



Environmental Management in the Middle East (EMME): Spatial Approaches

Course Syllabus

Course title

SDI-T for environmental impact assessment (EIA)

Course ECTS credits: 10

Course hour distribution by methods of studies

Lectures	Exercises	Self-study	Seminar	Final project	Total
20	90	190	0	80	280

Annotation of the course

This course is targeted to students of environmental studies, physical geography, engineering, landscape ecology, and sustainability of both undergraduate and graduate levels.

Aim of the course

This course aims at providing an overview of EIA using RS and GIS with organizational and technical components. Students will explore theoretical and practical concepts of EIA. It includes an introduction to Geographical Information Systems and Remote Sensing to harmonize the terminology and concepts related to spatial data, its analysis, modelling and EIA.

Learning outcomes

On completion of the course, the student should be able to:

Knowledge and understanding

- Understand the fundamentals about SDI-T for EIA
- Describe critically the factors that influence the development of a EIA
- Know which GIS/ RS operations and functions are suitable for dealing with EIA
- Practice data using for EIA and combine it in a GIS and RS



Skills and abilities

- Creatively apply and integrate new knowledge (models/ analysis techniques) for EIA
- Collect, analyze, and process data
- Use RS/GIS tools and applications
- Plan and conduct field work
- Plan and run project-based activities

Critical judgement and evaluation

- Evaluate data quality, adequacy and appropriateness
- Evaluate models' effectiveness
- Judge on severity of EIA and apply effective methods and applications towards providing proper solutions
- Validate proposed solutions by applying and evaluating them

Methods of course studies (Educational approach)

Students-based learning: oriented for self-study

Project-based learning: practical final project

Integrated approach (theory and practice): theory in parallel with applications and examples

Methods for the assessment of student achievements (the formula and the definition of the cumulative score)

Tests and Exercises: 60% (average of equally weighted exercises)

Final Project (includes a report and a presentation): 40 %

Study subject modules to be completed before this Course studies (Prerequisites)

Basic knowledge of mathematics, geography, physical processing, environmental protection.

Basic skills of Information Technologies.

Tentative Schedule (lectures)

Date	Topic	Objectives
Week 1	<p>Introduction to SDI-T for environmental impact assessment (VGTU)</p> <p>GIS & Geovisualization (NTUA)</p> <ul style="list-style-type: none"> • Introduction to GIS and Geovisualization (NTUA) • Models and structures - Advanced models 	<ul style="list-style-type: none"> • Introduction to SDI-T for environmental impact assessment • Introduction to GIS



	<ul style="list-style-type: none"> and structures (3D, temporal) (NTUA) • Data acquisition (GPS, RS, field surveying) (ENSG – VGTU) • Precision and quality of data (NTUA) • Reference systems and transformations (VGTU) • Spatial Databases (ENSG) • Spatial analysis and modelling of phenomena (LU) • Geovisualization (cartography) (NTUA) 	
Week 2	<p>Remote Sensing</p> <ul style="list-style-type: none"> • Electromagnetic radiation theories (VGTU) • Platforms and Sensors (VGTU, UL) • Data Acquisition (VGTU) • Preprocessing (Atmospheric and radiometric corrections) (BASU) • Multi-spectral signatures and classification algorithms (VGTU) • Orthophotomapping (ENSG) 	<ul style="list-style-type: none"> • Introduction to Remote Sensing
Week 3	<p>Introduction to the EIA Process (IGN (France))</p> <ul style="list-style-type: none"> • The legislative background • The projects that are subject to EIA • Criteria for deciding whether EIA is required • Importance of compliance with the EIA Directive • Relationship of EIA with Strategic Environmental Assessment and Assessments under the Habitats Regulations • The contents of an EIA Report • Scoping the EIA Report • Describing baseline environmental information • Predicting environmental impacts • Assessing the significance of impacts • Presentation of information in the EIA Report • Decision Making and Implementation 	<ul style="list-style-type: none"> • Gain a deeper knowledge and understanding of EIA processes
Week 4	<p>Application of GIS/RS in EIA (1) (VGTU, UL, SU)</p> <ul style="list-style-type: none"> • Environmental air pollution(VGTU) • Water and soil pollution (VGTU) • The underground pollution (UL) • Biodiversity (SU, TU) • Climate changes (SU, TU) 	<ul style="list-style-type: none"> • Gain a deeper knowledge and understanding of EIA
Week 5	<p>Application of GIS/RS in EIA (2)</p> <ul style="list-style-type: none"> • Landscape and land use (TU) • Heritage objects (UL, IKIU) • Flood risk analyses (NTUA) 	<ul style="list-style-type: none"> • Gain a deeper knowledge and understanding of EIA



	<ul style="list-style-type: none"> Sustainable development (NTUA, Loukas) 	
Week 6	Public health impact assessment <ul style="list-style-type: none"> Population analysis (IKIU) Assessment of health determinants and Disease analysis (LU) Public participation, SDSS and MCDM for EIA (NTUA, Loukas) 	<ul style="list-style-type: none"> Gain a deeper knowledge and understanding of Public health to EIA
Week 7	Final Project results <ul style="list-style-type: none"> Research methodology (General data of object) Mapping and visualization (2D and 3D mapping, charts, etc.) Reporting and representation Web-based GIS for presenting the results 	<ul style="list-style-type: none"> Gain a deeper knowledge and understanding how reporting of project results

Tentative Schedule (Exercises, Lab work/Self-studies)

Date	topic	Type*/objective
Week 1	Geographic Information Systems (NTUA)	<ul style="list-style-type: none"> Data acquisition exercise (ENSG, VGTU) Digitization, raster-to-vector (NTUA) Exercise using different data sources (with different CRS) (VGTU) Import non-spatial data and join with spatial datasets - (Simple) SQL queries (ENSG) Spatial analysis operations (LU)
Week 2	Remote Sensing (VGTU)	<ul style="list-style-type: none"> Copernicus data access online. Using sentinel 1 and Landsat or MODIS data – work with ESA SNAP Toolbox (VGTU, UL) Mapping desertification using SAR Data (VGTU)
Week 3	Introduction to the EIA Process (Final project)	<ol style="list-style-type: none"> Select a project title <ul style="list-style-type: none"> EIA of roads planning project EIA of animal and poultry farming project EIA of gas pipeline construction project Using public participation as an information source for EIA Location/allocation of renewable energy power plant (solar farms, wind farm, nuclear power plants) Literature review Collect/gather data
Week 4	Application of GIS/RS in EIA (1)	<ol style="list-style-type: none"> Pollution emission calculations (VGTU) Modeling of airborne contamination (VGTU) Impact on surface water (VGTU) Evaluation of groundwater status (UL) Soil Impact Assessment (SU, TU)



Week 5	Application of GIS/RS in EIA (2)	<ol style="list-style-type: none"> 1. Terrain modeling by GIS or RS (VGTU) 2. The Climatological analyses (LU) 3. The Meteorological analyses (LU) 4. Heritage objects (UL) 5. Flood risk analyses (NTUA)
Week 6	Public health impact assessment	<ol style="list-style-type: none"> 1. Population demographics assessment by GIS (SU) 2. Assessment of population morbidity(VGTU) 3. Disease Risk mapping (LU) 4. Suitability mapping using MCDM and GIS (LU) 5. Biological disaster risk analysis/assessment (NTUA)
Week 7	Final Project results (VGTU)	Perform the project

* e.g. answering questions, collecting data, performing analysis, writing codes, etc.

Tentative Schedule (Seminar, Project)

Date	topic	Type*/objective
Week 1		
Week 2		
Week 3	Final project (VGTU)	<ul style="list-style-type: none"> • EIA of roads planning project • EIA of animal and poultry farming project • EIA of gas pipeline construction project • Using public participation as an information source for EIA • Location/allocation of renewable energy power plant (solar farms, wind farm, nuclear power plants)
Week 4		
Week 5		
Week 6		
Week 7	Final project (VGTU)	Perform the project

Main bibliography (no more than 3 sources)

No.	Publication authors, year of issue, name, place of issue, publisher, (address of electronic publications and website)
1	A Handbook on Environmental Impact Assessment: https://www.nature.scot/sites/default/files/Publication%202014%20-%20A%20handbook%20on%20environmental%20impact%20assessment.pdf
2	Environmental Impact Assessment Handbook https://www.nature.scot/sites/default/files/2018-05/Publication%202018%20-%20Environmental%20Impact%20Assessment%20Handbook%20V5.pdf



3	Environmental Impact Assessment Training Manual: https://www.iisd.org/learning/eia/wp-content/uploads/2016/06/EIA-Manual.pdf
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Additional bibliography (no more than 10 sources)

No.	Publication authors, name, place of issue, publisher, year of issue (address of electronic publications and website)
1	Handbook on Environmental Impact Assessment Procedures in Poland: https://www.asser.nl/upload/eel-webroot/www/documents/national/poland/handbook.pdf
2	GUIDELINES FOR RAPID ENVIRONMENTAL IMPACT ASSESSMENT IN DISASTERS https://www.preventionweb.net/files/8267_bhrcgen30apr1.pdf
3	Environmental Impact Assessment (EIA): A handbook for scoping projects: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296952/geho0411b_trf-e-e.pdf

Required IT Resources

No.	Name of the software, manufacturer	License type
1	QGIS	OPEN/Free
2	SNAP	OPEN/Free

Course completed by

_____ (Signatures)

_____ (Signatures)

Project Coordinator

_____ (Signature)

Confirmation

The module certified by	Faculty of, University of		
Chairman of the studies committee (full name, signature)		Date	