to your course, contact your DoS.

IV.6 Opening hours of various ITC facilities and public holidays

The ITC-building

Monday - Thursday	7:30 - 22:30
Friday	7:30 - 21:00
Saturday	9:00 - 17:00

ITC-Bookshop (Room 0-006)

Monday - Friday	10:00 - 12:30

ITC-library (Room 3-038)

Monday, Thursday, Friday	8:30 - 17:00
Tuesday, Wednesday	8:30 - 21:00

ITC-audio-visual centre (Room 3-039)

Monday, Thursday, Friday	8:30 - 17:00
Tuesday, Wednesday	8:30 - 21:00

Students financial administration desk (Room 1-130)

Monday - Friday	10:00 - 16:00

ITC-restaurant

Services Monday - Friday for:

coffee and tea	10:15 - 10:45
lunch	12:15 - 13:30
coffee and tea	15:15 - 15:45

Public holidays and special ITC closing days

ITC-anniversary	17 December 1997
Christmas	25 and 26 December 1997
ITC is closed	25 December 1997 to 1 January 1998
Easter Monday	13 April 1998
Queen's birthday	30 April 1998
Ascension Day	21 May 1998
Friday	22 May 1988
ITC is closed	22 May 1998
Whit Monday	1 June 1998

Appendix 1 Information on MSc and PhD-courses

In addition to the PM-courses, the LARUS department has a research oriented Master of Science Degree (MSc) of 18 months and a PhD-Degree programme of three years.

The following MSc-courses are offered by the department:

FOR.2 Master of Science Degree course (MSc) which lasts eighteen months and focuses on the application of remote sensing and GIS on sustainable management of closed forest, management of woody biomass in rural areas, rehabilitation of degraded (forest) land, environmental protection and on woody biomass for energy development.

RLE.2 Master of Science Degree course (MSc), which lasts eighteen months, is designed to train the participants in the mapping and monitoring of plant cover and agricultural land use, and the application of the results of these surveys for a specific objective such as rural development, natural resource management or environmental conservation. The MSc degree also involves the production of a research thesis, and training in research methods.

ESM.2 The objectives of the master of science course in Environmental Systems analysis and Monitoring is to increase the participants' understanding of the multi-disciplinary nature of environmental issues and to provide the skills for the application of remote sensing and GIS for monitoring and analysis of environmental changes and impacts. The first part of the ESM.2 course may include either the Postgraduate course WRS.3 or GEO.3 of the department of Earth Resource Surveys (ERS) or the first 10 modules of any Professional Master degree course of the LARUS department. The second part provides expertise in applied research in aspects of environmental systems analysis and monitoring and involves the production of a research thesis and training in research methods.

SIG.2 The Master of Science Degree course in Socio-economic Information for Natural Resource Management is concerned with improving information management within and between the various parties involved in decision-making and policy support in natural resource and land management. and/or land tenure and cadastral issues, and/or rural energy planning. The first nine months consist of course work, comprising class work, case studies, individual study, field visits, and multidisciplinary group exercises. The subsequent nine months are devoted to preparing for, carrying out, and writing up a research thesis. Two months of this research are spent in the field, preferably in a developing country.

SOL.2 The main objective of the Master of Science Degree course in Soil Survey and the Application of Soil Survey Information is to develop ability to conduct and complete independent research in one of the following fields: soil-landscape relationships; soil survey methods and non-conventional soil cartography; digital processing and interpretation of satellite imagery for soil survey; interpretation of soil data for land evaluation and land use planning; soil conservation and management; soil pollution and environmental soil science; and soil informatics.