COURSE OUTLINE

1. GENERAL

SCHOOL	ENVIRONMENT & AGRICULTURAL ENGINEERING		
ACADEMIC UNIT	NATURAL RESOURCES & AGRICULTURAL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	1245	**SEMESTER**	3rd
COURSE TITLE	TOPOGRAPHY – REMOTE SENSING		

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	3	5
LABORATORY EXERCISES	2	
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*	Special Background, Specialised general knowledge, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competencies 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*

Within the course, it is expected that students will:

- ☞ understand the basic concepts of topography: lines, angles, inclined and horizontal distances, elevation differences, longitudinal sections, coordinates, area calculations
- ☞ become familiar with the use of surveying instruments and the basic methods of field measurements
- ☞ become proficient in relief analysis, photo interpretation, understanding the analysis of satellite images and aerial photographs and combining and using them with other vector geospatial data
- ☞ understand the use of remote sensing and geospatial data in areas of developing, environmental, and spatial interest

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
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……

Production of new research ideas	*Others…* *…….*

- Search, analysis and synthesis of data and information, using the necessary technologies
- Working in an interdisciplinary environment
- Decision making
- Working independently / Team work
- Project planning and management
- Respect for the natural environment
- Adaptation to new situations

3. SYLLABUS

1. Theory

Topography:

o Basic definitions (Horizontal plane, Vertical plane, Alignment, Line length, Right projection of point and line, Line angles)

o Units of measurement of angles, lengths - Scales

o Fundamental Problems

o Topographic map – Alignment on a topographic map

o Rectangular and Geographical Coordinates

o Determination of topographical relief

o Topographic Instruments and methods of measuring and calculating distances, angles and elevation differences

o Geometric Spatial Leveling for calculation of heights – Surface Spatial Leveling – Drawing contour lines

o Horizontal Survey with orthogonal coordinates

o Tachymetric Imprinting

o Area measurements (Simple geometric shapes, rectangular and polar coordinates)

o Basic drawings (straight lines, vertical lines)

Remote Sensing:

o Basic Principles of Remote Sensing (satellite data-aerial photographs).

- Definitions, electromagnetic radiation, electromagnetic spectrum, spectral signatures.

- Optical satellite systems and Radar systems. Advantages-Disadvantages.

o Analysis of remote sensing systems and their properties

- Analysis of Earth observation satellites, recording systems

o Preprocessing of satellite images

- Histogram improvement, atmospheric and topographic corrections, geometric correction

o Processing of satellite images

- Process of satellite images, filters, histogram transformations

- Band merging, band operations, vegetation indices, data decorrelation

- Image classification (automatic, supervised, object-oriented, rule-based)

o Basic principles and rules of Photointerpretation - Creation of Photointerpretation keys

- Photo interpretation rules and problems, photo interpretation keys, methodology of analysis and

interpretation of aerial photographs and satellite images

o Aerial photographs

- Preparation, Processing, Stereoscopic observation, Photo interpretation.

o Remote Sensing and Photo Interpretation Applications

- Long-term monitoring of natural phenomena and anthropogenic actions (land cover study, mapping (arbitrary, coastal), geomorphology, marine and coastal environment, etc.

- Identification and response to natural and technological disasters, monitoring, forecasting, damage assessment in the context of prevention and mitigation, preparation and development of warning systems, response, and redesign.

2**. LABORATORY EXERCISES – FIELD EXERCISES**

Topography:

o Basic topographic calculations (distances, angles, coordinates, area)

o Analog rangefinder function and use of tape measure, spear, spirit level and stadia. Geodetic routing measurements, geodetic routing solution and correction

o Surface leveling measurements – solution and calculations of volumes of earthworks – earthworks

o Analog speedometer function. Surveying a small area using a tape measure and a level thread (method of triangles – method of rays) or using a speedometer and stage (tachymetric survey)

o Alignment and vertical line drawings using simple topographical instruments (javelin, spirit level, tape measure, rectangle)

Remote Sensing:

o Acquire and analysis of satellite data

o Preprocessing of satellite data (Radiometric and Geometric correction etc.)

o Satellite data processing

o Merge & Operations between spectral bands, vegetation indices, etc.

o Classification

o Stereoscopic observation of aerial photographs (3D view)

o Image Photo interpretation

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Classroom, Face to face learning
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Lectures: Use of multimedia (power point presentations), Brainstorming, Working Groups - Case Study Laboratory exercises: Use of specialized software Communication: Using asynchronous eclass e-learning platform
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*	

Activity	***Semester workload***
Lectures	39
Laboratory Exercises	26
Field Exercises	20
Writing assignments	15
Case Study	25
Course total	*125*

are given as well as the hours of non-directed study according to the principles of the ECTS	
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.*	I. Theory: o Short answer questions (10%) o Problem-Solving (10%) o Written Assignment (5%) II. Laboratory Exercises o Problem Solving (15%) o Laboratory work (10%) Remote Sensing: I. Theory: o Final written exam in theory including open-type or short development questions, true-false and multiple choice (25%) II. Laboratory Exercises o Laboratory exercise-Case Study (25%)

5. ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Basic Principles of Topography. Markoski B., Springer, Switzerland, ebook, p. 229*
- *Fundamentals of Remote Sensing and Airphoto Interpretation. Avery T.E., Berlin G.L., Mc Millan Publishing Company, New York.*
- *Remote Sensing Digital Image Analysis, An Introduction. John A. Richards. Springer*
- *Computer Processing of Remotely-Sensed Images. Mather M.P., Wiley & Sons, Great Britain.*

- Related academic journals:

- *International Journal of Applied Earth Observation and Geoinformation*
- *Remote Sensing of Environment*
- *International Journal of Remote Sensing*
- *Remote Sensing, MDPI*