COURSE OUTLINE

1. GENERAL

SCHOOL	SCHOOL OF ENVIRONMENT AND AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF NATURAL RESOURCES DEVELOPMENT AND AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	Postgraduate		
COURSE CODE	**630016**	**SEMESTER**	**1o**
COURSE TITLE	GEOGRAPHIC INFORMATION SYSTEMS		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Practice	3	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	General knowledge, Scientific Area, Skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)

COURSE WEBSITE (URL)	http://openeclass.aua.gr/modules/document/document.php?course=AFPGM123

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course the student will have:

- achieved a deep understanding of what is a Geographic Information System (GIS) and how it works,
- understood the role and impact of GIS in agriculture and economy,
- understood the needs in terms of computer hardware and software,
- distinguish the differences between the digital and conventional cartography,
- understood what is a digital map, how it is created and how it is stored,
- the ability to create new maps or add data to existing maps,
- the ability to use mapping projection systems,
- understood the satellite navigation systems and the operation/function of the GPS devices,
- understood the different role of remote sensing and GIS,
- understood the models of geographic data and all the different ways of storing, processing and retrieving these data,
- become familiar with spatial queries that rise as a result of the use of new geographical services,
- Will be able to exploit the data of a map and the ways to process these data in order to answer spatial queries,
- Know the development stages, the methodologies, as well as, the management tools of the GIS, so as to actively participate in its development,
- be able to exploit dedicated open source software packages for the processing and analysis of geographical data,

be able to use the computer at a collaborative learning level with fellows, in the context of team work.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology

Adapting to new situations

Decision-making

Project planning and management

Respect for difference and multiculturalism

Respect for the natural environment

Showing social, professional and ethical responsibility and

Working independently	*sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search, analysis and synthesis of data and information by use of the necessary information and communication technologies.
- Adaptation to new situations.
- Decision making.
- Individual work.
- Team work.
- Generation of new research ideas.
- Work in related scientific fields.

Advance of free, fresh and logical thinking.

3. SYLLABUS

- Data
  - Collection of spatial data
  - Quality (scale, spatial resolution, etc.) and sources of spatial data errors
  - Spatial data models
  - Vector data structures (spaghetti, topological model, variations of the topological model)
  - Spatial processing of vector data (dissolve, merge, clip, intersect, union, etc.)
- Raster data structures
  - General information about raster data structures
  - Run length codes
  - Chain codes
  - Block codes
  - Trees (quadtrees, point quadtrees, linear quadtrees, binary trees)
  - Compact data structures (Peano-Hilbert, Morton, etc.)
- Spatial processing of raster data (spatial algebra: local, neighborhood, and zonal operations)
- Transformation between vector and raster structures
  - Conversion of vector structures to raster (algorithms for rasterizing points, lines, and polygons)
  - Conversion of raster structures to vector (thinning/skeletonization algorithms)
- Digital elevation models (DEMs)
  - Methods for representing DEMs
  - Triangular irregular networks (TINs)
  - Conversion of elevation tables to TINs and vice versa

- Sources of data for DEMs
  - Creation of elevation tables from digitized contours
  - Production of DEMs from satellite images and stereo aerial photographs
  - Geometric correction of elevation tables
  - Digital orthophotos
- Projection systems – Mathematical Cartography
  - Georeferencing
  - Planar and spherical coordinates
  - Methods for transforming coordinates
  - Geometric transformations to a rectangular coordinate system
  - Cartographic projections
  - Geodetic reference systems, datum
  - Transformations of georeferencing systems
- Thematic cartography
  - Maps
  - Classification of maps (scale, function, content)
  - Elements of a map (basic and secondary)
  - Hierarchy of geographic phenomena
  - Cartographic symbols
  - Visual variables
- Case studies (landfill siting, erosion risk assessment, surface water runoff, soil evaluation-land use planning) using ArcGIS software

4. TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>In classroom and in laboratory (face-to-face)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Exploitation of Information and Communication Technologies in teaching, in laboratory training and in communication with students.
Use of dedicated software.
Use of integrated e-learning system.
Communication with students via open eclass platform and e-mail.</td></tr>
<tr><td>TEACHING METHODS

The manner and methods of teaching are described in detail.

Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>20 hours</td></tr>
<tr><td>Laboratory work</td><td>40 hours</td></tr>
<tr><td>interactive teaching</td><td>25 hours</td></tr>
<tr><td>Projects and presentations</td><td>40 hours</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</td><td>I. Theory
Final Exam, written or oral, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving.
Assuming feasibility, Progress exams will take place during the semester whose marking will contribute to the determination of the final Theory mark.
Marking Scale: 0-10.
Minimum Passing Mark: 5.

II. Laboratory
Final Exam, hands on computer, of the software tools taught.
Marking Scale: 0-10.
Minimum Passing Mark: 5.

The final Course mark is the average of the marks on Theory and Lab.</td></tr>
</table>

5. ATTACHED BIBLIOGRAPHY

Proposed literature:

1. KEITH C. CLARK, *GETTING STARTED WITH GEOGRAPHIC INFORMATION SYSTEMS, 5TH EDITION*, PEARSON, 2011.
2. KOLLIA V., KALIVAS D, TRIAKONSTANTIS D, GEOGRAPHIC INFORMATION SYSTEMS, EMVRIO PUB., ATHENS.
3. http://www.esri.com/what-is-gis
4. http://www.qgis.org/
5. http://grass.osgeo.org/

-Related scientific journals

1. Journal of Geographic Information System (JGIS)
2. Cartography and Geographic Information Science.

GIS and Remote Sensing Journal