

Geoinformation in Environmental Management

Organized by

Mediterranean Agronomic Institute of Chania

Geoinformation in Environmental Management

MAI coordinator: Dr. Ioannis MANAKOS

Aims: The programme of Geoinformation in Environmental Management focuses on the ever growing demand for highly specialized and effectively educated scientists to tackle significant environmental issues in today's natural environment, agro-environmental issues and land use functions. Graduates, professionals and specialists from the Mediterranean and Balkan region majoring in a compatible discipline and background knowledge on Environmental issues have the opportunity to specialize on (a) Geographical Information Systems and Remote Sensing, their application to Environmental Management and other problems related to Environment, (b) Utilization of quantitative and decision support tools to strategic and environmental impact assessment within the environmental policy and legislative framework of the European Union. The attainment of the M.Sc. degree qualifies them with in depth academic knowledge and practical skills in Environmental Management, which enable a successful continuation of their doctorate studies and/or pursue of an international career in both the public and private sector.

Objectives:

- To provide a basis or opportunity for originality in developing or applying ideas while addressing a research hypothesis connected to decision support for environmental issues;
- To apply knowledge and understanding in solving real life problems in a multidisciplinary context, such as a strategical environmental assessment or the management of Mediterranean ecosystems require;
- To demonstrate the ability to integrate knowledge of the natural processes, and the environmental legislation and policy, handle complex geo-information technologies, and formulate judgments, even with incomplete raw data;
- To communicate their conclusions and the underpinning knowledge and rational addressing different audiences; in ways that enable the discussion with specialists or raise the interest of non-specialist audiences;
- Study under the supervision of specialized tutors that promote self-initiatives and autonomous handling while dealing with the research topic.

Part 1

Post graduate specialization programme

The programme is organized in 5 Units (60 ECTS)

ENM510.2810.0 INTRODUCTION TO STATISTICS (8 ECTS)

03-28 Oct. '11

Contents:

Statistics
Spatial Statistics – Theory

Learning outcomes:

- a) Understand randomness and probability and their roles and rules and why they are necessary in statistics.
- b) Understand and visualize via simulation the idea of the sampling distribution of a statistic.
- c) Understand and master the basis of statistical inferences (both in the form of confidence interval and hypothesis testing) for a single population parameter(s).
- d) Understand and master the basis of statistical inferences (both in the form of confidence interval and hypothesis testing) when comparing two population parameters.
- e) Understand and master the inference in Simple Linear Regression and also learn how to expand the comparisons between two population means to several population means via the ANOVA model.
- f) Point out the differences between classical and spatial statistics
- g) Demonstrate a working knowledge of analytical methods relevant for analyzing (statistically) geographical data.
- h) Suggest appropriate decision support and analytical techniques for case studies (real life problems with geographical data) described and justify their choice.
- i) Apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the field of Spatial Statistics.
- j) Have the learning skills to allow them to continue to study in more advanced topics in Spatial Statistics.

ENM520.21410.0 MANAGEMENT OF MEDITERRANEAN ECOSYSTEMS (14 ECTS)

31 Oct. '11 – 13
Jan. '12

Contents:

Environment, Ecosystems Processes and Issues
Environmental Legislation
Management of Grazing and Forest Resources and Landscapes
Sustainable Water Resources Management

Learning outcomes:

- a) Develop the ability to recognise basic ecosystems types.
- b) Improve the understanding on ecosystems process.
- c) Evaluate the potential impacts of anthropogenic activities upon ecosystem processes.

- d) Develop the ability to incorporate specific environmental patterns and processes into management.
- e) Learn to develop system-dynamics modelling approaches, parameterize models in order to apply them to specific case studies and answer specific questions.
- f) Demonstrate a basic knowledge on how to look up and understand the main features of legal texts concerning the integration of environmental protection in various areas of development.
- g) Distinguish between legally mandatory requirements of international and European legislation and the national margin of appreciation in environmental matters.
- h) Knowledge of the peculiarities of Mediterranean natural resources and landscapes.
- i) Ability to evaluate land use changes in Mediterranean landscapes
- j) The students will be able to identify and assess problems related to the quality of soil and water resources.
- k) They will be able to integrate knowledge, handle complexity, and formulate judgements for the sustainable management of soil and water resources.
- l) They will have the scientific background, the necessary skills and competences to develop integrated management plans and provide solutions and management measures at both riverbasin and local scale.

ENM530.1810.0 REMOTE SENSING AND GIS ANALYSIS TECHNIQUES (8 ECTS)

16 Jan. – 03
Febr. '12

Contents:

Remote Sensing
Digital Image Analysis

Learning outcomes:

- a) Enhance understanding in Remote Sensing and develop capacity for critical thinking and utilizing its tools in various disciplines.
- b) Ability to theoretically tackle with and plan Remote Sensing applications in Geosciences.
- c) Understand the basic spatial data concepts within GIS.
- d) Use various GIS software packages / understand basic GIS functionality.
- e) Integrate different spatial data in GIS context in order to complete complex real world applications.
- f) Create maps as GIS outputs.
- g) Identify and implement GIS applications.
- h) Use advanced GIS functionality for spatial analysis.
- i) Thorough understanding of Earth Observation imagery.
- j) Adequate skills in using imaging software.

ENM540.11810.0 INTEGRATED GIS/RS APPLICATIONS (18 ECTS)

06 Febr. – 27 Apr.
'12

Contents:

Basic Geodesy & Digital Photogrammetry
Geographical Information Systems
GIS Applications
Integrated GIS/RS Case Studies
Advanced Methods in Remote Sensing Analysis

Learning outcomes:

- a) During the course the students have learned to refer an aerial or satellite image to ground space and make all the appropriate preparation to make an accurate Digital Map using stereoscopic frame camera images or satellite scenes.
- b) The students will be able to guide a surveyor to take measurements of a land region, acquire the appropriate imagery and perform a photogrammetric project outcomming digital mapping products and solutions.
- c) Overview of potential applications of remote sensing in environmental management.
- d) How digital image analysis techniques can be applied on satellite imagery in order to produce thematic information needed in environmental management.
- e) Be familiar with advanced remote sensing methodologies including benefits and limitations.
- f) Have an overview of potential applications of these techniques in environmental monitoring.

ENM550.21210.0 ENVIRONMENTAL ASSESSMENT PROCESSES (12 ECTS)

30 Apr. – 15 June
'12

Contents:

Strategic Environmental Assessment
EIA Theory and Process
Decision Support Using GIS

Learning outcomes:

- a) Demonstrate a working knowledge of analytical methods relevant for environmental planning decisions.
- b) Demonstrate a working knowledge of SEA procedures.
- c) Identify and include relevant qualitative as well as quantitative data in decision processes in a way that demonstrates an appreciation of the need to communicate issues such as uncertainty and quality.
- d) Demonstrate a working knowledge of EIA procedures.
- e) Suggest appropriate decision support and analytical techniques for the case study described and justify their choice.
- f) Demonstrate good team-working, presenting and report writing skills as part of the case study.

RETAKE EXAMS

EXAMINATIONS

Participants are obliged to take an examination in order to obtain **an individual grade for each component** in the following arrangement: For every one or two week(s) of course delivery the given examination period is one week.

All units are subject to examination.

Examinations may take the form of written exams (problems, set of questions, exercises, multiple choice questions), individual or team work project, computer assisted exams or any combination of the above forms.

Retake examination is allowed for a maximum of three weeks course delivery (**9 ECTS**) of any unit except for the final unit.

Language of instruction: ENGLISH

ACADEMIC FACULTY WITHIN THE MSc PROGRAM

The academic faculty within the MSc Program is selected according to the needs of the Program, which is dynamically changing according to the recent scientific developments and market trends, and the excellence of expertise of the potential invited lecturers to the specific topic. Specialization on the taught topic, international experience in teaching, and international recognition in the academic community, comprise major criteria for the selection of the faculty. Each invited lecturer's performance is evaluated against the set learning outcomes and the students' and supervisor's opinion every academic year. Lecturer's performance above the average is the crucial criterion for an invitation for the next year.

Following this procedure of fine tuning of the curriculum through the adjustment of the content of the Units according to the developments and needs of the society, and the choice of a more experienced and compatible with the curriculum academic faculty, for the last 20 years, a dedicated team of professors has been selected that addresses in the best way the needs of the Program, while at the same time the dynamic of change in persons and improvement is maintained into it.

Weeks	TITLE	WEIGHT	DATES
SEMESTER I			
	ENM510.2810.0 Introduction to Statistics - 8 ECTS		03/10-28/10/2011
1	INT503.1308.3 STATISTICS	3	03-07/10/2011
2	EXAMS		10-14/10/2011
3	ENM513.1510.4 SPATIAL STATISTICS – THEORY	5	17-21/10/2011
4	EXAMS		24-28/10/2011
	ENM520.21410.0 Management of Mediterranean Ecosystems – 14 ECTS		31/10-13/01/2012
5	ENM521.2409.5 ENVIRONMENT, ECOSYSTEMS PROCESSES AND ISSUES (1 field trip)	4	31/10-04/11/2011
6	EXAMS		07-11/11/2011
7	ENM522.1209.1 ENVIRONMENTAL LEGISLATION	2	14-18/11/2011
8	EXAMS		21-25/11/2011
9	ENM523.2410.1 MANAGEMENT OF GRAZING AND FOREST RESOURCES AND LANDSCAPES (1 field trip)	4	28/11-02/12/2011
10	EXAMS		05-09/12/2011
11	ENM525.2410.3 SUSTAINABLE WATER RESOURCES MANAGEMENT	4	12-16/12/2011
12	EXAMS		19-23/12/2011
13	EXAM PREPARATION		26-30/12/2011
14	EXAM PREPARATION		02-06/01/2012
15	EXAMS		09-13/01/2012
	ENM530.1810.0 Remote Sensing and Image Processing - 8 ECTS		16/01-03/02/2012
16	ENM531.1410.2 REMOTE SENSING	4	16-20/01/2012
17	ENM532.1410.1 DIGITAL IMAGE ANALYSIS	4	23-27/01/2012
18	EXAMS		30/01-03/02/2012
SEMESTER II			
	ENM540.11810.0 Integrated GIS/RS Applications - 18 ECTS		06/02-27/04/2012
19	ENM541.1410.2 BASIC GEODESY & DIGITAL PHOTOGRAMMETRY	4	06-10/02/2012
20	EXAMS		13-17/02/2012
21	ENM515.2410.2 GEOGRAPHICAL INFORMATION SYSTEMS	4	20-24/02/2012
22	EXAMS		27/02-02/03/2012
23	ENM516.1410.5 GIS APPLICATIONS	4	05-09/03/2012
24	EXAMS		12-16/03/2012
25	ENM542.2410.1 INTEGRATED GIS/RS CASE STUDIES	4	19-23/03/2012
26	EXAMS		26-30/03/2012
27	ENM543.1210.2 ADVANCED METHODS IN REMOTE SENSING AN ANALYSIS	2	02-06/04/2012
28	EXAM PREPARATION		09-13/04/2012
29	EXAM PREPARATION		16-20/04/2012
30	EXAMS		23-27/04/2012
	ENM550.21210.0 Environmental Assessment Processes - 12 ECTS		30/04-15/06/2012
31	ENM551.2410.1 STRATEGIC ENVIRONMENTAL ASSESSMENT	4	30/04-04/05/2012
32	EXAMS		07-11/05/2012
33	ENM553.2410.1 EIA THEORY AND PROCESS (1 field trip)	4	14-18/05/2012
34	EXAMS		21-25/05/2012
35	ENM563.1410.1 DECISION SUPPORT SYSTEMS USING GIS	4	28/05-01/06/2012
36	EXAMS		04-08/06/2012
37	RETAKE EXAMS		11-15/06/2012

GEOINFORMATION IN ENVIRONMENTAL MANAGEMENT PROGRAM
Academic year 2011-2012

Part 2

The Master of science program

Project (9 months duration, 60 ECTS)

The qualified second year graduates (Master of Science Degree candidates) pursue their research thesis under the supervision of visiting and/ or own MAICH faculty in an environment fully equipped with modern facilities and the most recently updated software. Research addresses spearhead topics supporting national and EU Environmental policies within an interdisciplinary international scientific network.

Research activities: Topics generally available for Master of Science thesis:

- Desertification Monitoring,
- Environmental Resource Management,
- Environmental Impact Assessment,
- Landscape Ecology,
- Soil Erosion Risk Assessment,
- Agricultural Practices Monitoring,
- Precision Agriculture,
- Forest Fire Risk Assessment
- Fire Behaviour Modelling & Effectiveness of Fire Retardants,
- Management of Mediterranean Ecosystems, and
- Regional and Rural Development

INDICATIVE MASTER THESES REALIZED WITHIN THE AREA

1. **Title:** Hydrogeological model of the oriental quaternary aquifer of Vitoria-Gasteiz
Author: Jose Luis De Rivera Outomuro, Spain
Place of realization: MAICH
Thesis Director(s): Professor Dr. Inaki Antiguada
2. **Title:** Soil erosion and more specifically the assessment of k factor of the RUSLE equation
Author: Marinos Petriolis, Greece
Place of realization: MAICH
Thesis Director(s): Dr. C. Karydas
3. **Title:** Examination of the environmental factors in locating a landfill using Geographic information System and Remote Sensing techniques
Author: Ljiljana Barlakoska, FYROM
Place of realization: MAICH
Thesis Director(s): Prof. Jaromir Kolejka
4. **Title:** Knowledge-based classification of multitemporal data-set for automatic land use/cover mapping in rainfed agricultural areas of central Spain
Author: Irene Guerrero Fernandez, Spain
Place of realization: Spain
Thesis Director(s): Dr. Juan Traba Diaz, Manuel B. Morales
5. **Title:** Use of Field Spectroradiometric Measurements for Discrimination of Common Plant Species: Results from a Case Study
Author: Kiril Manevski, FYROM
Place of realization: MAICH
Thesis Director(s): Prof. Dr. Thomas Schneider

Detailed additional information (ECTS guide) and in particular an analytical syllabus is available at www.maich.gr/en/