CONTENTS

1st Semester

GEO1010 – MATHEMATICAL ANALYSIS

COURSE OUTLINE: GEO1010 - MATHEMATICAL ANALYSIS

(1) GENERAL

SCHOOL	ENGINEERING.		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO1010**	**SEMESTER**	1st
COURSE TITLE	**MATHEMATICAL ANALYSIS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	4	5
Total	**4**	**5**

COURSE TYPE	General Background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO224/

(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.

This course includes all the basic concepts of calculus with the ultimate goal of applying them to problems that arise in the field of engineering and elsewhere. The first and largest part of the course is related to the calculus of functions of one variable and the second part is related to functions of two variables.

The aim of the course is to deepen the students' knowledge in the concepts of mathematical analysis and to familiarize them with its use as a means and tool for solving problems in the various thematic areas of the Engineer's specialty. During the course students will acquire the necessary supplies to better understand the theoretical part of the specialty courses of their curriculum.

The student after the successful completion of the course will be able to:

- Appropriately use concepts from Calculus in a mathematical / applied environment
- Implement, with a systematic approach, methods for solving basic mathematical problems from the field of engineering and technological sciences.
- Interpret the results she/he has reached
- Verify the results through critical thinking.

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?

- *Exercise criticism and self-criticism*
- *Mathematical thinking and analysis*
- *Mathematical and analytical presentation of geometric concepts*
- *Search, analyze and synthesize data* with the use of the necessary technology
- *Autonomous work*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

The course is designed for a set of 13 weeks of lectures. The topics that will be discussed are the following

- Set of real and complex numbers
  The real number system. Mathematical Induction. The real line. Complex numbers and their properties. Polar representation of complex numbers.
- Real functions of one variable
  Basic Definitions, Algebraic Functions, Trigonometric Functions, Exponential Function
- Limit of a Function
  Existence and uniqueness of the limit. Algebraic properties of limits. One-sided limits. Limit of composite functions
- Continuity of functions
  Definitions, Continuity of Elementary Functions, Intermediate Value Theorem, Existence of maximum and minimum of continuous functions in closed intervals, Monotonic functions, Continuous and 1-1 functions, Inverse functions, Logarithmic function
- Differential Calculus of Functions of one variable
  Definition, Differentiation Rules, Derivatives of Elementary Functions, Mean ValueTheorem, Derivative of a Function and Monotonicity, Derivative and Local Extremes, L'Hopital Rule, Curved Functions, Inflection Points,
- Sequences of real numbers
  Converging sequences. Monotonic sequences. Defining a sequence recursively Integrals
- Series of real numbers
  Series of sequences. Taylor Series.
- Integral Calculus of functions of one variable
  The fundamental theorem of calculus. Integration techniques (integration by factors, recursively, rational functions, variable change). Definite integral, Integral applications
- Functions of two variables
- Sequences in R^2, Limits of Functions of Two Variables, Partial Derivative, Taylor Theorem, Extremes of Functions of Two Variables, Double Integrals. Green's Theorem, Stokes Theorem and Gauss Theorem.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face to Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Email • Specialized software (open source) for graphical representation of functions • PowerPoint Presentations
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	During the semester students will be given problems-exercises which together with the material of the lectures will be an aid for the preparation of the final exams.

Activity	***Semester workload***
Lectures	35%
Study of solved exercises	15%
Exercises to be solved	10%
Self - Study (bibliography)	40%
Course total	***100%***

(5) ATTACHED BIBLIOGRAPHY

1. *Wrede, R., Spiegel, M.R. (2013) - Schaum's Outline of Advanced Calculus,* Mcgraw-Hill, 6th Edition
2. *Trench W.F. (2013) - Introduction to Real Analysis,* Faculty Authored and Edited Books, Trinity University.
3. *Thomas, G.B., Finney, R.L., Wier, M.D. (2002) - Thomas' Calculus,* Addison - Wesley, 9th Edition
4. *Spivak, M. (2019) - The Hitchhiker's Guide to Calculus,* Vol 57, American Mathematical Society
5. *Halidias, N. (2021) - Applied Mathematics for Economists and Engineers,* Broken Hill. (in Greek)
6. *Rassias, T. (2017) - Mathematics I,* Tsotras, 2nd Edition (in Greek).

GEO1020 – LINEAR ALGEBRA AND MATRIX ANALYSIS

COURSE OUTLINE: GEO1020 - LINEAR ALGEBRA AND MATRIX ANALYSIS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO1020**	**SEMESTER**	1st
COURSE TITLE	**Linear Algebra and Matrix analysis**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		4	5
TOTAL		**4**	**5**
COURSE TYPE	General background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO235/		

(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.

The course aims to deepen students' knowledge in the topics of linear algebra, matrix theory, vector calculus, and to familiarize them with their use as means for solving problems in various engineering applications. The teaching process aims to provide students with the necessary background for a better understanding of the theoretical part of the specialty courses of their curriculum.

Upon successful completion of the course, students:

- Will have understood basic concepts of linear algebra and vector calculus,
- Will be able to use matrices and vector spaces in the mathematical modelling of engineering problems and draw related conclusions,
- Will be able to interrelate the geometric/mathematical principles taught within this course with the scope of surveying and geoinformatics engineering.
- Will be fully aware of how to apply the related methods in applications typically encountered by a Topography and Geoinformatics Engineer,

- Will have a general comprehension of how to apply all of the above to other engineering fields.

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?

- Criticism and self-criticism
- Mathematical thinking and analysis
- Mathematical and analytical presentation of geometric concepts
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Production of free, creative and inductive thinking

(3) SYLLABUS

- Vector spaces, linear dependence/independence, basis and dimension, orthogonality,
- Vector calculus: the concept of free vector, collinear and coplanar vectors, coordinate systems, cartesian, polar, cylindrical and spherical coordinates. Unit vectors, inner, outer (cross) and mixed vector products. Geometric implications of vector products.
- Line in 3-d space: vector, analytic and parametric expressions. Distance of point from line.
- Plane in 3-d space: vector, analytic and parametric expressions. Distance of point from plane. Curves and surfaces.
- Linear algebra and matrices: Definition, categories, properties, and operations (addition, scalar multiplication, multiplication, transpose). Row-reduced echelon form. Gauss-Jordan algorithm.
- Determinants: Definition and properties. Solution of linear systems.
- Augmented matrix. Invertible matrix. Formula and Gauss-Jordan algorithm for inverse matrix computation. Cramer systems.
- Bilinear forms. Symmetric matrices and applications. Eigenvalues and eigenvectors. Diagonalization and applications.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Lectures: Use of Powerpoint presentations or PDF files. • Utilization of E-class UNIWA platform (file exchange among professors and students) • Email
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek (English for ERASMUS students, if required) Methods of evaluation: • Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) • Projects during the semester (practical exercises on both theoretical and practical objectives related to the course) Evaluation criteria are known to the students before the final examination and the grades allotted to each exam question are indicated under each one. Students can see their corrected answers, their individual grade on each question, and receive comments on their mistakes.

Activity	***Semester workload***
Lectures	52
Study of theory and applications	50
Exercises preparation	35
Course total	***137***

(5) ATTACHED BIBLIOGRAPHY

- Greek:

1. Donatos, G., & Adam, M. (2008). Linear algebra: Theory and applications, Gutenberg, Athens.
2. Chalidias, N. (2018). Infinitesimal calculus, linear algebra and applications. Broken Hill Publishers Ltd.
3. Mpratsos, Ath. (2015), Lectures in advanced mathematics, Hellenic Academic Ebooks “Kallipos”, *URI: http://hdl.handle.net/11419/424*
4. Mpratsos, Ath. (2003), Advanced mathematics, Stamoulis, Athens.
5. Rassias, Th. (2017), Mathematics I (*2nd Edition*), Tsotras Editions.
6. Xenos, Th. (2004), Linear Algebra, Ziti Editions.
7. Strang, G. (2006), Introducton to Linear Algebra, Editions of University of Patras.
8. Strang, G. (2005), Linear Algebra and apllications, University Publications of Crete,

Herakleion.

- International:

1. Kreyszig, E. (2005), Advanced Engineering Mathematics, 9th edition, Wiley.
1. Glyn, J. et al. (2010), Advanced Modern Engineering Mathematics, 4th edition, Addison-Wesley Pub. Co.
2. Wylie, C.R. & Barrett, L.C. (1995), Advanced Engineering Mathematics, 6th edition, McGraw-Hill.
3. Zill, D.G. & Cullen, M.R. (2006), Advanced Engineering Mathematics, 3rd edition, Jones & Bartlett Pub.
4. Lipshutz, S. & Lipson, M. (2000), Linear Algebra, Schaum's Outline Series, 3rd edition.
5. Datta, B.N. (1995), Numerical Linear Algebra and Applications, Books/Cole Publishing Company.
6. Golub, G.H. (2002), Matrix Computations, John Hopkins University Press.
7. Meyer, C.D. (2000), Matrix Analysis and Applied Linear Algebra, SIAM. URL: http://www.matrixanalysis.com/DownloadChapters.html.
8. Shores, T.S. (2007), Applied Linear Algebra and Matrix Analysis, Springer Science. URL: http://www.math.unl.edu/~tshores1/linalgtext.html.

GEO1030 – INFORMATICS AND PROGRAMMING

COURSE OUTLINE: GEO1030 - INFORMATICS AND PROGRAMMING

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Level 6		
COURSE CODE	**GEO1030**	**SEMESTER**	1st
COURSE TITLE	**INFORMATICS AND PROGRAMMING**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		2	3
Laboratory exercises		2	2
Total		**4**	**5**
COURSE TYPE	General background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP151/		

(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.

This course aims to provide students with:

- basic knowledge of information systems, computer networks and the internet
- the foundations of algorithmic thinking and problem-solving methodologies
- essential information of data storage and representation in modern computer systems
- an introduction to programming and software development

After completing this course students will be able to:

- efficiently use multiple digital tools and the internet
- use flowcharts ad an algorithm description procedure
- perform numeric conversion and represent numbers in different arithmetic systems
- develop basic applications in high level computer programming languages like

MATLAB

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?

This course aims to develop the following competencies:

- Search, analysis and synthesis of data and information using appropriate technologies
- Promote creativity and inductive reasoning
- Independent thinking
- Team work

(3) SYLLABUS

Introduction to Computer Science. Historical review of computer systems. Computer architecture and involved technologies. Computer Networks and communication protocols. Hardware and Software. Flowcharts. Arithmetic Systems and numeric representations, conversions and operations. Introduction to programming using the MATLAB computer language. Design and analysis of computer programs. Data types. Variables. Operators and expressions. Data Input and Output. Flow control and conditional program execution. Logical expressions and complex structures for flow control. Iteration structures. Arrays. Basic Indexing. Introduction to functions. Software development using MATLAB. Program debugging. Problems and applications.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Course material (presentations, lecture notes, exercises, etc.) are uploaded in the e-learning platform (e-class). • e-mail and e-class announcements are used for communication with the students.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	I. Written final examination that includes: - Short answer questions - Problem solving II. Midterm written examinations III. Projects The examination material and the evaluation process are announced to the students during the lectures and are also posted on the course's website.

Activity	***Semester workload***
Lectures	40
Laboratory practice	40
Study and analysis of bibliography	20
Essay writing	50
Course total	**150**

(5) ATTACHED BIBLIOGRAPHY

In Greek

1. Kalatzis I., 2016. Algorithmic Programming using MATLAB. Sideris Publications
2. Mousas B. X., 2008. Basic Use & Programming with MATLAB. Ion Publications.

In English

3. Palm W., 2010. Introduction to MatLab for Engineers, McGraw-Hill.
4. Attaway S, 2016. Matlab: A Practical Introduction to Programming and Problem Solving. Butterworth-Heinemann.

GEO1040 – FUNDAMENTALS OF GEODESY AND SURVEYING ENGINEERING

COURSE OUTLINE: GEO1040 - FUNDAMENTALS OF GEODESY AND SURVEYING ENGINEERING

(1) GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO1040**	**SEMESTER**	**1st**
COURSE TITLE	**FUNDAMENTALS OF GEODESY AND SURVEYING ENGINEERING**		

INDEPENDENT TEACHING ACTIVITIES *in case the credits are awarded in discrete parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDIT UNITS**
Lectures	3	3
Laboratory Exercises	2	2
TOTAL	**5**	**5**

TYPE OF COURSE	Copmpulsory
PREREQUISITE COURSES:	None
C.LAUSSA OF TEACHING AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (In English)
ONLINE COURSE PAGE(URL)	https://eclass.uniwa.gr/courses/TOP119/

(2) LEARNING OUTCOMES

Learning Outcomes *The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that students will acquire after the successful completion of the course.*
After the end of the course, students will have acquired fundamental knowledge of Geodesy and Topography, as well as a general overview of the subjects of Surveying Engineering, while at the same time they will have become familiar with the basic field topographical work and measurements. The context of the course aims at understanding the theory and solving the practical issues that arise in the basic geodetic engineering tasks assigned to the students. Finally, it is expected that students will develop critical thinking about problems of basic work performed by the Surveying Engineer, and will be able to resolve them.
General Competencies *Taking into account the general skills that the graduate must have acquired (as these are listed in the Diploma Supplement and listed below) which / which of them is the subject of the course intended for?.*

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Autonomous work.
- Teamwork.
- Criticism and self-criticism.

(3) COURSE CONTENT

Lectures

History of Geodesy. Distinction between Geodesy and Topography; Introduction to Geodesy, definitions; shape, size and density of the Earth; Internal structure and structure of the Earth; internal-external forces; movements of the Earth; rotation around the earth, around the axis of the earth, movement of the pole; transition and congation. Tides. Gravitational field. Levels and coordinate systems. Spheroidal, ellipsoid; geographical coordinates of ellipsoids; geoids and altitude; convergence of verticals; the concept of 1st, 2nd and 3rd fundamental problems. Coordinate transformations: displacement, turning and changing of coordinate scale. Reference ellipsoids and geodetic datum. Projective systems; Greek projective systemsa EGSA and HATT. Changes in the level of the sea. Average sea level. Absolute and relative positions and their depiction.

Introduction to surveying. Types of measurements (distances, directions, angles, height differences), units of measurement. Geographical Polar and Cartesian coordinates; basic calculations; determinations of coordinates, direction and distances; errors of measurements, sources and types of errors, significant digits. Accuracy of measurements; transmission of errors. Equally and unequally weighted observations; topographic instruments, classical and modern methods of measurement, fieldwork; maps, diagrams, symbols, drawing methods; surface calculations (geometrical shapes, rectangular and polar co-arranged).

Laboratory Exercises

Laboratory exercises comprising of: basic topographical calculations (distances, angles of direction), compilation of coordinates (polar, cartesian), coordinate transformations(displacement, turning, scale), calculations of geometric sizes (distances, area) and estimation of their accuracy (transmission of errors), presentation and use of topographic measuring instruments and equipment.

(4) TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face to face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES Use of *TEIs in Teaching, Laboratory Education, Communication with students*	Lectures: Use of multimedia (power point presentations, videos) Laboratory exercises: use of software (office management software and specialized topographical software) Communication: use of asynchronous e-learning platform(http://eclass.survey.teiath.gr)
TEACHING ORGANIZATION	

Activity	***Semester Workload***
Lectures	80

The way and methods of teaching are described in detail. *The student's study hours for each learning activity are listed, as well as the hours of a non-guided study according to the principles of ECTS*	Study & analysis of bibliography	30
	Group Laboratory Exercises	40
	Total Course	**150**
STUDENT EVALUATION *Description of the evaluation process* *Explicitly defined assessment criteria are mentioned and if and where they are accessible to students.*	**Written exam (50%):** Multiple choice questions, methodology development and problem solving **Laboratory Exercises (50%)**	

(5) RECOMMENDED BIBLIOGRAPHY

Greek:

1. Agatza A. M., Balodimos D. D., 1988. Introduction to Geodesy. Student Notes of NTUA.
2. Vlachos D., 1987. Topography. Volume A. AUTh Publications.
3. Evangelia Lambrou, Giorgos Pantazis,2010. Applied Geodesy. Ziti Publications, 456 p.
4. Livieratos E., 1999. Theory of Geodesy. Ziti Publications, Thessaloniki.
5. A.G. Badelas A.G. , P.D. Savvaidis, I.M. Yfantis, I.D. Doukas, 2010. Geodesy Volume I Geodetic measurements and calculations. Kyriakides Publishing House,544 p.
6. Tsoulis D., 2004. Introduction to Topography. Ziti Publications, Thessaloniki.

English:

1. Anderson J.M., Mikhail E.M., 1985. Introduction to Surveying. McGraw-Hill, New York.
2. Gomarasca M., 2009. Basics of Geomatics. Springer.
3. Irvine W., 1980. Surveying for Construction. 2nd Edition. McGraw-Hill, New York.
4. Mueller I. I., Ramsayer K. H., 1979. Introduction to Surveying. Frederick Ungar, New York.
5. Shank V., 2012. Surveying engineering & Instruments. White Word Publications.
6. Shepherd F. A., 1977. Engineering Surveying. Edward Arnold, London.

GEO1050 – TECHNICAL AND TOPOGRAPHIC DRAWING

COURSE OUTLINE: GEO1050 - TECHNICAL AND TOPOGRAPHIC DRAWING

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO1050**	**SEMESTER**	1st
COURSE TITLE	**TECHNICAL AND TOPOGRAPHIC DRAWING**		

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	2	
Lab exercises	2	
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	None Preferred prerequisite knowledge: Euclidean Geometry
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO178/

(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.

After the successful completions of the course, students acquire a set of knowledge and skills that allow them to:

- Understand and effectively use the notion of drawing scale and the conventions of technical drawing
- Implement the basic rules and conventions of drawing line-work and annotations
- Understand the geometric projection methods and their implementation to technical drawing
- Easily perceive the three-dimensional space and effectively produce architectural and construction drawings and topographic diagrams.
- Understand the relief representation methods using contour lines and their implementation in drawings
- Produce sections of the earth surface
- Have a basic understanding of the computer tools and applications used for the

implementation of the above and the production of digital drawings.

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
- Working independently
- Project planning and management
- Creative and inductive thinking

(3) SYLLABUS

Theoretical part of the Course

1. Elements of drawing history. The contemporary use of drawing as an engineering communication language
2. Types of drawings and their basic features. Sketches. Maps and cartography.
3. Drawing scale
4. Drafting tools and materials. Standard drafting paper sizes. Line-work and annotation conventions, title blocks and legends.
5. Traditional drawing board methods and modern digital drafting environments.
6. Projection methods. Orthographic projection and its implementation to architectural and topographic drawing. Axonometric projection and its usual applications.
7. Basic land surveying techniques of measurements. Coordinates, topographic grid. Representing the measurements in drawings.
8. Contour lines and the relief representation of the ground surface. Calculating contour lines using the linear interpolation method.
9. Construction projects design. Ground sections and ground relief. Cross sections and longitudinal sections.
10. Types of topographic diagrams.

Lab Part of the Course

- Critical overview of Computer Aided Drafting (CAD) Software
- Practical exercises involving the use of CAD software appropriate for the production of topographic drawings
- Production of topographic diagrams and architectural drawings, with an emphasis in the aesthetics of the final outcome

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-Face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>• Utilization of e-class UNIWA platform
• Specialized CAD software for technical drafting
• Utilization of digital presentation methods in the lectures</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td>
<table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Laboratory practice</td><td>26</td></tr>
<tr><td>Lab exercises (homework)</td><td>38</td></tr>
<tr><td>Independent study</td><td>50</td></tr>
<tr><td>Course total</td><td><i>140</i></td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek

Methods of evaluation:

• Written exam at the end of the semester (min 50%). (possibility of partial substitution by practical exercises)

• Lab exercise exam using CAD software (max 50%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

1. Hansjorg Frey, 1999, Σχέδιο κατασκευών. Τεχνικό - Αρχιτεκτονικό – Στατικό. Ευρωπαϊκές Τεχνολογικές Εκδόσεις
2. Κοφίτσας Ιωάννης Δ. Μαθήματα Τοπογραφικού Σχεδίου.
3. Μαλικούτη Σταματίνα, 2011, Μεθοδολογία και Εφαρμογές Τεχνικού Σχεδίου. Σύγχρονη Εκδοτική.
4. Παυλίδης Ιορδάνης, 1996, Γραμμικό Σχέδιο, τ. 1. Εκδόσεις Ζήτη.
5. Ράκας Νικόλαος Χ., 2012, Τεχνικό Σχέδιο. Εκδόσεις Ζήτη.
6. Τζουβαδάκης Ιωάννης, 2007, 2D & 3D σχέδιο στο Autocad. Εκδόσεις Συμμετρία.
7. Κάππος Γιάννης, 2009, Δούλεψε με το Autocad 2009. Εκδόσεις Κλειδάριθμος

GEO1060 – INTRODUCTION TO ECONOMICS

COURSE OUTLINE: GEO1060 - INTRODUCTION TO ECONOMICS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO1060**	**SEMESTER**	**1st**
COURSE TITLE	**Introduction to Economics**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	45
Total	**3**	**45**

COURSE TYPE	General background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek (with the possibility of another language)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO198/

(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.

After the successful completion of the course, students are expected to:

- Know the basic concepts and principles of economics
- Understand the key indicators of economic growth and to be able to choose the most appropriate one
- Be aware of the relationship between the natural environment and economy
- Understand the content of rights in rem and the basic economic provisions of the Civil Code and tax legislation
- Be aware of potential partnerships (during the execution of projects and technical studies) and of the usual accounting obligations of engineers and be able to decide on relevant professional matters.
- Understand the current social and economic developments and be able to formulate well-founded arguments based on critical thinking
- Perceive the complexity of the institutions governing the Greek and the European economy

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 ○ Team work ○ Working independently ○ Working in an interdisciplinary environment ○ Project planning and management ○ Respect for the natural environment ○ Criticism and self-criticism ○ Production of free, creative and inductive thinking

(3) SYLLABUS

1. Basic economic concepts. Analysis of different economic ideologies.
2. Markets, consumers and the economic problem. Demand and supply theories.
3. Economic sectors. Indicators
4. Growth vs development
5. Factors of production
6. Cost
7. Enterprises and companies
8. Macroeconomic approach: inputs and outputs, external trade, consumption, savings, investments, inflation etc.
9. Labour force. Unemployment.
10. Money and the financial system
11. International trade. Global market.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY.</td><td colspan="2">Face to face
○ Face to face lectures and interactive teaching in the classroom
○ Encouragement of students to prepare the next course
○ Encouragement of students to attend related workshops, conferences etc.</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">○ Utilization of E-class UNIWA platform (file exchange between professors and students)
○ Web search (literature review and data sources)
○ Email</td></tr>
<tr><td rowspan="4">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Study and analysis of bibliography</td><td>81</td></tr>
<tr><td>Course total</td><td>100</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Language of evaluation: Greek
Methods of evaluation:
○ Written exams at the end of the semester (multiple choice questionnaires, short-answer questions)
○ Ability of conducting studies</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

○ Vavouras Ioannis, 'Economic Policy', Papazisis Publishers, 2013.
○ Dalamagas Vasilis, 'Introduction to public economics, Kritiki Publishing, 2010.
○ Parkin, Michael, Melanie Powell & Kent Matthews, 'Econonomics, Kritiki Publishing, 2013.

GEO1070 – PHILOSOPHY OF SCIENCE

COURSE OUTLINE: GEO1070 - PHILOSOPHY OF SCIENCE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	GEO1070	SEMESTER	1th
COURSE TITLE	PHILOSOPHY OF SCIENCE		
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	
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		3	5
COURSE TYPE	Optionally mandatory		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO1070/		

(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.

After the successful completion of the course, students will be able to:

- Know the basic concepts related to philosophy as well as science related technological achievements, being able to carry out relevant reviews
- know the historical course of the basic philosophical approaches and be aware of the relevant social and economic parameters
- understand the relationship of the natural environment with the relevant philosophical issues
- have established the connection of the examined issues with the profession of surveyor / geoinformatics engineer

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?

After the successful completion of the course, students acquire the following knowledge and skills:

- Adapting to new situations
- Autonomous work
- Working in an interdisciplinary environment
- Respect for diversity and multiculturalism
- Respect for the natural environment and sustainability
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

1. Introduction to philosophy, concepts and definitions
2. Science, technology, innovation and their recent achievements
3. Philosophy of science: political, sociological and other extensions
4. Common concepts: Spirit-Matter, Space-Time, Art-Technique
5. Logical Positivism. Scientific explanation and validation of scientific hypotheses.
6. Determinism and natural sciences
7. Space and time
8. Science and environmental protection
9. Contemporary issues: ethics, dignity, gender identity, minorities, democracy, etc.
10. Consequences / prospects for scientists (surveyors) engineers

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	• Face-to-Face • Lectures - interactive teaching in the classroom • Encouraging students to attend related Workshops, Conferences, etc.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Presentations in the blackboard • Presentations through Power Point slides

TEACHING METHODS

The manner and methods of teaching are described in detail.
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

Activity	*Semester workload*
Lectures	52 (13 X 4)
Study and preparation for the exams	38
Course total	*150*

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Written exam (100%)

(5) ATTACHED BIBLIOGRAPHY

9. Αυγελής, Νίκος, 'Εισαγωγή στη Φιλοσοφία της Επιστήμης', Σταμούλης, 2010
10. Ρουσόπουλος, Γιώργο, 'Φιλοσοφία της Επιστήμης', Liberal Books, 2011.
11. Sismondo, Sergio, 'Εισαγωγή στις Σπουδές Επιστήμης και Τεχνολογίας'. Μετάφρ. Βαρβάρα Σπυροπούλου, επιμ. Μανώλης Πατηνιώτης, Liberal Books, 2016.

2nd Semester

GEO2010 – PROBABILITY THEORY AND STATISTICS

COURSE OUTLINE: GEO2010 - PROBABILITY THEORY AND STATISTICS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO2010**	**SEMESTER**	2nd
COURSE TITLE	**PROBABILITY THEORY AND STATISTICS**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		4	5
Total		**4**	**5**
COURSE TYPE	General Background		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO251/		

(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.*
The student after the successful completion of the course will be able to: • Understand the basic mathematical concepts of probability theory and statistics • Connect the mathematical methodologies taught in the subject of their studies. • Apply the acquired knowledge in the solution of problems in the field of the Engineer's specialty.

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?*
• *Mathematical thinking and analysis* • *Search, analyze and synthesize data* with the use of the necessary technology • *Adaptation to new situations* • *Decision making* • *Autonomous work and Teamwork* • *Production of free, creative and inductive thinking*

(3) SYLLABUS

The course is designed for a set of 13 weeks of lectures and is divided into two main parts. The topics that will be discussed are the following

- **Probability**
    - Introduction to probability theory - basic concepts
    - Random variables
    - Expectation, variance, standard deviation, etc.
    - Probability distribution
    - Discrete and continuous distributions
- **Statistics**
    - Basic concepts: population, sample, frequencies, etc.
    - Descriptive statistics
    - Sampling distribution and normal distribution theory
    - Confidence intervals
    - Hypothesis testing
    - Linear regression and correlation

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">Face to Face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">• Web search (literature review and data sources)
• Utilization of E-class UNIWA platform (file exchange among professors and students)
• Email
• Specialized software (open source) for presenting data and to use in hypotheses testing
• PowerPoint Presentations</td></tr>
<tr><td rowspan="4">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>The student's study hours for each learning activity are given as well as the hours of non-</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>35%</td></tr>
<tr><td>Study of solved exercises</td><td>15%</td></tr>
<tr><td>Exercises to be solved</td><td>10%</td></tr>
</table>

directed study according to the principles of the ECTS	Self - Study (bibliography)	40%
	Course total	***100%***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	During the semester students will be given problems-exercises which together with the material of the lectures will be an aid for the preparation of the final exams.	

(5) **ATTACHED BIBLIOGRAPHY**

7. *Schiller J., Srinivasan R. A., Spiegel, M.R. (2013) - Schaum's Outline of Probability and Statistics,* Mcgraw-Hill, 4th Edition
8. *Georgiou, D. (2009) - Probability and Statistics,* Kleidarithmos
9. *Milonas N. and Papadopoulos B. (2017) -Probability & Statistics for Engineers,* Tziola Publications (in Greek)
10. *Papageorgiou, E. and Halikias, M. (2020) - Applied Statistics and Probability with SPSS & MATLAB,* Broken Hill. (in Greek)

GEO2020 – PROGRAMMING TECHNIQUES AND ALGORITHMS

COURSE OUTLINE: GEO2020 - PROGRAMMING TECHNIQUES AND ALGORITHMS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Level 6		
COURSE CODE	**GEO2020**	**SEMESTER**	2nd
COURSE TITLE	**PROGRAMMING TECHNIQUES AND ALGORITHMS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	2	3
Laboratory exercises	2	2
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO249/

(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.

The objectives of this course are:

- introduction to advanced programming techniques
- demonstration of methods and techniques for effective data management, analysis and visualization
- development of integrated applications and user interfaces
- understanding the structure of algorithms and their complexity
- algorithm design methodologies based on different algorithmic approaches

Upon successful completion of the course the student will be able to:

- design and implement software applications that process and / or visualize data
- processes complex structures and data sources
- select the most appropriate problem depending technique (e.g. sorting or searching)
- evaluate algorithmic solutions by estimating their complexity and identifying the factors that affect the performance of the algorithm
- develop modern applications utilizing the capabilities of software environment

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, analysis and synthesis of data and information, using the appropriate technologies
- Promotion of creative and inductive thinking
- Autonomous work
- Team work

(3) SYLLABUS

Functions. Scope and visibility of functions. Recursive functions. Functions and tables. Vectors, Tables, arrays and operations. Strings and text manipulation. Advanced indexing techniques. Design and analysis of algorithms. Complexity. Sorting and searching techniques. Algorithmic performance comparison. Basic data structures and representation. File manipulation of binary and text files. Graphics and visualization techniques in two and three dimensions. User interfaces. Applications in Topography and Geoinformatics.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Course material (presentations, lecture notes, exercises, etc.) are uploaded in e-learning platform (e-class). e-mail and e-class announcements are used for communication with the students.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see workload table below

Activity	***Semester workload***
Lectures	40
Laboratory practice	40
Study and analysis of bibliography	20
Essay writing	50
Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	I. Written final examination that includes: - Short answer questions - Problem solving II. Midterm written examinations III. Projects The examination material and the evaluation process are announced to the students during the lectures and are also posted on the course's website.

(5) ATTACHED BIBLIOGRAPHY

In Greek

1. Charles F. Van Loan & K-Y Daisy Fan, 2012. Το MATLAB στην Υπολογιστική Επιστήμη και Τεχνολογία, Εκδόσεις DaVinci. In greek
2. Χατζίκος Ε., 2016. Matlab για επιστήμονες και μηχανικούς, Εκδόσεις Τζιόλα.

In English

3. Gilat A., 2008. Matlab: An Introduction with Applications, John Wiley.
4. Moore H., 2017. MATLAB for Engineers, Pearson.

GEO2030 – DIFFERENTIAL EQUATIONS

COURSE OUTLINE: GEO2030 - DIFFERENTIAL EQUATIONS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO2030**	**SEMESTER**	2nd
COURSE TITLE	**DIFFERENTIAL EQUATIONS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	4	5
Total	**4**	**5**

COURSE TYPE	General Background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (in English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO247/

(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.

The aim of the course is to understand how differential equations are used in modeling problems that arise in the specialty of Engineer and how to solve these equations. The student after the successful completion of the course will be able to:

- Understand the basic mathematical concepts and the methodology of solving first order and higher order differential equations, systems of differential equations, as well as the use of Fourier series.
- Use differential equations in modeling problems of their specialty, solve them and draw conclusions.
- Connect the mathematical methodologies taught and apply the acquired knowledge in the subject of Surveying and Geoinformatics Engineer.
- Apply all of the above in other fields of the Engineer's specialty.

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?

- *Exercise criticism and self-criticism*
- *Mathematical thinking and analysis*
- *Mathematical and analytical presentation of geometric concepts*
- *Search, analyze and synthesize data* with the use of the necessary technology
- *Autonomous work*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

The course is designed for a set of 13 weeks of lectures. The topics that will be discussed are the following

- Basic concepts
  solution of differential equation (partial and general), initial and boundary value problems.
- First order differential equations
  classification and methods of solving, divisible variables, linear differential equations, homogeneous differential equations, exact differential equations, integrating factors, Bernoulli differential equation, Ricatti differential equation, applications in problems of the Engineer's specialty.
- Linear higher order linear differential equations with constant or variable coefficients
  definitions, the Wronskian, methods of solution, homogeneous solution, general solution of the linear differential equation, the method of undetermined coefficients, variation of parameters. Euler's equations. Initial value problems and applications in engineering and electricity.
- Solution of differential equations using power series
  ordinary points and singular points, existence of analytical solutions, solution to regular singular points.
- Systems of linear differential equations, matrix method.
- Laplace transforms
  definition and properties, solution of linear differential equations and systems of differential equations with constant coefficients with the Laplace transform. reduction of a differential equation in a first order system of equation.
- Bessel equations and Legendre equations, Gamma functions, Dirac delta function.
- Differential equations with partial derivatives, linear, boundary value problems, Separable equations. Applications in engineering.
- Fourier series, Dirichlet type conditions, Parseval identity. Applications of the Fourier series.
- Complex Functions and their applications.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY.</td><td>Face to Face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>• Web search (literature review and data sources)
• Utilization of E-class UNIWA platform (file exchange among professors and students)
• Email
• Specialized software (open source) for graphical representation of solutions of differential equations
• PowerPoint Presentations</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>35%</td></tr>
<tr><td>Study of solved exercises</td><td>15%</td></tr>
<tr><td>Exercises to be solved</td><td>10%</td></tr>
<tr><td>Self - Study (bibliography)</td><td>40%</td></tr>
<tr><td>Course total</td><td><i>100%</i></td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>During the semester students will be given problems-exercises which together with the material of the lectures will be an aid for the preparation of the final exams.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

11. *Boyce W.E., Diprima R.C. and Meade D.B. (2017) - Elementary Differential Equations and Boundary Value Problems,* 11th edn, Wiley.
12. *Trench W.F. (2013) - Elementary Differential Equations with Boundary Value Problems,* Faculty Authored and Edited Books, Trinity University.
13. *Goodwine B. , 2011, Engineering Differential Equations, Springer.*
14. *Kalbaugh David V., 2017, Differential Equations for Engineers: The Essentials, CRC Press.*
15. *Kreyszig E., 2005, Advanced Engineering Mathematics, 9th edition, Wiley.*
16. *Glyn, J. et al., 2010, Advanced Modern Engineering Mathematics, 4th edition, Addison-Wesley Pub. Co.*
17. *Wylie C.R. and Barrett L.C., 1995, Advanced Engineering Mathematics, 6th edition, McGraw-Hill.*
18. *Zill D.G. and Cullen M.R., 2006, Advanced Engineering Mathematics, 3rd edition, Jones & Bartlett Pub.*
19. *Halidias, N. (2021) - Applied Mathematics for Economists and Engineers,* Broken Hill. (in Greek)
20. *Rassias, T. (2017) - Mathematics II,* Tsotras, 2nd Edition (in Greek).

GEO2040 – SURVEYING INSTRUMENTS AND MEASURING METHODS

COURSE OUTLINE: GEO2040 - SURVEYING INSTRUMENTS AND MEASURING METHODS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO2040**	**SEMESTER**	2nd
COURSE TITLE	**SURVEYING INSTRUMENTS AND MEASURING METHODS**		
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 TEACHIN GHOURS**	**CREDITS**
LECTURES		2	3
LABORATORY EXCRCISES		3	2
TOTAL		**5**	**5**
COURSE TYPE	*special background*		
PREREQUISITE COURSES:	No prerequisite courses. It is recommended that the students have obtained the fundamental knowledge of the course "Fundamentals of Geodesy and Surveying Engineering".		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP128/		

(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.

The aim of this course is to give a deep understanding of the fundamental principles of conducting surveying measurements (angles, distances, height differences). This includes the operation principles, the usage and the processing of the collected observations. The students learn how to select the appropriate instrument / measurement technique in order to fulfill the requirements of each work.

Upon successful completion of the course students will be able to:

- understand the operation principles of the basic surveying instruments
- understand the errors that affect the surveying measurements (instrumental/environmental errors) as well as the techniques used to mitigate these errors
- use surveying instruments (theodolites, tachymeters, total stations, mechanical and digital levels)
- select the appropriate instrument / measurement technique for fulfilling the requirements of each work

- process the collected observations, estimate and judge their precision.

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*
- *Working independently*
- *Team work*
- *Production of new research ideas*

(3) SYLLABUS

Theoretical part:

- Instruments and methods for measuring angles and directions: Basic parts and use of theodolites. Plate and circular levels. Optical and electronic reading devices. Magnification, field of view and resolving power of the telescope. Accuracy and classification of theodolites. Instrumental errors: axial errors, circle eccentricity, circle graduation errors. Inspection and calibration: horizontal collimation and vertical indexing. Techniques for angle measurements. Centering devices: optical plumb, forced centering. Assessment of precision of angle measurements.
- Instruments and methods for distance measurements. The stadia method. Basic principles of electronic distance measurement: modulation, demodulation, refraction, refractive index, laser. Corrections: prism constant, atmospheric corrections.
- Total stations. Basic parts and use of total stations.
- Instruments and methods for height measurements. Basic parts and use of levels. Earth curvature and atmospheric refraction corrections. Classification of levels. Pendulum compensators. Line-of-sight error. Rod errors. Measuring procedures, line leveling, double-run leveling.

Laboratory part:

Tachymeter-theodolite: setting up, centering and levelling up, sighting, circle reading, measuring horizontal and vertical angles. Reduction of observations. Tacheometric observations.
Level: levelling up, sighting, reading the staff, use of digital levels and bar-coded staffs. Conduction of differential levelling, double run levelling and reduction of observations.
Total stations: setting up, measuring angles and distances, setting atmospheric parameters for EDM, setting prism constant. Field survey, plotting coordinates, creation of topographic map.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	*Face-to-face*
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching (PowerPoint presentations)* *• Use of an asynchronous e-learning platform (e-class).* *• Use of e-mail* *• Use of the Excel software in laboratory.*
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures	26
study and analysis of bibliography	26
laboratory practice	38
Laboratory preparation and essay writing	60
Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Assessment language: Greek (English for ERASMUS students upon request) Performance evaluation method: • Final Written Exam (90% of the final grade) of graded difficulty, which include open-ended questions and solving simple problems. • Evaluation of laboratory work (10% of the final grade) which includes the setting up and use of surveying instruments (theodolites, total stations, levels). The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography (in Greek):
1. Βλάχος Δ., 1987. Τοπογραφία. Τόμος Α. Εκδόσεις ΑΠΘ.
2. Καλτσίκης Χ., Φωτίου Α., 1999. Γενική τοπογραφία. Εκδόσεις Ζήτη, Θεσσαλονίκη.
3. Ρωσσικόπουλος Δ., 2006. Μέτρον Γεωμετρικόν. Εκδόσεις Ζήτη, Θεσσαλονίκη.
4. Τσούλης Δ., 2004. Εισαγωγή στην Τοπογραφία. Εκδόσεις Ζήτη, Θεσσαλονίκη.

- Suggested bibliography (in English):
1. Allan A.L., Hollwey J.R., Maynes J.H.B., Amin A., 1980. Practical Field Surveying and Computa-tions. Heinmann, Portsmouth, NH.
2. Bannister A., Raymond S., Baker R., 1998. Surveying. 7th edition. Prentice Hall, New Jersey.
3. Burnside D., 1991. Electronic Distance Measurement. 3rd edition, BSP Professional Books, UK.
4. Cooper M. A. R., 1982. Modern Theodolites and Levels, 2nd edition, Granada Publishing.
5. Deumlich F., 1982. Surveying Instruments. Walter de Gruyter, Berlin.

6. Fialovszky L., 1991. Surveying Instruments and their Operational Principles. Elsevier, New York.
7. Rüger J. M., 1996. Electronic Distance Measurement – An Introduction. 4th edition, Springer Ver-lag, Berlin
8. Saastamoinen J.J., 1967. Surveyor's Guide to Electromagnetic Distance Measurement. University of Toronto Press.

GEO2050 – ANALYTICAL GEOMETRY

COURSE OUTLINE: GEO2050 – ANALYTICAL GEOMETRY

(1) GENERAL INFORMATION

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Surveying and Geoinformatics Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO2050**	**SEMESTER**	2nd
COURSE TITLE	**ANALYTICAL GEOMETRY**		

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	4(3/1)	5
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	---
LANGUAGE OF INSTRUCTION AND EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

The main goal of the course is to have the student acquainted with the geometrical properties of the two- and three-dimensional space. A combined synthetic-analytical method, with geometric views of three-dimensional objects as the primary instructional tool is employed.

Once the course is completed, the student will..

- have understood elementary notions of analytic geometry in two-dimensional and three-dimensional space, which, along with the courses of linear algebra and calculus, form a solid theoretical backbone in engineering
- have a deeper understanding of three-dimensional space, as a primary component in every professional and scientific subfield in modern topography
- have learned about basic projection methods (top view, front view, axonometric, perspective) in the light of the underlying geometric-algebraic theory that is used for computer-aided (CAD) visualization
- be able to solve basic problems in 3D space geometry
- be able to solve linear coordinate transformations (scale, translation, rotation, rigid, affine, projective)

- Be in a solid position to implement the acquired knowledge in the context of subsequent department courses, as well as solve complex problems concerning representations of three- dimensional objects as well as their projections in two-dimensional space.

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
- Working independently
- Production of free, creative and inductive thinking

(3) SYLLABUS

Geometry for the topographical engineer: Elements of Euclidean geometry. Vectorial algebra. Coordinate reference systems. Point. Line. Curve. Plane. Surface. Study of relations between objects: Point to Plane, polygon, plane. Relation of line to a plane. Slope/direction of line. Directional cosines. Parallel lines and planes, orthogonal lines and planes, collinearity, coplanarity. Equivalent analytic expressions. Conics. Second degree surfaces. Applications to topography.

Linear transforms. Scale. Translation. Rotation. Rigid-body transformation. Similarity transformation. Affine and Projective transformations. Parameters. Properties. Non-linear transformations. Applications to geomatics. Generalities concerning projections. Central projection. Parallel projection. Methods of visualization. Top-view. Front-view. Axonometry. Perspective. Vision and central projection. Photography fundamentals. Vanishing points and lines. Introduction to projective geometry. 3D computerized visualization. Introduction to computer graphics and CAD.

(4) TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Web search (literature review and data sources) Utilization of E-class UNIWA platform (file exchange among professors and students) Email Specialized software and libraries (both commercial and open source) for the manipulation and editing of numerical and geospatial data Source code editors Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail. 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.*	

Activity	*Semester workload*
Lectures	39
Laboratory practice	13
Exercise preparation	40
Study of theory	58
Course Total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) • Homework (practical exercises on both theoretical and practical objectives related to the course)

(5) RECOMMENDED LITERATURE

In Greek:
1. Γεωργίου Δ., Ηλιάδης Σ., 2017, “Αναλυτική Γεωμετρία”.
2. Ξένος Θ., 2004, “Αναλυτική Γεωμετρία”.
3. Λευκαδίτης Γ., 2006. “Μέθοδοι Παραστάσεων”.

In English:
3. Kindle J. H., 1968. *Theory and problems of plane and solid analytic geometry.* McGraw-Hill, New York.

GEO2060 – PHYSICS I (MECHANICS)

COURSE OUTLINE: GEO2060 - PHYSICS I (MECHANICS)

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO2060**	**SEMESTER**	2nd
COURSE TITLE	**PHYSICS I (MECHANICS)**		

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 TEACHIN GHOURS**	**CREDITS**
LECTURES	3	3
LABORATORY EXCRCISES	2	2
TOTAL	**5**	**5**

COURSE TYPE	*general background*
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO187/

(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.

The aim of this course is to give a deep understanding of the fundamental principles of mechanics, including kinematics, Newton's laws, energy conservation, momentum and angular momentum conservation, the dynamics of rotational motion, central forces, oscillations, wave and fluid mechanics.

Upon successful completion of the course students will be able to:

- demonstrate a deep understanding of the theoretical foundations of classical Newtonian mechanics,
- interpret and critically evaluate the fundamental laws they must apply to deal with problems of classical mechanics,
- solve basic engineering problems through force analysis and application of appropriate laws and basic conservation principles,
- take laboratory measurements of physical quantities and explain the experimental results by connecting them with theory,
- collaborate with their fellow students for the preparation of an experimental project,
- apply the relevant laws to solve complex problems using the appropriate

mathematical tools,

- evaluate the conditions under which the use of the theory of relativity is necessary,
- interpret the results of their calculations in relation to the subject of Surveying and the science of Geoinformatics.

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?

- *Criticism and self-criticism*
- *Search for, analysis and synthesis of data and information,*
- *with the use of the necessary technology*
- *Adapting to new situations*
- *Working independently*
- *Team work*
- *Production of new research ideas*

(3) SYLLABUS

Theoretical part:

- Classical mechanics (fundamental principles, forces and vectors, diagram design, units of measurement).
- Kinematics in one dimension (displacement, time, average and instantaneous velocity and acceleration, motion with constant or variable acceleration, relative velocity, circular motion, velocity and position by integration).
- Kinematics in two and three dimensions (vectors of position, velocity, acceleration, independence of motion, circular motion, relative velocity).
- Newton's laws (forces and interactions, force diagram, inertial and non-inertial frames, central forces, gravitational force).
- Applications of Newton's laws (body in equilibrium, particle dynamics, friction, circular motion dynamics).
- Work and kinetic energy, work and energy of variable force, power. Conservative and non-conservative forces, forces and potential energy, gravitational potential energy, conservation of mechanical energy.
- Momentum, impulse, collisions (impulse-momentum theorem, conservation of momentum, collisions, center of mass).
- Rigid body rotation (angular velocity, angular acceleration, rotational kinetic energy, moment of inertia).
- Dynamics of rotational motion (torque, angular momentum, work and power in rotational motion, principle of conservation of angular momentum).
- Equilibrium and elasticity (equilibrium conditions, stress, strain, elastic modulus).
- Periodic motion (study of simple harmonic oscillation through the solution of the 2nd order differential equation, damped and forced oscillations, resonance).
- Fluid mechanics (hydrostatic pressure, continuity equation, Bernoulli’s equation).

- Waves (harmonic mechanical waves, standing waves, normal modes, wave interference, sound waves, intensity, attenuation).
- Limits of Newtonian mechanics, introduction to special and general theory of relativity.

Laboratory part:
Measurements - errors, graphs, measurement of lengths and radii of curvature, measurement of gravitational acceleration, calculation of spring constant, rigid body study, speed of sound measurement, calculation of solids and liquids density, coefficient of viscosity, determination of linear thermal expansion coefficient.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2"><i>Face-to-face</i></td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2"><i>Use of ICT in teaching (PowerPoint presentations και PDF)</i>
<i>• Use of an asynchronous e-learning platform (e-class).</i>
<i>• Use of e-mail</i>
<i>• Use of simulations for demonstration of natural phenomena and experiments.</i>
<i>• Use of the Excel software in laboratory.</i></td></tr>
<tr><td rowspan="6">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td><i>Lectures</i></td><td>39</td></tr>
<tr><td><i>study and analysis of bibliography</i></td><td>30</td></tr>
<tr><td><i>laboratory practice</i></td><td>26</td></tr>
<tr><td><i>Laboratory preparation and essay writing</i></td><td>55</td></tr>
<tr><td>Course total</td><td>150</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Assessment language: Greek (English for ERASMUS students upon request)
Performance evaluation method:
• Final Written Exam (60% of the final grade) of graded difficulty, which may include short-answer questions, open-ended questions and solving simple and complex problems.
• Evaluation of laboratory work (40% of the final grade) which includes written work, essay/report of laboratory measurements and oral examination during the measurements.
The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Young Hugh D, Freedman R, 2016, University Physics with Modern Physics, Pearson Education Ltd.

2. Halliday David, Resnick Robert, Walker Jearl, 2014 Fundamentals of Physics, John Wiley and Sons Inc.

3. Raymond A. Serway, John W. Jewett, 2012, Physics for Scientists and Engineers, CENGAGE Learning

- Related academic journals:

1. Nature, Macmillan Publishers Limited

2. Physical Review Letters, American Physical Society

3. Journal of Physics A,B,C,D, Institute of Physics
4. European Journal of Physics, Institute of Physics

3rd Semester

GEO3010 – THEORY OF ERRORS & ADJUSTMENT OF OBSERVATIONS I

COURSE OUTLINE: GEO3010 - THEORY OF ERRORS & ADJUSTMENT OF OBSERVATIONS I

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 6		
COURSE CODE	**GEO3010**	**SEMESTER**	3th
COURSE TITLE	**Theory of Errors & Adjustment of Observations I**		

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 Labs	4(3/1)	5
TOTAL	**4**	**5**

COURSE TYPE	Special Background
PREREQUISITE COURSES	---
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
OFFERED TO *ERASMUS* STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.*
Main purpose of the course is the introduction to the theory of errors and of parameter estimation, and the familiarization with the processes of the adjustment of observations with the method of Least Squares. After completing the course, the students: • will have understood the basic principles of parameter estimation from multiple measurements of equal or unequal precision, the concept of error propagation as well as the search, by means of strict mathematical criteria, of optimal solutions which minimize the effect of observation errors; • will know the concepts of precision, accuracy and reliability; • will be in position to apply methods of statistical processing of equally and unequally weighted measurements and to handle, with the least squares method, simple linear and non-linear adjustment problems in the context of the activities of the surveying and geomatics engineer; • will be capable of applying the acquired knowledge in the context of several other courses and exercises in our Department, but also for solving both basic and complex problems which involve computations based on actual measurements which inevitably contain errors.

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, using the necessary technology
- Working independently
- Production of free, creative and inductive thinking
- Decision-making
- Working in an interdisciplinary environment

(3) SYLLABUS

Error theory and its relation to other scientific topics. Areas of application of error theory in the fields of surveying and geoinformation.

Measurements and errors. Error types. Element of probability theory and statistics. Random variables and observation errors. One-dimensional random variables. Estimation from multiple measurements.

Probability distributions for discrete and continuous random variables. The “normal” distribution. Confidence intervals.

Observations of equal and unequal weight. Internal and external accuracy, reliability.

Muti-dimensional random variables. Muti-dimensional normal distribution. Error ellipse and error ellipsoid. Propagation of variances-covariances.

Parameter estimation and adjustment of observations. Method of observation equations. Least squares method for linear functions. Least squares method for non-linear functions.

Examples of solved adjustments.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Support by the electronic asynchronous course platform *eclass*. - Use of electronic material as teaching aid (ppt slides).
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of Evaluation: • Written examination in the end of the semester (70%), which combines open-ended questions and numeric calculations. • Evaluation of performance in the exercises (30%)

Activity	*Semester workload*
Lectures	39
Laboratory / Exercises	13
Preparation of Exercises	45
Non-directed study	53
Course total	**150**

(5) SUGGESTED BIBLIOGRAPHY

1. Agatza-Balodimou A.M., 2018. *The Method of Least Squares and Applications*. Tziola Editions, Athens (in Greek).

2. Darmanis A., 1997. *Adjustment of Observations and Estimation Theory*. Vols. I & II. Ziti Editions, Thessaloniki (in Greek)

GEO3020 – CONSTRUCTION SURVEYING

COURSE OUTLINE: GEO3020 - CONSTRUCTION SURVEYING

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 6		
COURSE CODE	**GEO3020**	**SEMESTER**	3th
COURSE TITLE	**CONSTRUCTION SURVEYING**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures and Labs		4(2/2)	5
TOTAL		4	5
COURSE TYPE	Special background		
PREREQUISITE COURSES:	Surveying Instruments & Measuring Methods		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Can be taught in English		
COURSE WEBSITE (URL)	UNIWA Open eClass | ΑΠΟΤΥΠΩΣΕΙΣ - ΧΑΡΑΞΕΙΣ		

(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.

Horizontal network densification. Sections. Intersection, resection, accuracy achievements. Traverses: instrument selection, measurements, corrections, reductions. Traverse evaluation, accuracy achievements. Vertical control network establishment and densification. Spirit leveling. Accurate leveling measurements. Errors and accuracy achievement during spirit leveling measurements. Trigonometric leveling. Error budget, accuracy control. Earth curvature effect, atmospheric refraction influence. Trigonometric leveling applications. Methods of surveying. Tachometry. Surveying procedures. Control points establishment (horizontal and vertical control networks), basics of topographic maps. Basics of vertical alignments and cross-sections. Field measurements and calculations. Basics on construction engineering, instruments. Control networks. Absolute and internal accuracy of a technical work. Characteristic points establishment. Basic alignments. Staking out points, angles and curves. Calculation of arc and curve elements. Angle and length correction during stake-out.

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?*
• Working independently • Teamwork • Adapting to new situations • Criticism and self-criticism

(3) SYLLABUS

- horizontal and vertical network densification,
- surveying methods,
- alignments,
- stake-out points, angles and curves

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
.</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>- Support by the electronic asynchronous course platform <i>eclass</i> (exchange of information and digital data between tutors and students)
- Use of software
- Use of programming environment for preparing projects.
- Use of Surveying software for Lab exercises.</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Laboratory / Exercises</td><td>26</td></tr>
<tr><td>Project</td><td>58</td></tr>
<tr><td>Non-directed study</td><td>40</td></tr>
<tr><td>Course total</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek or English

Methods of evaluation:
Final exam (50%) which includes open- ended questions and problem solving
Laboratory work (50%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- **Suggested bibliography:**
Allan A.L., Hollwey J.R., Maynes J.H.B., Amin A., 1980. Practical Field Surveying and Computations. Heinmann, Portsmouth,
NH. Anderson J. M., Mikhail E. M., 1985. Introduction to Surveying. McGraw-Hill, New York.
Blachut T., Chrzanowski A., Saastamoinen J., 1979. Urban Surveying and Mapping. Springer, Berlin. Bomford G., 1980. Geodesy. 4 th edition, Clarendon Press, Oxford.
Irvine W., 1995. Surveying for Construction. 2nd edition, McGraw-Hill, New York.
Uren J., Price W. F., 2005. Surveying for Engineers. 4th edition, MacMillan Press, London.
- **Related academic journals:**
Journal of Surveying Engineering. American Society of Civil Engineers

GEO3030 – PHYSICS II (ELECTROMAGNETISM & OPTICS)

COURSE OUTLINE: GEO3030 - PHYSICS II (ELECTROMAGNETISM & OPTICS)

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO3030**	**SEMESTER**	3th
COURSE TITLE	**PHYSICS II (ELECTROMAGNETISM & OPTICS)**		
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 TEACHIN GHOURS**	**CREDITS**
LECTURES		3	3
LABORATORY EXCRCISES		1	1
TOTAL		**4**	**4**
COURSE TYPE	*general background*		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP176/		

(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.

Upon successful completion of the course students will be able to:

- demonstrate a deep understanding of the theoretical foundations of electromagnetism,
- interpret and critically evaluate the fundamental laws they must apply to deal with complex problems of electromagnetism and geometrical optics,
- take laboratory measurements of physical quantities and explain the experimental results by connecting them with theory,
- apply the relevant laws to solve complex problems using the appropriate mathematical tools, discuss the applications of electromagnetism and optics in various scientific areas and collaborate with their fellow students for the preparation of an experimental project,
- interpret the results of their calculations in relation to the subject of Surveying and the science of Geoinformatics.

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?*
- *Criticism and self-criticism* - *Search for, analysis and synthesis of data and information,* - *with the use of the necessary technology* - *Adapting to new situations* - *Working independently* - *Team work* - *Production of new research ideas*

(3) SYLLABUS

Theoretical part:

- Electrostatics, Coulomb's law, electric field, electric dipoles, Gauss's law, potential, calculation of electrical potentials, electrostatic fields in matter. Electric field energy, capacitance and capacitors, polarization and dielectric materials. Electric current, resistance and DC circuits, Kirchhoff’s rules, electrical measurement instruments.
- Magnetostatics, magnetic field and forces, magnetic flux, motion of charged particles in a magnetic field, magnetic dipoles and magnetic dipole moment. Biot-Savart Law, calculation of magnetic fields. Ampere's law, paramagnetic, diamagnetic and ferromagnetic materials.
- Electromagnetic induction, Faraday's law, induced electric fields. Mutual induction, self-inductance, magnetic field energy, R-L, L-C and L-R-C circuits. Alternating current (AC), phasors, power in AC, resonance.
- Maxwell’s equations in differential and integral form. Time-varying E/M field, electromagnetic waves, wave equation, energy and momentum of electromagnetic waves, Poynting vector, radiation pressure.
- Nature and propagation of light, reflection and refraction laws.
- Introduction to geometric optics: prisms, mirrors, lenses, simple optical instruments (eye, camera, telescope).
- Introduction to wave optics, interference, diffraction. Scattering and polarization of light. Instrument resolution. Light sources and detectors. Introduction to interferometry.

Laboratory part:

Measurements - errors, graphs, capacitor charging, electrical resistivity measurement of conductors, effect of a magnetic field on an electron beam, refraction of a laser light beam on transparent material, optical prism refraction, spectroscope calibration, focal length measurement of a lens, oscilloscope measurements.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	*Face-to-face*

<table>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td><i>Use of ICT in teaching (PowerPoint presentations και PDF)</i>
<i>• Use of an asynchronous e-learning platform (e-class).</i>
<i>• Use of e-mail</i>
<i>• Use of simulations for demonstration of natural phenomena and experiments.</i>
<i>• Use of the Excel software in laboratory.</i></td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td>
<table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td><i>Lectures</i></td><td>39</td></tr>
<tr><td><i>study and analysis of bibliography</i></td><td>30</td></tr>
<tr><td><i>laboratory practice</i></td><td>13</td></tr>
<tr><td><i>Laboratory preparation and essay writing</i></td><td>38</td></tr>
<tr><td>Course total</td><td>120</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Assessment language: Greek (English for ERASMUS students upon request)

Performance evaluation method:
• Final Written Exam (70% of the final grade) of graded difficulty, which may include short-answer questions, open-ended questions and solving simple and complex problems.
• Evaluation of laboratory work (30% of the final grade) which includes written work, essay/report of laboratory measurements and oral examination during the measurements.

The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Young Hugh D, Freedman R, 2016, University Physics with Modern Physics (volume B), Pearson Education Ltd.

2. Halliday David, Resnick Robert, Walker Jearl, 2014, Fundamentals of Physics (volume B), John Wiley and Sons Inc.

3. Raymond A. Serway, John W. Jewett, 2012, Physics for Scientists and Engineers, CENGAGE Learning

- Related academic journals:

1. Nature, Macmillan Publishers Limited

2. Physical Review Letters, American Physical Society

3. Journal of Physics A,B,C,D, Institute of Physics

4. European Journal of Physics, Institute of Physics

GEO3040 – NUMERICAL METHODS

COURSE OUTLINE: GEO3040 - NUMERICAL METHODS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Level 6		
COURSE CODE	**GEO3040**	**SEMESTER**	3th
COURSE TITLE	**NUMERICAL METHODS**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		2	2
Laboratory exercises		2	2
Total		**4**	**4**
COURSE TYPE	Special background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP154/		

(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.

The objectives of this course are:

- introduction to numerical methods and their applications in engineering problems
- providing knowledge and skills necessary for the development of computational algorithms and applications in order to solve related problems

Upon successful completion of the course the student will be able to:

- recognize practical applications and problems of engineering science, whose solution depends on using numerical methods
- apply various methodologies of numerical analysis in order to solve fundamental mathematical problems for engineers
- use the basic principles of programming, algorithmic structures and techniques for the implementation of applications based on numerical methods and , in general, applications that solve engineering problems

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, analysis and synthesis of data and information, using the appropriate technologies
- Individual work
- Team work
- Work in an interdisciplinary environment
- Promotion of creative and inductive thinking

(3) SYLLABUS

Basic concepts. Numerical accuracy and error propagation. Matrices and determinants. Vector and matrix norms. Solving non-linear equations. Bisection method. Regula-falsi method. Newton-Raphson method. Secant method. Convergence to solutions. Multiple roots and modified Newton-Raphson method. Systems of linear equations. Stability of linear systems. Gaussian elimination. Factorization methods. Jacobi and Gauss-Seidel iterative methods. Convergence. Polynomial approaches to interpolation. Taylor polynomials. Lagrange and Newton interpolation. Interpolation and approximation with partial polynomials. Least squares method. Numerical integration. Trapezoidal and Simpson’s rule., Romberg and Gaussian quadrature rule, Numerical solutions of differential equations. Euler’s and Runge-Kutta methods. Error analysis. Implementation of numerical methods and application development in the Matlab programming environment.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY .	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Course material (presentations, lecture notes, exercises, etc.) are uploaded in the e-learning platform (e-class). • e-mail and e-class announcements are used for communication with the students.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below

Activity	***Semester workload***
Lectures	30
Laboratory practice	30
Study and analysis of bibliography	20
Essay writing	40
Course total	**120**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	I. Written final examination that includes: - Short answer questions - Problem solving II. Midterm written examinations III. Projects The examination material and the evaluation process are announced to the students during the lectures and are also posted on the course's website.

(5) ATTACHED BIBLIOGRAPHY

In Greek

1. Σαρρής Ι., Καρακασίδης Θ., 2015. Αριθμητικές Μέθοδοι και Εφαρμογές για Μηχανικούς. Εκδόσεις Τζιόλα.
2. Στεφανίδης Γ. Χ., Σαμαράς Ν.Ε., 1999. Υπολογιστικές Μέθοδοι με το Matlab. Εκδόσεις Ζυγός.
3. Chapra S., Canale R., 2016. Αριθμητικές Μέθοδοι για Μηχανικούς. Εκδόσεις Τζιόλα.

In English

4. Yang W., 2005. Applied Numerical Methods Using MATLAB. Wiley-Interscience..

GEO3050 – GENERAL AND MATHEMAICAL CARTOGRAPHY

COURSE OUTLINE: GEO3050 - GENERAL AND MATHEMAICAL CARTOGRAPHY

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Surveying and Geoinformation Engineering		
LEVEL OF STUDIES	Undergraduate – Level 6		
COURSE CODE	**GEO3050**	**SEMESTER**	3th
COURSE TITLE	**GENERAL AND MATHEMAICAL CARTOGRAPHY**		

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**
Theory	2	3
Laboratories Exercises	2	1
Total	**4**	**4**

COURSE TYPE	Background, mandatory
PREREQUISITE COURSES:	There are no prerequisite courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek - English (for ERASMUS students) - French (for ERASMUS students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in English and French language)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP105/

(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.

LEARNING

A) Learning the general and specific concepts / knowledge and techniques of the science and art of cartography (in the fields of General, Topographic, Nautical and Aeronautical cartography) and the corresponding maps.
B) Learning the components of a cartographic product and understanding their organizational structure.

SKILLS
A) Application of cartographic concepts eg. scales, grids, memos, etc. in the creation of cartographic products.
B) Acquisition of skills for 1) creation, 2) evaluation, 3) selection and 4) use of maps (with emphasis on topographic and nautical maps).

ABILITIES
A) Development of skills for the analysis, use and construction of new cartographic structures from different eg data and processes, depending on the constraints of reality.

In more detail, the objectives are defined as follows:

A) Learning the general and specific concepts / knowledge of the science and art of cartography
(in the fields of General, Mathematical, Topographic, Nautical and Aeronautical cartography) and the corresponding maps.
B) Acquisition of skills and abilities for 1) creation, 2) evaluation, 3) selection and 4) use of maps (with emphasis on topographic and nautical maps).
C) Distinguish the components of a cartographic product and understand their organizational structure. Development of possibilities for construction of a new structure from different eg Data and procedures, depending on the constraints of reality.
D) Application of cartographic concepts eg projections or scales in the creation of cartographic products.
E) Understanding the basic mathematical applications in cartography related to the representation of the Earth in two-dimensional space (plane) with the aim of understanding the basic concepts of the cartographic projections, the application of geometric and mathematical transformations, and concepts, methods and techniques of cartometry.
F) Correlation of cartography with arts and sciences

The course combines the theoretical knowledge required to understand the above objects with the perception of their practical application.
The knowledge and skills acquired by the students in the course are the necessary supplies required for the correct understanding of fundamental geometric / mathematical concepts related to the operation and utilization of maps, while substantially enhancing their background in one of the fundamentals. (Cartography) of the science of the Engineer of Topography and Geoinformatics.
Based on the modules designed to support the subject matter of the course, basic theoretical and practical elements are consolidated which are related to:
a. the basic principles of cartography and graphic representations
b. the map display-projection systems
c. the basic geometric, cartographic and mathematical transformations
d. the methods of cartometry
e. familiarity with the use of topographic, nautical and aeronautical maps
f. the connection of cartography with other arts and sciences.

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?

Taking into consideration the general skills that the graduate must have acquired, the course aims to:

1) understand the cartographic representation, through the passage from the Earth to the two-dimensional surface of the map and the graphic semiology / representation of phenomena, objects and places.

2) search, analysis and synthesis of data and information, using the necessary technologies for the creation of maps and cartographic information.

3) understanding all the concepts and techniques of paper mapping and their application in practice

4) adapt new situations, which requires the creation of maps in a very short period of time (eg in case of natural disasters), or the use of new types of maps;

data (eg very high resolution satellite imagery) or the use of new techniques and equipment (eg unmanned aircraft and vehicles).

5) make decisions regarding the correct choice of data, technical, basic graphics and aesthetic features that compose the quality of a map.

6) autonomous work through the theoretical development and practical elaboration of issues related to cartographic concepts and practices, with the aim of developing skills necessary for cartographic studies.

7) In group work aimed at the theoretical development and practical elaboration of issues related to cartographic concepts and practices in order to develop skills necessary for cartographic studies in a team environment where collaboration is necessary.

8) the ability to work in an international environment supported by learning such "standardized knowledge" of cartography taught in most universities.

parts of the world, as well as by using and learning English and French "cartographic" terminology.

9) work in an interdisciplinary environment supported by the nature of the cartography course that is directly related to road construction, plumbing, environmental protection, etc.

10) the production of new research ideas (although the course is in a short semester (3rd)) that is supported and developed through a) individual and group work but also b) with information about the research programs of the Department in relation to cartography and the possibilities of students' participation in them.

11) the design and management of cartographic projects.

12) the demonstration of social, professional and moral responsibility in matters of copyright data and software.

13) the exercise of criticism and self-criticism through the presentation day of the semester papers (individual and group).

14) the promotion of free, creative and inductive thinking.

(3) SYLLABUS

Theoretical part - Lectures

Introduction, Basic Concepts, Principles, Definitions. Terminology and "terminology". Interconnected and overlapping scientific fields, sciences and techniques. Bibliographic resources - Online resources - "Open" Courses in the field of cartography and related fields - Free data. Organizations, scientific and professional associations and organizations related to cartography, its applications and cartographic data.

Historical data. History of cartography.

Topographic Map - Basic Concepts of Graphic Semiology - Topographic Cartography - Symbols - Colors. Cartographic Toponymy - Alphanumeric Cartographic Semiology - Toponyms in Topographic Maps. Toponyms legend. Categorizations and Types of Maps. Rules of Cartographic Presentation and Composition of Topographic Maps. Cartographic Generalization. Conception, Design, Compilation, Construction, Update and Review of Topographic Maps. Basic principles of creation a "correct" map. Printing and Production of Topographic Maps. Manufacturers / Producers of Maps and Cartographic Data in Greece and Abroad. Categorizations and Types of Maps. Uses of Topographic Maps - Cartometry - Distances in a Map. Other Maps and their Uses. Map and Decision Making. Map and Propaganda. Cartography for Special Categories of Users and Purposes. Cartography and Arts - Media - Advertising. Cartography Research. Topographic Map, Basic Concepts - Accuracy, correctness and reliability of topographic maps. Rendering and cartographic representation of the terrain, rendering and shading techniques of the terrain. Contour lines and terrain. Standards / standardization in the construction of maps. Examples of Greek and foreign maps. Critical presentation and analysis. Pocket maps. Ways to fold maps. Cartographic errors and omissions. Cartography for Special Categories of Users and Purposes. Cartography and cinema. Copyright and legal issues in cartographic production.

The creation of a map. From reality to the map. Mathematics for cartographers. Theoretical and Mathematical Cartography - Cartographic Data. Reference Plane. Coordinate systems in level and space. Coordinate conversions. Coordinate transformations. Two dimensional Helmert transformations (4 parameters). (Shift Transform Turning Transform. Scale Transform). Two dimensional Affine transformation (6 parameters). Basic applications of transformations in cartograph. Sphere Reference. Spherical coordinates. Geographic coordinates. Spherical trigonometry.

Arc length. Loxodrome and orthodrome. Ellipsoid. Coordinate systems in ellipsoid. Radius of curvature. Arc length in ellipsoid. Coordinate systems in the ellipsoid. Theory of cartographic distortions.

Distortions of angles, distances and areas. Scales of linear distortions. Scales of area distortions. Ellipse of distortions. Tissot Theorem.
Basic concepts, types and characteristics of cartographic projections.
Developable surfaces (cylinder, cone & plane).
Classification of cartographic projections. Azimuth projections. Cylindrical projections. Conical projections. Planispheres.
Applications of cartographic representations-projections. Use, select, change of projection.
Geodetic reference systems. Coordinate transformations.
Ellipsoid transformations and geodetic reference system transformations.

Ellipsoid, projections, geodetic reference system and coordinate transformations in Greece.

Maps of military geographic service coverage system in various scales. Other geodetic systems of other map producers in Greece. Map Accuracy. Basic Concepts of Charts and their Use. Coordinate systems in the Greek charts and basic concepts of navigation. Aeronautical maps. Basic concepts of navigation and navigation in aeronautical maps. Cartometry. Methods of cartometry. Tools, methods in cartometry. Coordinates calculation. Distance Classification. Maps and distance problem. Length / distance measurements.
Slopes calculation. Area calculations (in reality and on the map) Volume calculations. Visibility studies. Spatial analysis studies using topographic maps. Basic applications of cartometry in cartography. Map and compass (orientation, navigation techniques, navigation). Map and GPS (combined use).

Laboratory Part - Practice Exercises
Consolidation and practical application of the concepts of cartography (as they are mentioned in the theoretical part): coordinate systems, transformations and coordinate transformations, projections, ellipses, projections and reference systems in Greece. Exercise in recognizing the basic and aesthetic characteristics of a map. Practical understanding of the importance of toponyms and their depiction techniques. Exercise in the illustration of the terrain. Composition of topographic map elements. Analysis of cartographic generalization in topographic maps. Map analysis. Cartometry applications. Basic use of map (topographic, chart). Use of compass, parallel and map. Special issues.

Implementation and automation of calculations and cartographic representations (calculation of distortion scales, implementation of cartographic projections, applications of geometric transformations & applications of mapping methods). Bibliographic search and critical composition work (in the theoretical and practical context of the course). Combined use of compass, map and GPS. Applications of transformations and mathematical applications in cartography.Positioning,, navigation and air navigation with charts and aeronautical maps.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face to face. Use of the Eclass platform (training materials, exercises, data, software, notes, etc.) Distance learning through the Eclass platform, Microsoft Teams, etc. (training materials, exercises, data, software, notes, etc.) • Internet use (search for bibliographic information and geospatial data sources) • Use of the “e-class” platform of UniWA (exchange of course data and digital data between teachers and students) • Use of e-mail • Use of specialized software tools and libraries (commercial and open source) for the management and processing of numerical and geospatial data • Use of office software (copywriters, presentation

<table>
<tr><td></td><td colspan="2">software, spreadsheets)</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">Slides, use of softwares, software, video, use of internet, smart phones, Tablet, GPS / GIS</td></tr>
<tr><td rowspan="11">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>13 X 2 = 26 hours</td></tr>
<tr><td>Seminars (by invited speakers)</td><td>5 hours preparation of questions by groups</td></tr>
<tr><td>Laboratory Exercises / Field Exercises</td><td>2 X 13 = 26 hours + 26 preparation = 52 hours of teaching+preparation</td></tr>
<tr><td>Interactive teaching</td><td>3 hours of preparation</td></tr>
<tr><td>Training visits 5 hours</td><td>5 hours</td></tr>
<tr><td>Elaboration of a group study (project)</td><td>7 hours</td></tr>
<tr><td>Preparation of an individual study</td><td>5 hours (preparation)</td></tr>
<tr><td>Educational presentation of the works</td><td>5 hours</td></tr>
<tr><td>Course preparation / weekly study</td><td>26 hours</td></tr>
<tr><td>Course total</td><td>134 hours</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2"><i>Language of assessment:</i>
<i>Greek or English or French ((for ERASMUS students)</i>
<i>Evaluation methods:</i>
• <i>Written examination at the end of the semester: 60%</i>
• <i>Laboratory Exercises / Field Exercises: 20%</i>
• <i>Personal study and presentation: 20%</i></td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Gretchen N. Peterson , 2012, Cartographer's toolkit – Colours, typography , patterns, PetersonGIS, San Bernardino CA, USA.*
- *Elements of Cartography (6th Edition). 1995. With A. Robinson, J. Morrison, P. Muehrke, A. Kimmerling & S. Guptill. New York: Wiley.*
- *Sandra Lach Arlinghaus , Joseph J. Kerski ,2014, Spatial mathematics-Theory and practice through mapping , Taylor & Francis Group Boca Raton, FL, US.*
-

- Related academic journals:

- *The Cartographic Journal, The World of Mapping- Published on behalf of The British Cartographic Society (BCS)*
  Print ISSN: 0008-7041, Online ISSN: 1743-2774, Journal Impact Factor: 0.424, http://www.maneyonline.com/loi/caj
- *Cartographica (On line Journal)- published by the Canadian Cartographic Association*

http://www.utpjournals.com/Cartographica.html

- *Cartography and Geographic Information Science - published by Taylor & Francis http://www.tandfonline.com/toc/tcag20/current#.U6Fe4dKKBMw*
- *Cartography & Surveying- published by Maney Publishing http://maneypublishing.com/index.php/feature-of-the-month-carto-survey*

- Useful Links

http://www.geography.wisc.edu/histcart/

GEO3060 – Descriptive and Perspective Geometry

COURSE OUTLINE: GEO3060 - DESCRIPTIVE AND PERSPECTIVE GEOMETRY

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
DEPARTMENT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**GEO2120**	**SEMESTER OF STUDIES**	3th
COURSE TITLE	**DESCRIPTIVE AND PERSPECTIVE GEOMETRY**		
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 TEACHIN GHOURS	CREDITS	
Lectures & seminars	2		
Laboratory exercises	2		
Total	**4**	**4**	
COURSE TYPE	Field of Science		
PREREQUISITE COURSES:	Typically, there are not prerequisite courses. Essentially, the students should possess knowledge of 3D Euclidian Geometry		
TEACHING AND ASSESSMENT LANGUAGE:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	NO		
COURSE WEBPAGE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75		

(2) LEARNING OUTCOMES

Learning outcomes

At the end of the course the students are expected to be in position to design and draw representations of 3D objects by applying scientifically based methods of representation, that are nowadays used by engineers, and not by simply applying practical methods.

In this way the students will be able:

1. To cover adequately the needs of representation of any object on their field of interest.
2. To understand the relationship between a 3D object and its representations on a plane.
3. To realize the methods of creation of any image that appear on a computer screen when CAD programs are used.
4. To understand the geometrical relations in space of the object as well as
5. The geometrical relations between 3D and 2D representation of the objects.

General Abilities

By the end of the course the student would be able to analyze and compose given information.
To enrich his or her inductive reasoning
To adjust in new situations
To work autonomously and in groups

(3) COURSE CONTENT

An overview of the course can be summarized as follows:
A. GENERALLY ABOUT PROJECTIONS
1. Central Projection
2. Parallel Projection
3. Orthogonal Projection
B. METHODS OF REPRESENTATIONS
1. Representation on two planes (Method of Gaspard Monge)
2. Perspective with one, two or three vanishing points
C. APPLICATIONS OF THE METHODS
1. Polyhedrons are represented using the above methods.
2. Representation of geometrical objects with the methods of representation.
3. Transformation of the representation of an object to another means of representation
4. Sections of solids and surfaces
5. Developments
6. Applications of methods of representation on real problems that occur on practicing the profession of Architects.

(4) TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD	Lectures.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	e-class during lectures 3d animated videos are presented. Also special in-house software is introduced
TEACHING ORGANIZATION	
STUDENT ASSESSEMENT	1. Through quick and simple exercises with bonuses given during the lecture. 2. Weekly assignments 3. Final exams (theory and laboratory)

Activity	***Semester Workload***
Lectures	26
Homework	24
Total number of hours for the Course	***50 hours (total student work-load)***

(5) RECOMMENDED LITERATURE

-

In Greek

1. «Descriptive Geometry», George E. Lefkaditis – George M. Exarchacos
2. «Descriptive Geometry», Markatis Stylianos
3. «Descriptive Geometry», Georgiou Dimitris

GEO3070 – PHYSICAL GEOGRAPHY & ENVIRONMENTAL MANAGEMENT

COURSE OUTLINE: GEO3070 - PHYSICAL GEOGRAPHY & ENVIRONMENTAL MANAGEMENT

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Level 6		
COURSE CODE	**GEO3070**	**SEMESTER**	3rd
COURSE TITLE	**PHYSICAL GEOGRAPHY & ENVIRONMENTAL MANAGEMENT**		
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 TEACHINGHOURS**	**CREDITS**
Lectures		3	3
Laboratory exercises		1	1
Total		**4**	**4**
COURSE TYPE	Special background		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75		

(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.

After completing the course, the students will be able to:

- recognize the basic properties of the natural environment and their relation to environmental problems
- understand the main environmental problems and the factors contributing to them in a global context and in Greece
- understand the human – environment interaction
- have knowledge of the measures to resolve environmental problems
- have knowledge of the institutions, legislation and international conventions for environmental management in an international context, with special emphasis to European and Greek environmental legislation
- have knowledge of the Environmental Impact Assessment (EIA) process and recognize the environmental impact of proposed projects

- participate in multidisciplinary EIA teams

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
- Working independently or team work
- Respect for the natural environment

(3) SYLLABUS

1. Environmental problems in a global context and in Greece
2. Environmental data sources
3. Atmosphere -air pollution - mitigation measures for air pollution
4. Elements of meteorology - Climate change, international conventions for climate change
5. Elements of hydrology - water adequacy and quality -water pollution - water resources management, wastewater treatment facilities
6. Soil composition, formation and classification - soil degradation, waste management
7. Fossil fuel and the depletion of energy resources, energy efficiency, renewable energy sources
8. Ecosystems and protected areas (wetlands, forests, European network of protected areas NATURA 2000)
9. Legislation-Environmental Impact assessment
10. European environmental policy

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>Powerpoint for presentations, the course website (e-class) for uploading course material and students' assignments. Statistical analysis software as well as Geographic Information Systems software are used for teaching and carrying out exercises and projects.</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Laboratory practice</td><td>33</td></tr>
<tr><td>Study and analysis of bibliography</td><td>40</td></tr>
<tr><td>Course total</td><td>125</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek
Methods of evaluation:
Final exam (70%) which includes open- ended questions
Laboratory work (30%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

In Greek:

1. Vavizos G., Bendali Fr. and Veriopoulos G. 2008. Manual of natural environment research, Papassotiriou, Athens.
2. Vouvalidis K. 2011. Physical Geography, Disigma publishing, Thessaloniki.
3. Georgopoulos A., Nikolaou K., Dimitriou, A. Gavrilakis C. and Blionis G. 2014. Earth: a small and fragile planet, Gutenberg, Athens.
4. Themelarou S., Panetsos L., Panetsos S. 2009. Environment, Tziolas publishing, Thessaloniki.
5. Tyler Miller G. and Spoolman S. E.2018. Environmental Science 15th edition, Tziolas publications, Thessaloniki.
6. Wright, R.T. and Boorse, D.F. 2013. Environmental Science. Toward A Sustainable Future, 11th Edition, Parissianou publishing, Athens.

In English:

1. De Blij H. J., Muller P. O., Burt J.E. and Mason J. A. 2013. Physical Geography: The Global Environment, Oxford University Press.
2. Strahler A.H., 2013. Introducing Physical Geography, 6th edition, John Wiley.
3. Glasson J., Therivel R. and Chadwick A. 2005. Introduction to Environmental Impact Assessment, 3rd Edition, Routledge.
4. Holden J. 2017. An Introduction to Physical Geography and the Environment, 4th Edition Pearson, Harlow, England.
5. Lemmens M. 2011. Geo-information: Technologies, Applications and the Environment,

Springer

6. Russo M. 2008. Environmental Management: Readings and Cases, 2nd Edition, Sage Publications.

- Related academic journals:

1. Journal of Environmental Management, Elsevier
2. Environmental Management, Springer

4th Semester

GEO4010 – PHOTOGRAMMETRY I (Introduction to Photogrammetry)

COURSE OUTLINE: GEO4010 – PHOTOGRAMMETRY I (Introduction to Photogrammetry)

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 6		
COURSE CODE	**GEO4010**	**SEMESTER**	4th
COURSE TITLE	**GEO401 Photogrammetry I (Introduction to Photogrammetry)**		

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 Labs	4(2/2)	5
TOTAL	**4**	**5**

COURSE TYPE	Special Background
PREREQUISITE COURSES	No prerequisite courses. However, it is suggested to be taken after completion of courses *Analytic Geometry*, *Linear Algebra & Matrices*, *Error Theory & Adjustment of Observations I*, *Programming Techniques & Algorithms.*
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
OFFERED TO *ERASMUS* STUDENTS	Can be taught in English
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

The course has a double purpose. First, the students should learn the basic task of a photogrammetric process and to become familiar with the whole range of current applications of Photogrammetry, its importance for engineering projects and its synergy with other methods for collection and processing of 3D information. Second, they should comprehend the basic concepts and the fundamental problems of photogrammetry, fully grasp the geometry of the image and its distortions, understand the geometry of the stereopair, learn to assess the expected accuracy of the outcome of a photogrammetric procedure and, finally, be able to apply this knowledge in practical exercises implementing and evaluating certain metric image-based applications. Thus, this course is at the same time then necessary background for the next two compulsory photogrammetric courses.
After completing the course, the students:

- Have fully understood the specific character of the scientific-technological field of photogrammetry and its connection to other data collection techniques used by the surveying and geomatics engineer (remote sensing, geodesy);

- Can adequately handle the basic concepts involved in image geometry (perspective projection), having at the same time understood the basic sources of error and the revalnt correcting techniques;
- Have well comprehended the basic photogrammetric methodology (single-image/stereoscopic) for reconstructing 3D space, thus being able to adapt it for particular cases;
- Are trained in the practical application of the concepts taught so that may combine the theoretical background with the production and evaluation of concrete results;
- Hence are in position to address in practice the fundamental photogrammetric tasks (camera calibration, space resection and intersection, relative and absolute orientation) and perform relatively simple single or double image metric tasks;
- Are capable, using the knowledge from previous courses on programming and least squares adjustments, to implement program code for solving fundamental problems;
- Have all background knowledge to comfortably follow the next compulsory courses *Photogrammetry II* and *Photogrammetry III*.

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?

- Working independently
- Production of free, creative and inductive thinking
- Able for criticism and self-criticism

(3) **SYLLABUS**

Introduction to photogrammetry and its importance for surveying and geoinformatics. Historic development, categorization, application fields, photogrammetric products. Analogue and digital images. Central projection and its properties. Scale of nadir images, displacement due to relief, image vanishing points. Cameras and platforms for photogrammetric recording. Image and space reference systems. 2D and 3D linear coordinate transformations. Rotation matrices. Image coordinate measurements. Ground control. Interior image orientation. Correction of image coordinates, lens distortions. Exterior image orientation. The collinearity condition as mathematical model of central projection. Scale of oblique images. Fundamental photogrammetric problems. Photogrammetric space resection – photogrammetric space intersection – camera calibration. Geometry of the stereopair – normal case of the pair. Longitudinal and lateral overlap. Stereoscopic parallax and stereoscopic viewing. Analytic orientations of the stereopair. Coplanarity condition. Relative and absolute orientation of the stereopair. Basic earlier principles of photogrammetric instruments. Single-image photogrammetry. Rectification of planar objects.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>- Support by the electronic asynchronous course platform <i>eclass</i> (exchange of information and digital data between tutors and students
- Use of electronic material as teaching aid (ppt slides).
- Solution of photogrammetric problems using <i>Matlab</i>.</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Laboratory / Exercises</td><td>26</td></tr>
<tr><td>Preparation of Exercises</td><td>36</td></tr>
<tr><td>Non-directed study</td><td>62</td></tr>
<tr><td>Course total</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek
Methods of Evaluation:
• Written examination in the end of the semester (70%), which combines open-ended questions and numeric calculations.
• Evaluation of performance in the Lab exercises (30%)</td></tr>
</table>

(5) SUGGESTED BIBLIOGRAPHY

1. Mikhail E.M., Bethel J.S., McGlone J.C., 2001. *Introduction to Modern Photogrammetry*. John Wiley & Sons, Inc., New York
2. Wolf P.R., DeWitt B.A., 2000. *Elements of Photogrammetry with Applications in GIS*. McGrawHill, New York.

In Greek:

1. Dermanis A., 1991. *Analytic Photogrammetry*. Ziti Editions, Thessaloniki.
2. Kraus K., 2003. *Photogrammetry.* Vol 1. TEE Editions, Athens.
3. Patias P., 1991. *Introduction to Photogrammetry*. Ziti Editions, Thessaloniki.

Petsa E., 2000. *Fundamental Concepts and Fundamental Problems of Photogrammetry*. Course Notes, UniWA, Athens.

GEO4020 – SURVEYING NETWORKS AND COMPUTATIONS

COURSE OUTLINE: GEO4020 - SURVEYING NETWORKS AND COMPUTATIONS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO4020**	**SEMESTER**	4th
COURSE TITLE	**SURVEYING NETWORKS AND COMPUTATIONS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	3
Laboratory exercises	1	1
Total	**4**	**4**

COURSE TYPE	Specialized general
PREREQUISITE COURSES:	No prerequisite courses needed
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr /courses/TOP117

(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.

The aim of this course is the achievement of theoretical background and practical knowledge of the planning, establishment and measure of surveying networks, the pre-processing of the observations, the adjustment and the testing of the horizontal and vertical control networks.

Basic course goals:

- Planning of surveying networks based on quality criteria
- Establish and measure surveying networks
- Network development based on specific methodologies
- Optimal combination of data and accurate coordinate estimation
- Accuracy assessments
- Statistical testing of observations
- Adjustment validation
- Final adjustment in GGRS87 – Measurement reductions

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*
- *Decision-making*
- *Working independently*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

Survey networks, basic definitions. Establishment of survey networks and measurement procedures. Method for an efficient network point installation. Network observations. Horizontal angles, bearings, distances, height differences. Observation pre-processing. Accuracy requirements. Station adjustment. Angle reductions. Distance reductions. Spirit leveling observations. Observation pre-processing and accuracy assessment. Instruments choice based on Hellenic regulations. Observations of vertical angles. Network planning and adjustment. Adjustment based on observation equations model. Quality validation of horizontal networks. Accuracy estimation. Adjustment and quality check of vertical control networks. Network planning using quality criteria. Internal and external validation of topographic networks.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td rowspan="1">DELIVERY.</td><td colspan="2">Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">e-class, software development, communication with students through e-class</td></tr>
<tr><td rowspan="5">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory practice</td><td>13</td></tr>
<tr><td>Study and analysis of bibliography</td><td>68</td></tr>
<tr><td>Course total</td><td><i>120</i></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">The final course evaluation is based on written examination (70%) and laboratory work (30%)

Language of evaluation: Greek (English if needed, e.g., Erasmus+ students)

Written examination with short-answer questions, problem solving and laboratory work</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

- *Baarda W., 1967. Statistical Concepts in Geodesy. Netherlands Geodetic Commission, Publications on Geodesy, New Series, Vol. 2, No. 4, Delft.*
- *Hazay I., 1970. Adjusting Calculations in Surveying. Akademiai Kiado, Budapest.*
- *Kuang S., 1996. Geodetic network analysis and optimal design: Concepts and Applications. Sams Publications, Sterling, IL.*
- *Mackenzie P. A., 1985. Design and Assessment of Horizontal Survey Networks. The University of Calgary.*
- *Vanicek P., Krakiwsky E., 1992. Geodesy: The Concepts. Elsevier, New York.*

- *Related academic journals:*

- Journal of Geodesy
- Journal of Geodetic Sciences
- IAG Series publications

GEO4030 – THEMATIC CARTOGRAPHY

COURSE OUTLINE GEO4030 - THEMATIC CARTOGRAPHY

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO4030**	**SEMESTER**	4th
COURSE TITLE	**Thematic Cartography**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		3	3
Project		1	2
Total		**4**	**5**
COURSE TYPE	General background [obligatory]		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75 https://eclass.uniwa.gr/courses/TOP132/		

(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.

The course aims students to get acquainted with the principles of Cartography. Rules and methodologies in thematic map design are presented. Students get familiar to collection, modification and presentation methods of thematic cartographic facts of the real world. Students also develop skills on composition and representation.
After course's successful completion, students are expected to:

- Know the theoretical background and principals of cartography, the specific rules of thematic cartography, to recognize, evaluate and classify cartographic sources and data
- To comprehend fundamental definitions of graphic semiology and to implement optic and conceptual equilibrium rules on thematic cartographic symbology
- To comprehend and the function and to implement methods of concurrent information systems and software, in the field of thematic cartographic representation

- To analyze the needs of the potential map-reader and to decide over the type of the cartographic basemaps and data that would be used for thematic representation, to decide over data management and to implement the best-fitting technical processing methods for their transformation to cartographic information
- To correlate the available cartographic information/data to the cartographic synthesis scope and the represented geographical projects and to decide over the appropriate cartographic symbology
- To produce integrated thematic cartographical representations using digital cartographic data and state-of-the-art cartographic software and GIS, to implement cartographic analysis methods, so as to interpret spatial distributions and identify spatial patterns
- To evaluate analysis results, to perform comparative analysis and to conduct relevant technical reports and documentation on the results of cartographic approach in spatial phenomena and problems
- To elaborate with other students in project elaboration and oral presentation

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, analysis and synthesis of data and information, with the use of the necessary technology
- Adaption to new work conditions
- Decision-making
- Independent work
- Team work
- Self-evaluation
- Free, creative and inductive thinking

(3) **SYLLABUS**

i. Introduction. Historic review. Geographic space perception. Fundamental characteristics of maps. Maps types and classification. Maps Use. Concurrent context. Technical developments and prospective
ii. Introduction to Thematic Cartography. Cartography and thematic representations. Cartographic communication and thematic cartography. Thematic maps use. Applications. Cartographic, basemaps. Cartographic generalization and classification. Map scales and dimensional issues. Cartographic models and geographical data models
iii. Cartographic information. Data and sources. The topographic nature of cartographic data. Spatial continuity and geometry. Cartographic data sources. Classification and evaluation methodologies. Geographic phenomena and representation models. Data and geographical variables types and classification. Geographical reference units. Geographical data measurement. Scales and measurement levels. Basic statistical prossesing.
iv. Graphical semiology. Cartographic data visual organization. Components. Visual variables. Visual balance. Visual balance rules. Design principles. The use of color. Dimensions of color. Color models. Organizational issues of cartographic and thematic content. Nomenclature and typography.
v. Thematic mapping and Symbolization. Qualitative distinction of geographic data. Symbols of qualitative and ranked data referred to areas, points and lines.
vi. Quantitative Data. Continuous Phenomena - Isarithmic maps - Statistical Surfaces. Symbolization of absolute and grouped values. Proportional Symbols. Dot maps. Chartograms. Choropleth maps, classification and grouping values. Accuracy of choropleth maps. Quantitative data on lines. Combining data and spatial relationships.
vii. Cartographic production. Cartographic composition. Completeness and components. Preparatory procedures. Design of thematic maps. Graphical elements of cartographic composition. The geometry of the graphic page. Auxiliary frames and lines. Presentation of thematic content. Legends. Orientation and Scales. Coordinate systems and cartographic grid. Text elements.
viii. Cartographic Atlases. National, school, special purpose maps and digital atlases. Thematic maps and multimedia. WEB-GIS and mapping applications.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (legislation and literature review) • E-class UNIWA platform and office Microsoft 365 UNIWA tools (TEAMS, Class Notebook, Shared docs, email) • GIS and CAD software • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Evaluation Language: Greek (English) Evaluation methods: • Written exam (winter or September exams period) • Exercises evaluation • Individual project evaluation Team project evaluation

Activity	*Semester workload*
Lectures Theory	40
Exercises	20
Individual projects	35
Team project	30
Home study	25
Course total	***150***

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Arlinghaus, S.L. 1996. Practical Hand Book of Spatial Statistics. CRC Press.

2. Bertin, J. 1983. A new look at Cartography: Graphic communication and design in contemporary Cartography.

3. Bertin, J. (1983). The Semiology of Graphics, University of Wisconsin Press, Madison.

4. Brewer C.A., 2005. Designing Better Maps: A Guide for GIS Users, ESRI, pp. 220

5. Cuff, J.D., Mattson, T.M., 1982, Thematic maps. Their design and production., Methuen, London

6. Dent, B., 1990. Cartography: Thematic Map Design. Wm.C.Brown Publishers, Dubuque U.S.A.

7. Longley, P., Goodchild, M., Maguire, D., Rhind, D. 2001. Geographic Information Systems and Science. John Wiley& Sons, New York. 8. MacEachren, A., 2008, How Maps Work: Representation, Visualisation and Design, Guilford Press 5

9. Robinson, A. H., Sale R. D., R. D., Morrison, J. and Muehrcke, P., C. (1995) Element of Cartography, (VIth Ed.)J Wiley, New York.

10. Slocum, A. T., 2009, Thematic Cartography and Geographic Visualization, Pearson Prentice Hall

International Cartographic Association: http://icaci.org/ GeoVISTA Center: - http://www.geovista.psu.edu/ http://www.askmaps.com/001/ http://www.lib.utexas.edu/maps/thematic.html
Milestones in the History of Thematic Cartography: http://www.datavis.ca/milestones

http://www.geodata.gov.gr
(INSPIRE):
http://europa.eu/legislation_summaries/environment/general_provisions/l28195_el.htm
The INSPIRE geoportal: http://inspire-geoportal.ec.europa.eu/
Joint Research Centre - JRC - European Commission: https://ec.europa.eu/jrc/en/about
Environmental Systems Research Institute: http://www.esri.com/

- Related academic journals:
Journal of Maps: http://www.journalofmaps.com
Cartography and Geographic Information Science:
http://www.cartogis.org/publications/journal.php
MDPI Land

GEO4040 – URBAN HYDRAULIC WORKS

COURSE OUTLINE: GEO4040 - URBAN HYDRAULIC WORKS

(6) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
DEPARTMENT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**GEO4040**	**SEMESTER OF STUDIES**	4th
COURSE TITLE	**URBAN HYDRAULIC WORKS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures & seminars	2	
Laboratory exercises	2	
Total	**4**	**4**

COURSE TYPE	Field of Science
PREREQUISITE COURSES:	Typically, there are not prerequisite courses.
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	no
COURSE WEBPAGE (URL)	https://eclass.uniwa.gr/courses/TOP130/

(7) 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.

At the end of the course the students are expected to be in position to:

1. Have a comprehensive understanding of key principles of fluid mechanics
2. Be able to use methods and formulas to solve problems involving fundamental fluid mechanics
3. Be able to deploy mathematical methods for the analysis and design of pipe systems
4. Be able to estimate water needs for human communities
5. Know how to read and prepare technical drawings related to water networks.
6. Prepare technical reports that are well organised and effectively communicate all key information

General Abilities

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?

By the end of the course the student would be able to analyze and compose given information.

To enrich his or her inductive reasoning

To work autonomously and in groups

(8) COURSE CONTENT

This course investigates fundamental fluid properties and introduces the fundamental principles of static and dynamic fluid mechanics and their applications to solve typical engineering problems. In short, the following concepts are being taught: The Archimedes's principle, hydrostatic law and forces on submerged bodies, Pascal's law, Toricelli's principle, Bernoulli's law and the conservation of energy. The course covers the design and analysis of pressure pipe networks in more detail. Darcy - Weissbach's and Hazen-Williams' formulas are employed. In these engineering problems, inter-connecting pipes, reservoirs and pumps are used to transport fluids, e.g. oil or water, at specified (steady) flow rates and pressures. It also investigates energy losses in pipes as well as in pipe fixtures and fittings (Reynold's number, Moody's diagram).

The main exercise assignment consists of the use of a mathematical model of pressure flow (two Matlab files) for the investigation of the interplay between discharge, pressure, velocity and losses in pipe flow.

The semester's project consists of the design of a pressure water network for a small municipality together with the necessary drawings.

(9) TEACHING AND LEARNING METHODS - ASSESSMENT

<table>
<tr><td>DELIVERY</td><td>Lectures.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>e-class
Also special in-house software (Excell VBA) is introduced for the solution of the Hardy-Cross method.
ppt presentations
Matlab files and diagrams</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester Workload</i></th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Homework</td><td>24</td></tr>
<tr><td><i>Total number of hours for the Course</i></td><td><i>50 hours (total student work-load)</i></td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>1. Through quick and simple applications with bonuses given during the lecture.
2. Weekly exercise assignments/ Main exercise assignment
3. Semester's Project
4. Final exams</td></tr>
</table>

(10) ATTACHED BIBLIOGRAPHY

In Greek

- ΥΔΡΑΥΛΙΚΗ 2 τόμοι, Daugerty – Franzini. Εκδόσεις Φούντας
- *Στοιχεία Φυσικής Υδρολογίας*, G. Hornberger et al. Εκδόσεις ΔΙΣΙΓΜΑ, 2019. Μετάφραση-Επιμέλεια Σ.Η.Καραλής
- Τερζίδης, Γ.Α., «Μαθήματα Υδραυλικής 2:Κλειστοί Αγωγοί», Εκδόσεις Ζήτη, Θεσσαλονίκη, 1997.
- Κωτσόπουλος Σ., «Υδρεύσεις», Εκδόσεις Ίων, 2013.

Periodicals

- International Journal of Hydropower & Dams, Aqua Media International, Ltd.
- Water Science and Technology: Water Supply, IWA Publishing

GEO4050 – ANALYTICAL CARTOGRAPHY

COURSE OUTLINE: GEO4050 - ANALYTICAL CARTOGRAPHY

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO4050**	**SEMESTER**	4th
COURSE TITLE	**ANALYTICAL CARTOGRAPHY**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	4
Lab exercises	1	1
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	-- Preferred prerequisite knowledge: *General Cartography, Informatics & Programming, Programming techniques & algorithms*
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

The course aims to present analytical methods applied in cartography. Specifically, the course consists of several sections, including basic principles of cartographic projections, geometrical transformations, cartometry methods, hill shading and relief representation methods, and principles of cartographic generalization. The course combines both the theoretical and the practical knowledge required towards the understanding and the application of the aforementioned sections, using (among others) modern digital tools for the implementation of mathematical computations as well as computer programming and automatization techniques.

The course includes both theoretical lectures and lab exercises aiming at the complete under-standing of the mathematical tools which are used in Cartography and consist the basis for the support of the contemporary cartographic applications and systems. The acquired knowledge helps students to be fully aware regarding the geometric/mathematical principles connected to map utilization process, enhancing substantially at the same time their back-ground in one of the most fundamental fields (Cartography) in the science of surveying and geoinformatics engineering.

Based on the sections designed for the support of the course, the theoretical and the practical elements, which are comprehended in the framework of the course, are related to:

a. basic principles of cartographic projections

b. map projection systems

c. basic geometric transformations

d. traditional and probabilistic methods in cartometry

e. analytical relief representation and hill shading methods

f. geometrical operators and algorithms for cartographic visualization

After the successful completions of the course, students acquire a set of knowledge and skills that allow them to understand the function and apply analytical cartography methods, in both digital and analog environment.

At the same time, the theoretical approaches and the practical implementation of analytical cartography methods taught in the course help students in the upcoming academic semesters, as well as for the elaboration of diploma theses in the fields of Cartography and Geographic Information Systems.

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
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) **SYLLABUS**

Theoretical part of the Course

11.Basic principles of cartographic projections:
- Cartographic reference systems
- Coordinate systems
- Distortions of basic measures
- Linear distortion scales
- Areal distortion scales
- Ellipse of distortion
- Tissot’s theorem

12.Map projection systems:
- Basic principles of systems
- Developable surfaces (cylinder, cone, & plane)
- Basic classification of map projections (normal, transverse, & oblique)
- Map projections classification based on distortions (conformal, equal-area, & equidistant)
- Normal projections
- Transverse projections
- Oblique projections
- Map projections applications
- Map projection systems in Greece

13.Basic geometric transformations:
- Translation
- Rotation
- Scale
- Similarity
- Affine
- Projective
- Basic applications in cartography
- Conversions among projection systems

14.Elements of Cartometry:
- Basic classification of cartometry methods (traditional & probabilistic)
- Lengths measurements
- Areas measurements
- Analytical methods for areas calculation
- Methods for volumes calculation
- Error estimation methods and errors propagation law
- Basic applications in cartography

15.Relief representation and hill shading:
- Hypsometric cartographic information representation
- Triangulated Irregular Network (TIN)-based Digital Elevation Models (DEMs)
- Grid-based DEMs
- Basic principles of hill shading
- shading algorithms

- applications of relief representation and hill shading methods

16.Cartographic generalization:

- Basic principles of cartographic generalization
- Geometrical operators of cartographic generalization
- Analytical algorithms of cartographic generalization (independent points, local, & global processing)

Lab Part of the Course

- Practical exercises on the computations, automatizations (using both mathematical software and computer programming techniques) and representation methods applied in analytical cartography (computations of distortion scales, generation of cartographic projections, applications of geometric transformations, & applications of cartometry methods)
- Literature review exercises (based on both the theoretical and the practical parts of the course)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Email • Specialized software and libraries (both commercial and open source) for the manipulation and editing of numerical and geospatial data • Source code editors • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) • Homework (practical exercises on both theoretical and practical objectives related to the course)

Teaching methods:

Activity	***Semester workload***
Lectures	39 (13 X 3)
Study and analysis of bibliography	39 (13 X 3)
Laboratory practice	52 (13 X 4)
Lab exercises	13 (13 X 1)
Educational visits	7 (1 X 7)
Course total	**150**

(5) ATTACHED BIBLIOGRAPHY

12. Bugayevskiy, L. M., & Snyder, J. P. (1995). Map projections: a reference manual, London: Taylor and Francis.
13. Grafarend, E. W., & Krumm, F. W. (2014). Map projections. Berlin–Heidelberg: Springe.
14. Karras G., (1995). Linear coordinates transformations in Photogrammetry, Lectures notes, Department of Rural & Surveying Engineering, National Technical University of Athens.
15. Maling D.H., (1989). Measurements from Maps: Principles and Methods of Cartometry. New York: Pergamon Press.
16. Nakos, B., (2015). Analytical Cartography (In Greek). [ebook] Athens:Hellenic Academic Libraries Link. Available Online at: http://hdl.handle.net/11419/2233.
17. Robinson, A.H., Morrison, J.L., Muehrcke, P.C., Kimerling, A.J. & Guptill, S.C. (2002). Elements of cartography (In Greek.) (Kavouras, M., Nakos, B., Tsoulos, L., Filippakopoulou V., & Tomai E. trans.), Zographos: NTUA publications.

18. Snyder, J. P., & Voxland, P. M. (1989). An album of map projections (No. 1453). US Government Printing Office.
19. Tsoulos, L., Skopeliti, A., & Stamou, L. (2015). Cartographic composition and production in digital environment (In Greek). [ebook] Athens:Hellenic Academic Libraries Link. Available Online at: http://hdl.handle.net/11419/2506.

GEO4060 – ENGINEERING MECHANICS

COURSE OUTLINE: GEO4060 - ENGINEERING MECHANICS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO4060**	**SEMESTER**	4th
COURSE TITLE	**ENGINEERING MECHANICS**		

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	
Exercises/ tutorials	1	
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	Preferred prerequisite knowledge: *mathematics and basic science*
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

This is a 2-in-1 course that combines mechanics of rigid bodies (statics I) and mechanics of deformable bodies (strength of materials). The successful completion of the course allows students to:

- Understand the effect of forces and stresses
- Apply the principles of mechanics to different materials
- Develop problem solving skills through application of these principles to basic engineering problems
- Become familiar with the stress-strain curves, the mechanical behavior of materials, and therefore with the different types of simple stresses and with basic tests to determine the strength of materials.
- Acquire background knowledge and experience in mechanics of materials (necessary for further studies in structures; soil mechanics, statics)

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
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

- Introductory terms and definitions & elements of vector algebra
- Equilibrium of rigid body
- Local constraints and degrees of freedom - loading
- Forces and moments
- Beam analysis and reactions
- Trusses and frames analysis and reactions
- Geometry of cross sections
- Concept of Stress and strain
  Pure Bending
- Torsion
- Buckling and buckling behavior of columns
- Analysis and Design of Beams for Bending
- Shear and axial force diagrams
- Bending moment diagrams
- Gerber beams

Lab Part of the Course

-

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Videos • Email • Office software (word, presentations, spreadsheets editors)	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	52 (13 X 4)
	Study and analysis of bibliography	52 (13 X 4)
	Laboratory practice	-
	Lab exercises	-
	Educational visits	-
	Course total	**104**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written test mid- semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) accounting for 20% • Written test end of semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) accounting for 80%	

(5) ATTACHED BIBLIOGRAPHY

20. Aifantis Ch. 2010 (in Greek) “Introduction tp the strength of materials and rigid body mechanics”, GRAPHOLINE.
21. Beer, Johnston, DeWolf, Mazurek. 2014 “Mechanics of materials”, 7th edition, McGraw Hill.
22. Lecture notes

GEO4070 – Remote Sensing I

(11) GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate – Level 6		
COURSE CODE	GEO 407	**SEMESTER OF STUDIES**	**4th**
COURSE TITLE	**REMOTE SENSING I**		

INDEPENDENT TEACHING ACTIVITIES *in case the credits are awarded in discrete parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and the total credits*	**WEEKLY HOURS DIDASKALIAS**	**CREDIT UNITS**
Lectures	3	4
Laboratory Exercises	1	1
TOTALS	**4**	**5**
Add rows if needed. The organisation of teaching and the teaching methods used are described in detail in (d).		

TYPE OF COURSE *general background, specific background, specialization* *general knowledge, skills development*	Compulsory
PREREQUISITE COURSES:	No pre-required courses
C.LAUSSA OF TEACHING AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes (English)
ONLINE COURSE PAGE(URL)	https://eclass.uniwa.gr/courses/GEO407/

(12) LEARNING OUTCOMES

Learning Outcomes

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that students will acquire after the successful completion of the course.

Consult Annex A

- *Description of the Level of Learning Outcomes for each course of study according to the Qualifications Framework of the European Higher Education Area*
- *Descriptive Indicators of Levels 6, 7 &8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Summary Guide to writing Learning Outcomes*

After the end of the course, students will have understood the following:

- Introduction to the basic concepts of Electro-Magnetic radiation and the physical laws of its interaction with matter and atmosphere.
- Description of digital remote sensing data
- Description of the principles of satellite navigation
- Reporting of key earth observation programmes by research and commercial satellites
- Princples for the recognition, pre-processing and improvement-correction of digital images
- Basic principles and description of multi-spectral images, thermal infrared and radar
- Introduction to digital image analysis software

General Competencies

Taking into account the general skills that the graduate must have acquired (as these are listed in the Diploma Supplement and listed below) which / which of them is the subject of the course intended for?.

Search, analysis and synthesis of data and information, using the necessary technologies

Adaptation to new situations

Decision-making

Autonomous work

Teamwork

Working in an international environment

Working in a multidisciplinary environment

Production of new research ideas

Project planning and management

Respect for diversity and multiculturalism

Respect for the natural environment

Demonstration of social, professional and moral responsibility and sensitivity to gender issues

Criticism and self-criticism

Promoting free, creative and inductive thinking

……

Other…

…….

- *Search, analysis and synthesis of data and information, using the necessary technologies*
- *Decision-making*
- *Autonomous work*
- *Teamwork*

(13) COURSE CONTENT

Theoretical Part of the Course

Basic principles of Electro/Magnetic (E/M) radiation (laws, interactions of electromagnetic radiation with the atmosphere and the surface of the Earth, spectral signatures). Pre-processing of digital image (Geometric deformations, geo-reference, atmospheric and radiometric correction). Methods of image enhancement (Histogram, filters); basic concepts of image sorting. Presentation and description of digital remote sensing data (multispectral sensors, visible/infrared, thermal infrared, Radar, Lidar). Inking/geometry of satellite systems. Space programmes and Earth Observation sensors (Sentinel, Landsat, IKONOS, QuickBird, Worldview).

Laboratory Part of the Course

Use of specialized software (e.g. ENVI), Reading and description of multispectral data of digital imagery. Histogram, geometric, radiometric and atmospheric corrections. Image improvement methods.

(14) TEACHING AND LEARNING METHODS - EVALUATION

<table>
<tr><td>WAY OF DELIVERY
<i>Face to face, Distance learning, etc.</i></td><td>Face to face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES Use of
<i>TEIs in Teaching, Laboratory Education, Communication with students</i></td><td>Lectures: Use of ICT (power point presentations)
Laboratory exercises: use of specialized software for the analysis of digital image data.
Communication: use of asynchronous tele-education platform-eclass</td></tr>
<tr><td>TEACHING ORGANIZATION
<i>The way and methods of teaching are described in detail.</i>
<i>Lectures, Seminars, Laboratory Exercise, Field Exercise, Study & Bibliography Analysis, Tutorial, Practical (Placement), Clinical Exercise, Art Workshop,</i>Interactive Teaching, Educational Visits, Project,<i>Project, Writing a Project, Writing a Paper, Artistic Creation, etc.</i>
<i>The student's study hours for each learning activity are listed, as well as the hours of a non-guided study according to the principles of ECTS</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester Workload</i></th></tr>
<tr><td>Lectures</td><td>60</td></tr>
<tr><td>Study & analysis of bibliography</td><td>60</td></tr>
<tr><td>Laboratory Exercises</td><td>30</td></tr>
<tr><td>Total Course</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT EVALUATION
<i>Description of the evaluation process</i>
<i>Evaluation Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report/ Report, Oral Examination, Public Presentation, Laboratory Thesis, Clinical Examination, Clinical Examination, Artistic Interpretation, Other/</i></td><td>• Multiple-choice final written exam and development questions(70%)
• <u>Laboratory Exercises(30%)</u></td></tr>
</table>

Other *Explicitly defined assessment criteria are mentioned and if and where they are accessible to students.*	Language of the examination: Greek (English if needed, e.g., Erasmus+students)

(15) RECOMMENDED BIBLIOGRAPHY

Greek:

1. Skianis Eim. G., Nikolakopoulos G. K., Vaiopoulos A. D. 2012. "Remote Sensing" ION Publications 336sel.
2. Kartalis K., C., 2007, Fidas, "Principles & Applications of Satellite Remote Sensing", V. Gkiourdas Ekdotiki, Athens.
3. Mertikas S.P., 2006, "Remote Sensing and Digital Image Analysis", ION Publications

English:

1. Campbell J.B., 2006. *Introduction to Remote Sensing*, The Guilford Press, New York.
2. Cracknell A.P., L. Hayes, 2007. *Introduction to Remote Sensing*, CRC Press.
3. Jensen J.R., 2005. *Introductory Digital Image Processing: A Remote Sensing Perspective*. Prentice Hall.
4. Mather P., 2004. *Computer Processing of Remotely Sensed Images: An Introduction*. Wiley.
5. Schowengerdt R.A., 2006. *Remote Sensing: Models and Methods for Image Processing*, Academic Press.

5th Semester

GEO5010 – GEOMETRICAL GEODESY

COURSE OUTLINE: GEO5010 - GEOMETRICAL GEODESY

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO5010**	**SEMESTER**	5th
COURSE TITLE	**GEOMETRICAL GEODESY**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	4	4
TOTAL	**4**	**4**

COURSE TYPE	Specialized general
PREREQUISITE COURSES:	No prerequisite courses needed
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr /courses/TOP103

(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.

The aim of this course is the study of the shape of the earth, the ellipsoidal model and its geometry, the basic geodetic problems. Observations, reference systems and coordinates. Geodetic datum. Observation reductions. Coordinates and datum transformations. Introduction to Physical and Space Geodesy. Geodetic networks. Applications.

Basic course goals:

- Basic geodetic applications in earth’s ellipsoidal model
- Geodetic reference systems and ellipsoid geometry
- Reference surfaces in Geodesy
- Coordinates estimation and transformation in various datums
- Estimation and assessment of geodetic transformation parameters
- Horizontal and Vertical datum
- Observations reductions to the ellipsoid or the map

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*
- *Decision-making*
- *Working independently*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

Historical aspects of Geodesy. Reference surfaces (sphere, ellipsoid, geoid). Point positioning. Earth motion (revolution, polar motion). Best fitting of an ellipsoid to the geoid surface. Geocentric ellipsoid, geodetic ellipsoid. Ellipsoidal parameters. Reference systems. Geodetic Cartesian and ellipsoid coordinates. Geocentric and geodetic reference systems, local astronomical (physical) and geodetic system. Deflection of the vertical. Coordinate transformations. Geodetic datum definition. Inertial and celestial reference systems. Time systems (solar, sidereal time, UTC, GPS time). Astronomical latitude and longitude. Ellipsoidal geometry. Radii of curvature. Meridian arc length. Parallel arc length. Lines on the ellipsoid. Normal section. Geodesic. Observation reductions to the ellipsoid. Plumb line and vertical. Angle and distance reductions. Geodetic networks. Observation equations on the ellipsoid. Geodetic network adjustments. Physical Geodesy. Height systems. Introduction to Earth’s gravity field. Gravity potential and gravity acceleration. Equipotential surfaces and the geoid. Mean Sea Level. Gravity field approximations. Geoid estimation methods. Combination of heights (N, h, H).

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	e-class, software development, communication with students through e-class
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity*** / ***Semester workload*** Lectures: 52 Laboratory practice: 48 Study and analysis of bibliography: 20 **Course total**: **120**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The final course evaluation is based on written examination with short-answer questions, problem solving and laboratory work Language of evaluation: Greek (English if needed, e.g., Erasmus+ students)

Activity	*Semester workload*
Lectures	52
Laboratory practice	48
Study and analysis of bibliography	20
Course total	**120**

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Bomford G, 1980. Geodesy. 4th Edition. Clarendon Press, Oxford.*
- *Heiskanen W. A., Moritz H., 1967. Physical Geodesy. Freeman & Co, San Francisco.*
- *Torge W., 2001. Geodesy. 3rd Edition. Walter de Gruyter, Berlin.*
- *Vanicek P., Krakiwsky E., 1992. Geodesy: The Concepts. Elsevier, New York.*

- Related academic journals:

- Journal of Geodesy
- Journal of Geodetic Sciences
- IAG Series publications

GEO5020 – PHOTOGRAMMETRY II (Analytical Photogrammetry)

COURSE OUTLINE: GEO5020 - PHOTOGRAMMETRY II (Analytical Photogrammetry)

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 6		
COURSE CODE	**GEO5020**	**SEMESTER**	5th
COURSE TITLE	**Photogrammetry II (Analytical Photogrammetry)**		

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 Labs	4(2/2)	4
TOTAL	**4**	**4**

COURSE TYPE	Specialized general knowledge
PREREQUISITE COURSES	Photogrammetry I It is suggested to be taken after completion of courses *Analytic Geometry*, *Linear Algebra & Matrices*, *Error Theory & Adjustment of Observations I*, *Programming Techniques & Algorithms.*
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
OFFERED TO *ERASMUS* STUDENTS	Can be taught in English
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

Basic purpose of this course, following that of *Photogrammetry I*, is to convey to students the necessary adequate knowledge regarding the processes of image block adjustment (aerial triangulation / phototriangulation) and the processes of reconstruction, particularly those involving the modern photogrammetric systems, the photogrammetric products, the planning of photogrammetric projects as well as their accuracies and specifications. At the same time the students acquire deeper insight and familiarity with the mathematical models and adjustment techniques through which the basic photogrammetric processes are performed.

After completing the course, the students:

- Have got to know the concepts and techniques of modern photogrammetric practice
- Have comprehensive theoretical knowledge regarding bundle block adjustment and photogrammetric 3D reconstruction
- Have been practically familiarized with modern systems and the software of

photogrammetric processing as well as with today's photogrammetric products (DTM, 3D scene models, orthomosaics).
- Are in position to address basic photogrammetric tasks via suitable methodologies and systems or software, by adapting the photogrammetric process to the requirements of each particular project.
- Will be capable to develop algorithms for the application of the above methods.
- Will be in position to design photogrammetric studies taking into account the given accuracy levels and specifications.

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
- Working independently
- Working in an interdisciplinary environment
- Production of free, creative and inductive thinking

(3) SYLLABUS

Review of concepts taught in course *Photogrammetry I*. Digital aerial cameras. Specifications and planning of aerial photography. Image acquisition flights and modern navigation systems for aerial platforms. Analytical photogrammetric algorithms. Direct linear transformation (DLT). Phototriangulation and aerial triangulation. Method of independent models. Multi-image bundle adjustment. Camera self-calibration. Introduction of additional parameters, geodetic constraints GPS observations. The issue of initial values. Specifications of aerial triangulation. Bundle adjustment without ground control (free network). Photogrammetric 3D reconstruction. Early analytical plotters and digital photogrammetric workstations. Today's photogrammetric software. Digital photogrammetric products. Photogrammetric generation of digital elevation and terrain models. Other method for DEM/DTM generation (LIDAR, SAR, terrestrial laser scanners). Surface triangulation. Image orthorectification. Accuracy of photogrammetric products. Greek and international specifications for photogrammetric projects. Photogrammetric processing of high-resolution satellite images – methods and products. Applications of terrestrial photogrammetry.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Support by the electronic asynchronous course platform *eclass* - Use of electronic material as teaching aid (ppt slides). - Solution of photogrammetric problems using *Matlab*. - Use of free and commercial software for Lab exercises.

TEACHING METHODS *The manner and methods of teaching are*	***Activity***	***Semester workload***
	Lectures	26

described in detail. *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*	Laboratory / Exercises	26
	Preparation of Exercises	16
	Non-directed study	52
	Course total	**120**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of Evaluation: • Written examination in the end of the semester (70%), which combines open-ended questions and numeric calculations. • Evaluation of performance in the Lab exercises (30%)	

(5) SUGGESTED BIBLIOGRAPHY

3. Mikhail E.M., Bethel J.S., McGlone J.C., 2001. *Introduction to Modern Photogrammetry*. John Wiley & Sons, Inc., New York
4. Wolf P.R., DeWitt B.A., 2000. *Elements of Photogrammetry with Applications in GIS*. McGrawHill, New York.
5. Graham R., Read R., 2007. *Manual of Aerial Survey: Primary Data Acquisition*. 2nd edition, Whittles Publishing, Scotland, UK

In Greek:

4. Dermanis A., 1991. *Analytic Photogrammetry*. Ziti Editions, Thessaloniki.
5. Kraus K., 2003. *Photogrammetry.* Vol 1. TEE Editions, Athens.

GEO5030 – ROAD GEOMETRIC DESIGN I

COURSE OUTLINE: GEO5030 – ROAD GEOMETRIC DESIGN I

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO5030**	**SEMESTER**	5th
COURSE TITLE	**ROAD GEOMETRIC DESIGN I**		

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 & Individual Exercise (Theoretical part of the Course)	2	
Group Exercise (Lab Part of the Course)	2	
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO192/

(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.

After the successful completion of the course, students will be able to:

- Understand the design process and the degree of detail per stage of study of a road project
- Understand the limitations and commitments under which critical limit values are derived
- Apply basic principles and methods related to safe and functional road design
- Evaluate combinations of critical parameters regarding road design quality
- Solve common problems that occur in the process of geometric road design

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?

After the successful completion of the course, students acquire the following knowledge and skills:

- Search for analysis and synthesis of data and information, with the use of the necessary technology tools
- Teamwork
- Work in an interdisciplinary environment
- Design and project management
- Respect the natural environment
- Production of free, creative and inductive thinking

(3) SYLLABUS

Theoretical part of the Course

17. Hierarchy of road network
18. Selection of Standard Section Based on Circulatory Capacity
19. Vehicle Simulation in Road Construction
20. Vehicle Dynamics
    - Adhesion
    - Promotional Power
    - Braking force
    - Vehicle Movement in Curves
21. Speeding, Safety Criteria
22. Design principles in Horizontal alignment
23. Design in Vertical alignment
24. Design principles of superelevation
25. Cross sections - Lateral Configurations
26. Road Design in Space, Visibility
27. Earthworks
28. Widening - Enlargement

Lab Part of the Course

A series of exercises in the main cognitive objects of the theory, the composition of which results in the design of a road section at the preliminary design level.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	• Face-to-Face • Lectures - interactive teaching in the classroom • Encouraging students to attend related Workshops, Conferences, etc.	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Presentations in the blackboard • Presentations through Power Point slides	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	52 (13 X 4)
	A series of exercises in the main cognitive objects of the theory, the composition of which results in the design of a road section at the preliminary design level. Delivered individually	60
	Study and preparation for the exams	38
	Course total	***150***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Theoretical part of the Course • Written exam (50%) Lab Part of the Course • Delivery of individual exercises and oral examination (50%)	

(5) ATTACHED BIBLIOGRAPHY

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27. Hassan, Y., Easa, S. M. and Abd El Halim, A.O. Analytical Model for Sight Distance Analysis on Three-Dimensional Highway Alignments, Transportation Research Record, Vol. 1523, 1996.
28. Zimmermann, M. Increased Safety Resulting from Quantitative Evaluation of Sight Distances and Visibility Conditions of Two-Lane Rural Roads. Proceedings of the 3rd International Symposium on Highway Geometric Design, TRB, Chicago, USA 2005.

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30. Gillespie T.D. "Fundamentals of Vehicle Dynamics". Society of Mining Metallurgy and Exploration Inc.1992.
31. Heisler H. "Advanced Vehicle Technology". Edward Arnold. A Division of Hobber & Stoughton, Germany 1993.
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GEO5040 – GEOGRAPHIC INFORMATION SYSTEMS & SCIENCE

COURSE SYLLABUS: GEO5040 – GEOGRAPHIC INFORMATION SYSTEMS & SCIENCE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	MSc.		
COURSE CODE	**GEO5040**	**SEMESTER**	5th
COURSE TITLE	**Geographic Information Systems and Science**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	3
Lab exercises	1	2
TOTAL	**4**	**5**

COURSE TYPE	specialized general knowledge, skills development
PREREQUISITE COURSES:	Thematic Cartography
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

The aim of the course is to present the necessary concepts to students so that they are able to design, develop, manage and implement a complete system of geographic information using modern tools, methods, and techniques in an ever-changing competitive environment.

By its nature, the science of Geographical Information is an interdisciplinary subject, which, however, apart from the high standards of its theoretical existence, also has a large part of the application of its methods. Therefore, the course material and its structure in two distinct but interrelated sections (theoretical and applied), aims at a deeper understanding of both the substance and the methodology, as well as the management of geospatial information with the most modern software tools related to the subject. . At the same time, the knowledge and skills acquired by the students attending the course do not lead to a sterile and strictly theoretical training, but through a known and accessible to the average student in the 6th level of complexity of the subjects raised, they are faced with issues. to be faced in the labor market. In addition, they receive all those cognitive supplies and skills, which in combination with the more specific cognitive subjects of the Science of Geographical Information contained in their curriculum, acquire the opportunity to claim their place in the next level (8th) of their studies.

According to the design of the content of the specific subject, students cognitively approach the

following:
a) The fundamental concepts, functions, and capabilities of Geoinformatics and Geospatial Information Management Systems,
b) The different types and structures of data, their advantages, and disadvantages
c) The relations between the categories of geographical data,
d) The theoretical and technological knowledge, but also the technical skills related to the registration, analysis, management, retrieval, and display of geospatial information
e) The design, creation, and development of integrated Geographic Information Systems,
f) The importance of Geoinformatics projects in projects of national and international scope.

Therefore, the objectives of this subject matter extend to a description of those who have successfully attended this subject, which has the following characteristics:
a) The assimilation of theoretical and applied knowledge on the Science of Geographical Information.
b) The development of intellectual and practical skills in solving problems that arise in the design, creation, and management of integrated Geographic Information Systems.
c) The development of skills through the synthetic creation and support of arguments related to the science of Geographical Information and strengthen the responsibility and autonomy to acquire sufficient opportunity for further professional and personal development.
d) The development of possibilities of a professional approach to the object through the use of the knowledge and understanding acquired during the work of creation and management of integrated Geographic Information Systems but also of a communicative nature through which the results of the work are successfully communicated to both specialized and non-specialized -skilled audience.

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, analysis, and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Autonomous work
- Teamwork
- Exercise criticism and self-criticism
- Promoting free, creative, and inductive thinking

(3) SYLLABUS

Theoretical Part of the Course

1. Geographical and Spatial Data and Information, Geoinformatics, Science of Geographical Information:
    - Basic principles and terminology
    - Information, data, and spatial reports.
    - Geospatial information, data sources, technologies, and techniques for their collection.
    - Organization of Geospatial Information, models, and structures.
    - Introduction to Geographic Information Systems, characteristics, definitions, evolution over time, categories and species, components, function, use.
2. Conceptual Codification:

- Spatial - non-spatial properties, characteristics of spatial entities.
- Structure, relationships, and combinations of spatial entities, spatial changes, mechanisms of spatial data organization.

3. The Geometry of Spatial Information:
    - Geographical location, representation, dimensions, placement of geographical objects in spatial reference systems.
    - Vector models, point and distance view, line and surface view, topological relations.
    - Raster models and their topological relations.
    - Data entry subsystems, management of geometric information in GSP, transformations.
4. Geospatial Databases - Models and Structures:
    - Architecture and structure of a database management systems.
    - Design and development of spatial databases. Input of descriptive information, connection to external databases, methods of correlation of the data.
5. Codification - Integration of Spatial Information: Connection and correlations of Geometric - Descriptive Information.
    - Recognition - correction of errors. Topological integration. Retrieval, information update, spatial queries.
    - Geographic Information on the Internet (Web-GIS, Internet Mapping).
    - Specifications, Protocols, Structure, Diffusion, and Interoperability.
    - National and international geographic data networks.
6. Principles of Analysis and Design of a GIS:
    - Terminology
    - General design
    - Identification of input elements.
    - Analysis of financial characteristics
    - Customization of the organization by a group of users
    - Detailed system design
    - Meta-information dictionaries
    - Problems
7. Introductory elements of Spatial Analysis.

Applied Part of the Course

- Organization, classification, codification, and normalization of geospatial information
- Design and development of geospatial databases
- Introduction of geometric, pictorial, and descriptive data in a geographic information system
- Automation of geospatial information - Geometric topological relations and topological integration.
- Retrieval, management, and updating of geospatial information
- Visual representation (mapping) of geospatial information
- Interoperability

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face

<table>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>• Web search (literature review and data sources)
• Utilization of E-class UNIWA platform (file exchange among professors and students)
• Use of email
• Use of specialized software (both commercial and open source) for the manipulation, editing and mapping of the geospatial data
• Use of Office software (word, presentations, spreadsheets)</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Study and analysis of bibliography</td><td>30</td></tr>
<tr><td>Laboratory practice</td><td>13</td></tr>
<tr><td>Elaboration of individual study</td><td>35</td></tr>
<tr><td>Educational visits</td><td>8</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total
(25 hours of workload per credit unit)</td><td>125</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of Evaluation: Greek
Evaluation Methods
• Written exam at the end of the semester (Multiple choice, short development and problem-solving exercises)
• Homework evaluation (development of theoretical topic and commentary of scientific articles
• Evaluation of laboratory work (development of the topic of creating and managing an integrated GIS)
• Oral presentation of work (Ms Office presentation of the theoretical topic)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

Books

1. P. Longley, M. Goodchild, D. Maguire, D. Rhind, 2010. “Geographic Information System and Science”, 6th edition. Publication in Greek language, by Klidarithmos Editions, Athens.
2. J. Katsios, A. Tsatsaris, 2014. “Lectures of Thematic Cartography”, Publication in Greek language, by Disigma Editions, Thessaloniki.
3. A. Zisou, 2007. “Introduction to Geographic Information Systems. ArcGis-ArcView. Publication in Greek language, by Stamoulis Editions.
4. E. Stefanakis, 2010. “Geographical Databases and GIS”. 2nd edition. Publication in Greek language, by Papasotiriou Editions.
5. Bolstad, P., 2016. GIS Fundamentals: A First Text on Geographic Information Systems, Fifth Edition, Eider Press.
6. Kerski, J. & Clark, J., 2014. The GIS Guide to Public Domain Data. ESRI Press

7. Rigaux, P, Scholl, M, 2002, Spatial databases :with application to GIS, San Francisco, CA: Morgan Kaufmann Publishers
8. McDonnell, R, Kemp, K, International GIS dictionary Cambridge, [England] : GeoInformation International ; New York, NY : John Wiley & Sons , 1995
9. Kraak, M. J., Ormeling, F. J., 1996, Cartography: Visualization of spatial data, Harlow, Longman

Web pages

1. http://www.hellasgi.gr/ (Greek Organization for Geographic Information)
2. http://eurogi.org/ (European Umbrella Organization for Geographic Information)
3. http://www.opengeospatial.org/ (Open Geospatial Consortium)
4. http://support.esri.com/other-resources/gis-dictionary/a (GIS Dictionary)
5. http://www.ncgia.ucsb.edu/Publications/Tech_Reports/92/92-13.PDF (GIS Terminology)
6. http://hydroscope.gr/ (National Bank of Hydrological and Meteorological Information)
   http://www.geodata.gov.gr/ (Public Open-source national geoportal)
7. https://www.gislounge.com/open-source-gis-applications/ (Open Source GIS Software)
8. https://www.gislounge.com/gis-software-applications/ (Commercial and Proprietary GIS Software)
9. https://www.gislounge.com/bibliographies/ (Bibliographies)

Scientific Journals

1. International Journal of Geographical Information Science, Taylor & Francis
2. Geoinformatica, Springer
3. Journal of Geographical Systems, Springer
4. Journal of Geographic Information System Scientific Research
5. ISPRS-International Journal of Geo-Information (IJGI is an open access journal of MDPI)

GEO5050 – SATELLITE SURVEYING

COURSE OUTLINE: GEO5050 - SATELLITE SURVEYING

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO5050**	**SEMESTER**	5th
COURSE TITLE	**SATELLITE SURVEYING**		
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 TEACHIN GHOURS**	**CREDITS**
LECTURES		3	3
LABORATORY EXCRCISES		1	2
TOTAL		**4**	**5**
COURSE TYPE	*special background*		
PREREQUISITE COURSES:	No prerequisite courses. It is recommended that the students have obtained the fundamental knowledge of the course "Geometrical Geodesy".		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP127/		

(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.

The aim of this course is to give a deep understanding of the fundamental principles of satellite surveying using GNSS (Global Navigation Satellite Systems). Emphasis is given in geodetic satellite surveying, i.e. techniques offering cm level precision. The students learn how to choose the appropriate satellite receiver and measurement technique in order to fulfill the requirements of each work. They also learn how to plan and conduct GNSS measurements understanding potential error sources (multipath, E/M interferences etc.) as well as how to process the satellite observations and estimate coordinates and heights in the local reference systems.

Upon successful completion of the course the students will be able to:

- understand the operation principles of GPS and GNSS receivers
- understand the GPS signal structure (carrier frequencies, PRN codes, navigation message)
- understand the basic satellite measurement methods (absolute, relative, static-kinematic, RTK)
- understand the basic error sources that affect the GNSS measurements as well as

the methods used to mitigate these errors

- understand the pseudorange and phase measurements and the mathematical models for data processing (single- double-differences, ambiguity resolution)
- understand the network-based methods (Single-base, VRS, MAC, FKP)
- plan and conduct geodetic GNSS measurements
- process the satellite observations and estimate coordinates with accuracies on the mm or cm level
- apply network-based techniques using networks of permanent reference stations like e.g. the Hellenic Positioning System

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*
- *Working independently*
- *Team work*
- *Production of new research ideas*

(3) SYLLABUS

Theoretical part:

- Introduction to satellite surveying
- Global Navigation Satellite Systems (GPS, GLONASS, GALILEO)
- Coordinate and time reference systems used in satellite surveying.
- GPS signals (carrier frequencies, PRN codes), orbital elements.
- GPS receivers, receiver and antenna technology.
- Surveying techniques (autonomous-relative, static-kinematic, real-time techniques, RTK).
- Error sources and elimination methods.
- Mathematical models for carrier-phase processing (single-, double- and triple-differences), fast ambiguity resolution algorithms.
- Satellite based augmentation systems (EGNOS and WAAS).
- GNSS networks: design, measurement, baseline reductions and tie to the national Geodetic Reference System.
- Determination of orthometric heights by means of GNSS.
- Continuously Operating Reference Stations networks.
- Network-based techniques (VRS, FKP, MAC) used in CORS networks like the Hellenic Positioning System (HEPOS).

Laboratory part:

- Measurement planning using GNSS planning software
- Field measurements with GPS and GNSS receivers (static, RTK)
- Set up of a geodetic GNSS receiver, measuring and converting the antenna height

- Processing of carrier phase observations (baseline reduction, evaluation of reliability), network adjustment, geodetic datum transformation, estimation of orthometric heights.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	*Face-to-face*
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching (PowerPoint presentations, videos)* • *Use of an asynchronous e-learning platform (e-class).* • *Use of e-mail* • *Use of the GNSS software in laboratory.*
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures	52
study and analysis of bibliography	37
laboratory practice	25
Laboratory preparation and essay writing	36
Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Assessment language: Greek (English for ERASMUS students upon request) Performance evaluation method: • Final Written Exam (80% of the final grade) of graded difficulty, which include short-answer questions, open-ended questions and solving simple problems. • Evaluation of laboratory work (20% of the final grade) which includes exercises (processing of GNSS data). The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.

(5) ATTACHED BIBLIOGRAPHY

- ***Suggested bibliography (in Greek):***
1. Φωτίου Α., Πικριδάς Χ., 2012. GPS και Γεωδαιτικές Εφαρμογές. Εκδόσεις Ζήτη, Θεσσαλονίκη.
2. Δερμάνης Α., 1999. Διαστημική Γεωδαισία και Γεωδυναμική – GPS. Εκδόσεις Ζήτη, Θεσσαλονίκη

- ***Suggested bibliography (in English):***
1. Hofmann-Wellenhof B., Lichtenegger H., Wasle E., 2008. GNSS: Global Navigation Satellite Systems – GPS, GLONASS, Galileo, and More. Springer-Verlag, Wien/New York.
2. Leick A., 2004. GPS Satellite Surveying. 3rd edition, John Wiley & Sons, New Jersey.

3. Seeber G., 2003. Satellite Geodesy. 2nd edition, De Gruyter, Berlin.

GEO5060 – TECHNICAL HYDROLOGY

COURSE OUTLINE: GEO5060 - TECHNICAL HYDROLOGY

(1) GENERAL

<table>
<tr><td>SCHOOL</td><td colspan="3">SCHOOL OF ENGINEERING</td></tr>
<tr><td>DEPARTMENT</td><td colspan="3">DEPARTMENT OF SURVEYING AND GEOINFORMATICS</td></tr>
<tr><td>LEVEL OF COURSE</td><td colspan="3">UNDERGRADUATE</td></tr>
<tr><td>COURSE CODE</td><td>GEO5060</td><td>SEMESTER OF STUDIES</td><td>5th</td></tr>
<tr><td>COURSE TITLE</td><td colspan="3">TECHNICAL HYDROLOGY</td></tr>
<tr><td colspan="2">INDEPENDENT TEACHING ACTIVITIES
<i>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</i></td><td>WEEKLY TEACHIN GHOURS</td><td>CREDITS</td></tr>
<tr><td colspan="2">Lectures & seminars</td><td>2</td><td></td></tr>
<tr><td colspan="2">Laboratory exercises</td><td>2</td><td></td></tr>
<tr><td colspan="2">Total</td><td>4</td><td>4</td></tr>
<tr><td>COURSE TYPE</td><td colspan="3">Field of Science</td></tr>
<tr><td>PREREQUISITE COURSES:</td><td colspan="3">Typically, there are not prerequisite courses.</td></tr>
<tr><td>TEACHING AND ASSESSMENT LANGUAGE:</td><td colspan="3">Greek</td></tr>
<tr><td>THE COURSE IS OFFERED TO ERASMUS STUDENTS</td><td colspan="3">YES</td></tr>
<tr><td>COURSE WEBPAGE (URL)</td><td colspan="3">https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75</td></tr>
</table>

(2) LEARNING OUTCOMES

Learning outcomes
At the end of the course the students are expected to comprehend basic concepts of the water cycle and hydrology 1. Students understand the essential components and function of the hydrologic cycle including precipitation, evaporation/evapotranspiration, overland flow and surface storage, groundwater flow and storage, and channel flow, and storm water runoff. Assignments that demonstrate accomplishment of this outcome: a. first project -> water balance in a Greek basin with the use of the Thornwaite method. b. final exams 2. Students are able to delineate the divide of a water basin on a topographical map. 3. Students know the basic statistics and their terminology involved in Hydrology. Comprehend what the Intensity-Duration-Frequency curves are, and what is their use. 4. Know how to solve the Manning's formula. 5. Students are able to perform engineering hydrology computations and subsequent dimensioning of hydraulic elements: Design discharge with the use of the Rational method.

Assignments that demonstrate accomplishment of this outcome: second project -> dimensioning of a culvert for a small basin.

6. Know where to look for reliable hydrological and meteorological data.

General Abilities

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?

By the end of the course the student would be able to analyze and compose given information.

To enrich his or her inductive reasoning

To work autonomously and in groups

(3) COURSE CONTENT

The theoretical part of the course includes surface waters and groundwater adopting thus a holistic view. The unifying idea is the hydrologic circle and the site is the water catchment. Special emphasis is given in the scientific method as demonstrated by the principle of conservation of mass and energy applied in the water balance calculations. Theory is complimented by the presentation of the challenges due to climate change, and the presentation of the new technological tools that are now made available to the science of Hydrology, Geographical Information Systems and Remote Sensing. Also, the main flood control works are presented and their functions explained.

In short the course contains the following

1. Hydrology science, Hydrologic circle, Hydrologic variables and units of measurement, Spatial and Temporal scales in Hydrology. Residence times. Water catchments, Water balance of a catchment.
2. Precipitation: Spatial characteristics of precipitations, their types (snow, hail, rain) and their integration over the basin (Thiessen polygons, equal precipitation curves). Rainfall graphs. Rainfall gradient. Frequency analysis. Gumbell distribution.
3. Evapotranspiration: Actual and potential evapotranspiration. Methods and formulas used for potential evaporation (mass transport methods, energy balance methods, hybrid methods). Thornwaite's method for actual evapotranspiration.
4. Hydrometry: Measurements of velocity and discharge in rivers and streams. The rating curve. Stage and discharge hydrographs. The Manning formula.
5. Floods. Frequency analysis and relevant distributions (Lognormal, LogPearson3).
6. Methods for computing design discharge: Rational Method, IDF curves, unit hydrograph.

(4) TEACHING AND LEARNING METHODS - ASSESSMENT

DELIVERY	Lectures.

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>e-class
Ppt presentations</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.
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</i></td><td>
<table>
<tr><th><i>Activity</i></th><th><i>Semester Workload</i></th></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Homework</td><td>24</td></tr>
<tr><td><i>Total number of hours for the Course</i></td><td><i>50 hours (total student work-load)</i></td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure
Specifically-defined evaluation criteria are given, and if and where they are accessible to students</i></td><td>1. Through quick and simple applications with bonuses given during the lecture.
2. Weekly assignments (exercises)
3. Two projects
4. Final exams.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

Greek

1. *Στοιχεία Φυσικής Υδρολογίας*, G. Hornberger et al. Εκδόσεις ΔΙΣΙΓΜΑ, 2018. Μετάφραση-Επιμέλεια Σ.Η.Καραλής
2. Κουτσογιάννης Δ. Και Ξανθόπουλος Θ., «Τεχνική Υδρολογία», 3η έκδοση, Τυπογραφείο ΕΜΠ, 1999.
3. Τσακίρης Γ., «ΥΔΑΤΙΚΟΙ ΠΟΡΟΙ: Ι. Τεχνική Υδρολογία και Εισαγωγή στη Διαχείριση Υδατικών Πόρων», Εκδόσεις Συμμετρία, Αθήνα, 2013.

English

4. Chow Te Ven, Maidment David and Mays Larry, ”Applied Hydrology,” 2nd edition, McGraw-Hill, 2013.
5. Elements of Physical Hydrology, G. Hornberger et al., Johns Hopkins University press, 2016.
6. Maidment David, “Handbook of Hydrology,” McGraw-Hill, 1993.
7. Hydrology: A science of Nature, Andre Musy & Cristophe Higy, CRS Press, 2011.
8. Hydrology in Practice, Elisabeth Shaw, 1994
9. Hydrology for engineers, linsley R., Kohler M., Paulhus J., McGraw-Hill, 1982.

periodicals

10. International Journal of Hydrology Science and Technology. Intescience Publishers
11. Sustainability Science, Springer

Links

12. UNESCO’s International Hydrological Programme (IHP)

    http://en.unesco.org/themes/water-security/hydrology

13. Hydrology links from USGS: http://www.nws.noaa.gov/om/hod/hydrolnk.html

GEO5070 – DATABASE PROGRAMMING

COURSE OUTLINE: GEO5070 - DATABASE PROGRAMMING

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Level 6		
COURSE CODE	**GEO5070**	**SEMESTER**	5th
COURSE TITLE	**DATABASE PROGRAMMING**		
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	4
Laboratory exercises		-	-
Total		**3**	**4**
COURSE TYPE	Specialized general knowledge		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP155/		

(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.

The objectives of this course are:
- understanding the operation and structure of a relational database system
- the development of skills related to the design of relational databases
- programming databases using the SQL language

Upon successful completion of the course the student will be able to:
- apply the main techniques for designing, modeling and implementation of simple databases
- use the main techniques of the SQL language In order to implement database systems
- understand and apply the advantages of relational databases in information management
- combine procedural and declarative programming techniques for management purposes and information processing in Geographic Information Systems

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, analysis and synthesis of data and information, using the appropriate technologies • Individual work • Project design and manipulation • Work in an interdisciplinary environment • Promotion of creative and inductive thinking

(3) SYLLABUS

Types of databases. System’s architecture. Entity-Relation model. Relational data model. Normalization. Data management operations. Relational algebra. Introduction to SQL. Tables, creating tables. Data types. The concept of primary key. Field properties. Value field integrity. Relationships between tables. Questions and criteria. Complex questions based on multiple tables. Views and aggregate functions. Calculated fields. Forms, reports, grouping and ordering in reports. Table management. Integrity restrictions. Hierarchical structures and networks. Procedures. Triggers. Database development in MySQL, MS-Access and phpMyAdmin. SQL extensions.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Course material (presentations, lecture notes, exercises, etc.) are uploaded in the e-learning platform (e-class). • e-mail and e-class announcements are used for communication with the students.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	I. Written final examination that includes: - Short answer questions - Problem solving II. Midterm written examinations III. Projects The examination material and the evaluation process are announced to the students during the lectures and are also posted on the course's website.

Activity	*Semester workload*
Lectures	30
Laboratory practice	30
Study and analysis of bibliography	20
Essay writing	40
Course total	**120**

(5) ATTACHED BIBLIOGRAPHY

In Greek

1. Κεχρής Ευάγγελος, 2015, Σχεσιακές βάσεις δεδομένων, Εκδόσεις Κριτική.
2. Μανωλόπουλος Ι., Παπαδόπουλος Α., 2006. Συστήματα Βάσεων Δεδομένων: Θεωρία και πρακτική εφαρμογή. Εκδόσεις Νέων Τεχνολογιών.
3. Στεφανάκης Ε., 2010. Βάσεις Γεωγραφικών Δεδομένων και Συστήματα Γεωγραφικών Πληροφοριών. Εκδόσεις Παπασωτηρίου.
4. Elmasri R. Navathe S.B., 2007. Θεμελιώδεις Αρχές Συστημάτων Βάσεων Δεδομένων. Εκδόσεις Δίαυλος
5. Connolly T. M., Begg C. E., 2001. Συστήματα βάσεων δεδομένων. Εκδόσεις Ίων.

In English

6. Carter J., 2002. Database Design and Programming with Access, SQL, Visual Basic and ASP. McGraw Hill
7. Rockoff L., 2010. The Language of SQL: How to Access Data in Relational Databases. Cengage Learning PTR.

6th Semester

GEO6010 – INTRODUCTION TO DIGITAL IMAGE PROCESSING

COURSE OUTLINE: GEO6010 - INTRODUCTION TO DIGITAL IMAGE PROCESSING

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Level 6		
COURSE CODE	**GEO6010**	**SEMESTER**	6th
COURSE TITLE	**INTRODUCTION TO DIGITAL IMAGE PROCESSING**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		3	4
Laboratory exercises		-	-
Total		**3**	**4**
COURSE TYPE	Specialized general knowledge		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO250/		

(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.

The objectives of this course are:
- understanding the basic concepts of digital image processing
- familiarity with the methods and mathematical models used for image analysis and processing
- the use of the above methods for the processing, enhancement, segmentation of digital
- image as well as for analyzing and extracting semantic information for image classification and pattern recognition applications
- the development of skills related to the implementation of the above methods in a programming environment

Upon successful completion of the course the student will be able to:
- understand the main features of digital image processing
- know the main tools, techniques, limitations and open problems in digital image processing
- programmatically implement methods and techniques of digital image processing

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, analysis and synthesis of data and information, using the appropriate technologies • Individual work • Project design and manipulation • Work in an interdisciplinary environment • Promotion of creative and inductive thinking

(3) SYLLABUS

Introductory concepts. Image formats and representation. Image digitization. Basic principles of digital images. Numerical and logical operations. Point transformations. Histogram balancing and thresholding techniques. Two-dimensional filters and transformations. Line detection, edges outlines and image areas. Mathematical morphology. Image segmentation. Image analysis, feature extraction, color and texture, points of interest. Coding and image compression. Pattern recognition techniques in digital images.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Course material (presentations, lecture notes, exercises, etc.) are uploaded in the e-learning platform (e-class). • e-mail and e-class announcements are used for communication with the students.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	I. Written final examination that includes: - Short answer questions - Problem solving II. Midterm written examinations III. Projects The examination material and the evaluation process are announced to the students during the lectures and are also posted on the course's website.

Activity	***Semester workload***
Lectures	30
Laboratory practice	30
Study and analysis of bibliography	20
Essay writing	40
Course total	**120**

(5) ATTACHED BIBLIOGRAPHY

In Greek

1. Ν. Παπαμάρκος, 2013,Ψηφιακή επεξεργασία και ανάλυση εικόνας, Εκδότης Αφοι Παπαμάρκου Ο.Ε.
2. R. C. Gonzalez and R. E. Woods, 2018, Ψηφιακή Επεξεργασία Εικόνας, Εκδόσεις Τζιόλα.
3. Ι. Πήτας, 2010, Ψηφιακή Επεξεργασία Εικόνας, Εκδότης Ιωάννης Πήτας.
4. Ι. Ν. Έλληνας, 2010, Ψηφιακή Επεξεργασία Εικόνας και Βίντεο, Εκδότης Ιωάννης Έλληνας.

In English

5. C. Solomon, T. Breckon, 2010, Fundamentals of Digital Image Processing, Wiley.
6. M. Petrou and C. Petrou, 2010, Image Processing: The Fundamentals, Wiley.

GEO6020 – URBAN PLANNING

COURSE OUTLINE: GEO6020 – URBAN PLANNING

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO6020**	**SEMESTER**	6th
COURSE TITLE	**URBAN PLANNING**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		2	3
Lab exercises		2	2
Total		**4**	**5**
COURSE TYPE	*General background*		
PREREQUISITE COURSES:	..		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	..		

(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.*
The course highlights the challenges urban planning has to address. Emphasis is placed on analysing the basic principles and tools of urban planning and the regulatory framework of urban planning in Greece. A historical overview of the models and typologies of cities at the international, European and national levels is performed. The evolution of the city and urban planning notions is also examined. The current institutional/legal framework for urban planning in Greece is also discussed in relation to the effects of the economic crisis. The procedures for the preparation, approval and implementation of urban studies, building regulations, and current licensing procedures are analysed. At the same time, the various types of plans and studies in Greece at the different levels of planning are discussed. Moreover, the role and responsibilities of public and private bodies involved and the importance of participatory decision-making in urban planning are recorded and highlighted. Finally, the use and importance of modern technologies and cutting-edge techniques in urban planning are pointed out.

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
- Teamwork
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

1. City and urban planning: Historical analysis.
2. Urban development models and city typology.
3. Analysis of basic concepts (settlement, city, urbanization, functions, socio-economic parameters, etc.)
4. Urban land uses. Urban planning problems.
5. Urban studies and urban planning.
6. Implementation of urban planning studies.
7. Building regulations and other regulatory legislation for construction. Approval-building permit and urban planning provisions.
8. Analysis of the evolution of the legal framework for urban planning in Greece. Design levels and types of plans/ studies.
9. Public and private bodies involved in urban planning. Participation in decision-making in urban planning.
10. Modern technologies and urban planning: Cartographic archives and cutting-edge techniques.
11. The role of topographers / geoinformatics engineers in urban studies.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-Face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>• Web search (literature review and data sources)
• Utilization of E-class UNIWA platform (file exchange among professors and students)
• Email
• Office software (word, presentations, spreadsheets editors)</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td>
<table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>39 (13 X 4)</td></tr>
<tr><td>Study and analysis of bibliography</td><td>26 (13 X 2)</td></tr>
<tr><td>Preparation of essays</td><td>65</td></tr>
<tr><td>Study</td><td>50</td></tr>
<tr><td>Course total</td><td><i>180</i></td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek

- Methods of evaluation:
• Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions)
•
- Study/ Essay (Essay on the theoretical and practical objectives of the course)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

– Jenks M., Dempsey, N. (2005). Future forms and design for sustainable cities. Routledge.
– Rydin Y. (2012). Governing for sustainable urban development. Routledge.
– Wheeler S.M., Beatley T. (Eds.). (2014). Sustainable urban development reader. Routledge.
– European Commission, 'A new Partnership for Cohesion; Convergence, Competitiveness, Cooperation (7th report on economic and social cohesion', European Communities, 2017.
– European Commission, 'ESDP, European Spatial Development Perspective', European Communities, 1999.
– Hall P. 'Urban and Regional Planning'. 4th Edition. Routledge. London and New York, 2002.
– OECD, 'Towards a New Role for Spatial Planning, OECD Publications, 2001.
– Reimer M., Getimis, P., Blotevogel H. 'Spatial Planning Systems and Practices in Europe. A Comparative Perspective on Continuity and Changes', (eds), Routledge, New York, 2014.

Websites

– ECTP-CEU (European Council of Spatial Planners - Conseil européen des urbanistes), http://www.ectp-ceu.eu/
– European Commission / Regional Policy, http://ec.europa.eu/regional_policy/index_el.cfm/
– ESPON, (European Observation Network for Territorial Development and Cohesion), http://www.espon.eu/main/
– ISOCARP (International Society of City and Regional Planners), http://www.isocarp.org/

– United Nations Development Programme , http://www.undp.org/content/undp/en/home.html/

GEO6030 – REMOTE SENSING II

COURSE OUTLINE: GEO6030 - REMOTE SENSING II

(1) GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate – Level 6		
COURSE CODE	**GEO6030**	**SEMESTER OF STUDIES**	6th
COURSE TITLE	**REMOTE SENSING II**		

INDEPENDENT TEACHING ACTIVITIES *in case the credits are awarded in discrete parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and the total credits*	**WEEKLY HOURS DIDASKALIAS**	**CREDIT UNITS**
Lectures	2	3
Laboratory Exercises	1	1
TOTAL	**3**	**4**

TYPE OF COURSE	Compulsory
PREREQUISITE COURSES:	REMOTE SENSING I
C.LAUSSA OF TEACHING AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (English)
ONLINE COURSE PAGE(URL)	https://eclass.uniwa.gr/courses/GEO603/

(2) LEARNING OUTCOMES

Learning Outcomes

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that students will acquire after the successful completion of the course.

Objectives of the course are the following:

- Application of satellite image evaluation techniques
- Retrieval and processing of satellite data by online platforms
- Programming methods in specialized remote sensing software
- Visualization of remote sensing data analysis results
- Photo interpretation of images in topographical and cadastral applications

General Competencies

Taking into account the general skills that the graduate must have acquired (as these are listed in the Diploma Supplement and listed below) which / which of them is the subject of the course intended for?.

- *Search, analysis and synthesis of data and information, using the necessary technologies*
- *Decision-making*
- *Autonomous work*
- *Project planning and management*

(3) COURSE CONTENT

- Supervised, unsupervised and object-oriented classification of multispectral satellite images
- Processing images and programming
- Neural networks, Artificial Intelligence and Machine Learning in Remote Sensing
- Remote sensing applications in urban and rural areas
- The use of Remote Sensing in environmental applications of soil and water quality
- Operational applications of Remote Sensing
- Retrieval and processing of satellite data from USGS and COPERNICUS web platforms
- Retrieval and processing of historical data from the platforms of the Army Geographical Service and the Greek Land Registry
- Interferometry and radar applications
- Digital Soil Models and Remote Sensing
- Remote Sensing and Geographic Information Systems
- Photo-interpretation of historical data in property status surveys, forest maps, topographical and cadastral applications.

(4) TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY.	Face to face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES Use of *TEIs in Teaching, Laboratory Education, Communication with students*	Lectures: Use of ICT (power point presentations) Laboratory exercises: use of specialized software for the analysis of digital image data. Communication: use of asynchronous eclass e-learning platform
TEACHING ORGANIZATION *The way and methods of teaching are described in detail. The student's study hours for each learning activity are listed, as well as the hours of a non-guided study according to the principles of ECTS*	see table below
STUDENT EVALUATION *Description of the evaluation process* *Explicitly defined assessment criteria are mentioned and if and where they are accessible to students.*	• Multiple-choice final written exam and development questions (70%) • <u>Individual Semester Theme</u> <u>(30%)</u>

Activity	***Semester Workload***
Lectures	60
Study & analysis of bibliography	60
Laboratory Exercises	30
Total Course	**150**

	Language of the examination: Greek (English if needed, e.g., Erasmus+students)

(5) RECOMMENTED BIBLIOGRAPHY

Greek:

4. Skianis Eim. G., Nikolakopoulos G. K., Vaiopoulos A. D. 2012. "Remote Sensing" ION Publications 336sel.
5. Kartalis K., C., 2007, Fidas, "Principles & Applications of Satellite Remote Sensing", V. Gkiourdas Ekdotiki, Athens.
6. Mertikas S.P., 2006, "Remote Sensing and Digital Image Analysis", ION Publications

English:

6. Campbell J.B., 2006. *Introduction to Remote Sensing*, The Guilford Press, New York.
7. Cracknell A.P., L. Hayes, 2007. *Introduction to Remote Sensing*, CRC Press.
8. Jensen J.R., 2005. *Introductory Digital Image Processing: A Remote Sensing Perspective*. Prentice Hall.
9. Lillesand S. M.,R.W. Kiefer, J.W. Chipman, 2007. *Remote Sensing and Image Interpretation*. Wiley.
10. Mather P., 2004. *Computer Processing of Remotely Sensed Images: An Introduction*. Wiley.
11. Sabins F.F., 1997. *Remote Sensing: Principles and Interpretation*, W. H. Freeman & Co., New York.
12. Schowengerdt R.A., 2006. *Remote Sensing: Models and Methods for Image Processing*, Academic Press.

GEO6040 – SPATIAL DECISION SUPPORT SYSTEMS

COURSE SYLLABUS: GEO6040 – SPATIAL DECISION SUPPORT SYSTEMS

(1) **GENERAL**

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	MSc.		
COURSE CODE	**GEO6040**	**SEMESTER**	6th
COURSE TITLE	**Spatial Decision Support 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	3	3
Lab exercises	1	1
TOTALS	**4**	**4**

COURSE TYPE	specialized general knowledge, skills development
PREREQUISITE COURSES:	Geographic Information Systems and Science
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

The aim of the course is to present the necessary concepts to students, so that they are able to highlight Geographic Information Systems as a mechanism for supporting and planning spatial decisions through the theory, methods, techniques, and applications of spatial analysis, in continuous and discontinuous spatial data models, using modern tools, methods, and techniques in an ever-changing competitive environment.

Because by its nature the science of Geographical Information is an interdisciplinary subject, which in addition to the high standards of its theoretical existence has a large section for the application of its methods, the course material is structured in two distinct but interconnected sections (theoretical and applied). It aims at a deeper understanding of both the substance and the methodology, as well as the management of geospatial information in the appropriate way, which leads to its emergence, as a key factor influencing decision-making with parameters that depend on natural and man-made phenomena. At the same time, the knowledge and skills acquired by the students in the subject do not lead to a sterile and strictly theoretical training, but through a known and accessible to the average of the students in the 7th level of complexity of the subjects raised, they are faced with issues. to be faced in the labor market. In addition, they receive all those cognitive supplies and skills, which in combination with the more specific cognitive subjects of the Science of Geographical Information contained in their curriculum, acquire the opportunity to claim their place in the next level (8th) of their studies.

According to the design of the content of the specific subject, students cognitively approach the following:
a) The spatial relations between continuous and discontinuous spatial entities
b) The models of spatial distributions
c) The identification of spatial patterns with specific characteristics and properties
d) The critical evaluation of spatial analysis methods.

Therefore, the objectives of this subject matter extend to a description of those who have successfully attended this subject, which has the following characteristics:
a) The assimilation of theoretical and objective knowledge in terms of analytical and synthetic treatment of geospatial information that leads to spatial decisions.
b) The development of mental and practical skills in solving spatial analysis problems.
c) The development of skills through the synthetic creation and support of arguments during the spatial transformation, reinforcing in terms of responsibility and autonomy for the acquisition of sufficient capacity for further professional and personal development.
d) The development of possibilities of a professional approach to the object through the use of the knowledge and understanding acquired during the design and implementation of applications that complete a spatial decision-making system.

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, analysis, and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Autonomous work
- Teamwork
- Exercise criticism and self-criticism
- Promoting free, creative, and inductive thinking

(3) SYLLABUS

Theoretical Part of the Course

1. The conceptual framework of spatial analysis using GIS
   - Terminology
   - Basic principles and methods
   - Continuous and discontinuous geospatial data models
   - Analysis of the European Directive (2007/2 / EC - INSPIRE) and the corresponding Greek one (Law 3882/2010) for the National Spatial Data Infrastructure.
   - Spatial Relations
   - Spatial Statistics (distance, density, regression and autocorrelation)
2. Spatial Analysis Methodology in Discontinuous and Continuous Spatial Data Models
   - Geographic Data Interactions
   - The concept of entity in spatial analysis, characteristics and properties
   - Spatial queries - spatial queries
   - The analysis categories for discontinuous entities
   - The analysis categories for continuous entities
   - Logical operations on the characteristics of one or more entities
   - Functions in features of multiple entities that overlap in space.

- Spatial components when retrieving multiple properties in single geospatial entities
- Methods of generalization and simplification of entities

3. Spatial Analysis Operations
   - Transactions between levels of geospatial information.
   - Digital background update.
   - Remove digital background features.
   - Peripheral Zones
   - Analysis with thematic criteria.
   - Change of cartographic information with geometric and thematic criteria.
   - Generalization and simplification operations
4. Support for spatial decisions in GIS:
   - Introduction to the basic concepts
   - General principles and structures of decision-making systems, components.
   - Demarcation of spatial problems.
   - Decision making procedures.
   - The multi-criteria analysis
   - Creation of location models with automated processes through programming.
5. GIS applications in Greece: Detailed presentation of the design of the structure and their operation.
6. GIS applications internationally. Specifications, standards, references to actions of international organizations for geographical information

Applied Part of the Course

- Applications of Spatial Analysis functions using modern commercial and free / open source GIS software.
- Composition of applications oriented to spatial decision making
- Planning principles in GIS and creation of location-allocation models for human activities.
- Geospatial information diffusion functions on the web.
- Interoperability

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Use of email • Use of specialized software (both commercial and open source) for the manipulation, editing and mapping of the geospatial data • Use of Office software (word, presentations, spreadsheets)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures	39
Study and analysis of bibliography	25
Study elaboration	35
Lab exercise	13
Seminar (*)	8

<table>
<tr><td></td><td>(*)Specialized lecture on issues that fall within the subject matter, by scientists in the field</td><td></td></tr>
<tr><td></td><td>Course total
(30 hours of workload per credit unit)</td><td>120</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students..</i></td><td colspan="2">Language of Evaluation: Greek
Evaluation Methods:
• Written exam at the end of the semester (Multiple choice, short development and problem-solving exercises)
• Homework evaluation (development of theoretical topic and commentary of scientific articles
• Evaluation of laboratory work (gradual development of project for management and analysis in a GIS environment)
• Oral presentation of work (Ms Office presentation of the theoretical topic)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

Books

1. Pappas, V, 2011. GIS in Spatial Planning: Scientific Edition of the University of Patra (Greek language)
2. Zisou, A, 2010. ArcGIS Extensions: Spatial Analyst, 3D Analyst, Theory and Practice, Publication in Greek language, by Stamoulis Editions
3. E. Stefanakis, 2010. “Geographical Databases and GIS”. 2nd edition. Publication in Greek language, by Papasotiriou Editions.
4. Karnavou, E., 2002. GIS and Spatial Data Infrastructure for the Contemporary Greece, Publication in Greek language, by Observer Editions
5. Koutsopoulos K., 2002. GIS and Spatial Analysis, Publication in Greek language, by Papasotiriou Editions.
6. Tsatsaris, A., Katsios, I., 2020, GIS in Spatial Analysis of Continuous Entities. Notes in Greek language.
7. Alibrandi, M, Fitzpatrick, 2003, GIS in the classroom: Using Geographic Information Systems in social studies and environmental science, Portsmouth, NH: Heinemann
8. DeMers, M, 2002, GIS modeling in raster, New York: Wiley.
9. Hunsaker, C, 2001, Spatial uncertainty in ecology: implications for remote sensing and GIS applications, New York: Springer.
10. Lawson, A, Denison, D, 2002, Spatial cluster modeling, Boca Raton, FL : Chapman & Hall/CRC
11. Malczewski, J, 1999, GIS and multicriteria decision analysis New York: Wiley.
12. Stillwell, J, Clarke, G, 2004, Applied GIS and spatial analysis, Wiley

Web pages

1. http://www.csiss.org/ (Center for Spatially Integrated Social Science)
2. http://teachspatial.org/ (Resources for Spatial Teaching & Learning)

3. http://gispopsci.org/software/ (Advanced Spatial Analysis program)
4. http://www.spatialanalysisonline.com/ (Geospatial Analysis - A comprehensive guide)
5. http://www.gitta.info/website/en/html/index.html (Geographic Information Technology Training Alliance)

Scientific Journals

6. International Journal of Geographical Information Science, Taylor & Francis
7. Journal of Spatial Science, Taylor & Francis
8. Geoinformatica, Springer
9. Journal of Geographical Systems, Springer
10. GISciences & Remote Sensing, Bellwether Publishing, Ltd.
11. Journal of Geographic Information System, Scientific Research
12. ISPRS-International Journal of Geo-Information (IJGI is an open access journal of MDPI)

GEO6050 – SURVEYING FIELD COURSE

COURSE OUTLINE: GEO6050 - SURVEYING FIELD COURSE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 6		
COURSE CODE	**GEO6050**	**SEMESTER**	6th
COURSE TITLE	**SURVEYING FIELD COURSE**		

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 Labs	4(2/2)	5
TOTAL	**4**	**5**

COURSE TYPE	Special background
PREREQUISITE COURSES:	GEO302-CONSTRUCTION SURVEYING
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Can be taught in English
COURSE WEBSITE (URL)	

(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.

- **Planning Topographic Surveys - Gathering the Data**
- **Field Methods for Topographic Mapping.** General Procedures, digital surveying Using terrestrial and satellite methods, coordinating field and office procedures for digital survey systems
- **Hydrographic Survey.** Introduction, tides, instrumentation for hydro graphic survey, procedures for hydro graphic survey, hydro graphic charts
- **Review of Greek Surveying Standards and Specifications.**Specifications, Equipment Specifications

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?

Students will be able to manage all stages of the work leading to a complete surveying project at a professional level. The course also aims to develop critical thinking whereby students must address solutions to engineering problems that arise during a typical surveying project.

(3) SYLLABUS

- Planning Topographic Surveys - Gathering the Data,
- Field Methods for Topographic Mapping,
- Hydrographic Survey,
- Greek Surveying Standards and Specifications

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
<i>Face-to-face, Distance learning, etc.</i></td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>- Support by the electronic asynchronous course platform <i>eclass</i> (exchange of information and digital data between tutors and students)
- Use of software
- Use of programming environment for preparing projects.
- Use of Surveying software for Lab exercises.</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Laboratory / Exercises</td><td>48</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Non-directed study</td><td>50</td></tr>
<tr><td>Course total</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek or English

Methods of evaluation:
Final exam (60%) which includes open- ended questions and problem solving
Laboratory work (40%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Allan A.L., Hollwey J.R., Maynes J.H.B., Amin A., 1980. Practical Field Surveying and Computations. Heinmann, Portsmouth, NH.
2. Andersen J. M., Mikhail E. M., 1998. Surveying: Theory and Practice. 7th edition, McGraw-Hill, New York.
3. Blachut T., Chrzanowski A., Saastamoinen J., 1979. Urban Surveying and Mapping. Springer, Berlin.

4. Buckner R. B., 1983. Surveying measurements and their analysis. Landmark Enterprises, Cordova, CA.
5. Johnson A., 2004. Plane and Geodetic Surveying. The Management of Control Networks. Spon Press, London & New York.
6. King R. W., Masters E. G., Rizos C., Stolz A., Collins J., 1987. Surveying with Global Positioning System FERD. Dümmler Verlag, Bonn.
7. Shepherd F. A., 1977. Engineering Surveying. Edward Arnold, London.
8. Schofield W., Breach M., 2007. Engineering Surveying. Butterworth-Heinemann. Elsevier.
9. Uren J., Price W. F., 2005. Surveying for Engineers. 4th edition, MacMillan Press, London

GEO6060 – SPATIAL ANALYSIS

COURSE OUTLINE: GEO6060 - SPATIAL ANALYSIS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Level 6		
COURSE CODE	**GEO6060**	**SEMESTER**	6th
COURSE TITLE	**SPATIAL ANALYSIS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	3
Laboratory exercises	1	1
Total	**4**	**4**

COURSE TYPE	Skills development
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

After completing the course, the students will be able to:

- draw samples from lists or maps
- analyze spatial data using Descriptive and Inferential Statistics
- apply statistical analysis in a GIS environment (GIS)
- solve geographical problems using appropriate software
- understand and discuss scientific publications which involve statistical analysis
- select the appropriate method of spatial analysis according to the nature of the problem and the data properties

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 • Working independently

(3) SYLLABUS

1. Basic concepts: types of data, organization and properties of geographical data
2. Geographical data and scales of measurement
3. Geographical data collection: primary and secondary data, methods for data collection, spatial sampling techniques
4. Description of geographical data: frequency distributions, crosstabulations, visualization, measures of central tendency and dispersion, geostatistical indices, exploratory spatial data analysis
5. Probability distributions, hypothesis testing, statistical tests: t, ANOVA, X^2
6. Spatial patterns, point pattern analysis, mapping spatial clusters
7. Correlation analysis of quantitative and qualitative data, regression analysis, multiple regression, spatial autocorrelation indices, spatial regression
8. Introduction to multivariate methods for geographical data analysis (factor analysis cluster analysis, discriminant analysis)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Powerpoint for presentations, the course website (e-class) is used for uploading course material and students' assignments. Statistical analysis software as well as Geographic Information Systems software are used for teaching and carrying out exercises and projects.	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	39
	Laboratory practice	13
	Study and analysis of bibliography	58
	Essay writing	40
	Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek or English Methods of evaluation: Final exam (50%) which includes open- ended questions and problem solving Mid-term exam (10%) which includes open- ended questions and problem solving Laboratory work (40%)

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

In Greek:

1. Iliopoulou P. 2015. Spatial Anlaysis. [e-book] Athens Hellenic Academic Libraries Link (Heal Link). Available at *http://hdl.handle.net/11419/2059*
2. Koutsopoulos K. 2009. Essay on spatial analysis, Vol. I and II, Papassotiriou, Athens.

In English:

1. Fotheringham S.A., Brudson C. and Charlton M. 2000. Quantitative Geography-Perspectives on Spatial Data Analysis, London: SAGE Publications
2. O' Sullivan D. and Unwin D.J. 2010. Geographic Information Analysis, John Wiley
3. Robinson G.M. 1998. Methods and Techniques in Human Geography, Wiley
4. Rogerson P.A. 2004. Statistical Methods for Geography, Sage Publications
5. Wong D. W. S. and Lee J. (2005). Statistical Analysis of Geographic Information with ArcView GIS and ArcGIS, Wiley.

- Related academic journals:

- Geographical Analysis, Wiley
- Applied Spatial Analysis and Policy, Springer

GEO6070 – SPATIAL DATABASES AND DIGITAL – CARTOGRAPHY

COURSE OUTLINE: GEO6070 - SPATIAL DATABASES AND DIGITAL - CARTOGRAPHY

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Surveying and Geoinformation Engineering		
LEVEL OF STUDIES	Undergraduate – Level 6		
COURSE CODE	**GEO6070**	**SEMESTER**	6th
COURSE TITLE	**Spatial Databases and Digital Cartography**		

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**
Theory	3	3
Laboratories Exercises	2	1
Total	**5**	**4**

COURSE TYPE	Special background (special knowledge in Spatial Databases), specialization of general knowledge (those of Cartography) and development of skills (creation of SDB, creation of digital maps, using specialized programs and equipment). Mandatory
PREREQUISITE COURSES:	There are no prerequisite courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek - English (for ERASMUS students) - French (for ERASMUS students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (In English and French)
COURSE WEBSITE (URL)	https://eclass.teiath.gr/courses/TOP106/

(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.

The course aims at

A.Knowledge

- Understanding, acquiring knowledge and learning all the stages of creating digital cartographic / spatial data, digital maps and Spatial Databases.

B.Skills

- Familiarity with their applications in specific examples.
- To acquire skills and abilities for the design, creation, creation of metadata and control of Spatial Databases, Web Mapping and in satellite mapping

C.Abilities

- To develop skills for the application of techniques for the analysis needs and the creation of studies for the development of Spatial Databases and their integration into existing or in development spatial Information Systems in any environment or requirement and by selecting the best combinations of tools and techniques

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?

Taking into account the general skills that the graduate must have acquired, the course aims at:

1. *In understanding the design, development, implementation and control of BXD. In the search, analysis and synthesis of digital spatial data and information, using the necessary technologies for the creation of digital maps and digital spatial / cartographic information on the Internet.*
2. *To adapt to new situations that require the creation of maps in a very short time (e.g., in case of natural disasters), or the use of new types of cartographic data (e.g., very high-resolution satellite images) or the use of new techniques and equipment (e.g., unmanned aerial vehicles and vehicles).*
3. *In making decisions regarding the correct choice of data, techniques, projections, basic graphics and aesthetic features that compose the quality of a digital map and the correct structure of a SDB.*
4. *In autonomous work through the theoretical development and practical elaboration of issues related to cartographic concepts and practices with the aim of developing skills necessary for BXD development studies, digital maps and spatial data infrastructures.*
5. *The ability to work in an international environment supported by learning both "standardized knowledge" of digital cartography and SDB taught in most universities around the world and by using and learning both English and French "cartography" / SDB terminology.*
6. *In the work in an interdisciplinary environment supported by the nature of the course of SDB and digital cartography that is directly related to road construction, plumbing, environmental protection, three-dimensional representation of objects, etc.*
7. *In the production of new research ideas that is supported and developed through a) individual and group work but also b) with the information about the research programs of the Department in relation to SDB and digital cartography and the possibilities of students' participation in them.*
8. *In the design and management of development projects, information and control of BXD and digital maps.*
9. *Demonstrating social, professional and ethical responsibility in data and software copyright issues.*
10. *In the exercise of criticism and self-criticism through the presentation day of the semester papers (individual and group).*
11. *In the promotion of free, creative and inductive thinking.*

(3) **SYLLABUS**

Theoretical part- Lectures

Introduction. Basic concepts. Principles. Terminology and "terms". Interconnected and overlapping scientific fields, sciences and techniques. Cartographic, Geographical, Geographical, Spatial and Geospatial Data.
Digital Cartography and Visualization / Visualization of Spatio-temporal Data. Bibliographic resources - Internet resources - "Open" Courses - Free data - "Open source" software. Organizations, scientific associations and organizations related to digital cartography and its applications.
Spatial Data, Geographic Information Systems, and Spatial Databases. Types & Structures of Digital Spatial & Cartographic Data - Characteristics of Spatial Data.
Connection of Spatial Data with other Data - introductory concepts. SDB and virtual and augmented reality.
Software & Equipment. Sources & Methods of Production of 2D and 3D Spatial Data - Volunteered Geographic Information - Crowdsourcing.
Spatial Data Producers - National and International Infrastructure - INSPIRE.
Georeferencing Data. Alphanumeric & Spatial Data Management Databases & Systems.
SD / SDB design and implementation levels. Similarities and differences of Alphanumeric Bases and Spatial Data. Conceptual Design SDB & CASE- Tools. Spatial-temporal modeling. Topology. Logical Physics Design SDB and Models. Interconnection of SDB & SAB and SDB with other Data. Metadata and data dictionaries.
Quality of Digital Spatial Data and SDB. Error detection. Quality parameters. Quality check.
Compatibility of Spatial Data (data) - Software (Software) - Devices / equipment (hardware) - Standards for the exchange of Spatial Data. Compression of Digital Spatial Data.
Digital Cartography and Sustainable Development. Digital Atlases and Multimedia Cartography.
New technologies and devices and their Applications in Digital Cartography and SDB (smartphones, tablets, handheld GPS / GIS, UAV, etc.
Dynamic Cartography (Animated Cartography) - Underground Digital Cartography - Interior Cartography. Network cartography.
Cartographic Generalization in Digital Spatial Data.
Analysis, Design, Implementation, Control and Information of SDB. Production of Analog Maps with digital data.
Digital Maps and Web Mapping Applications - Web Mapping
Automatic Navigation Systems, Mobile Cartography, electronic navigators. Location Based Marketing (LBM), SDB and digital cartography.
Location Based Services (LBS). Digital Ground Models - Buildings - Surface - Cities - City GML standard.
Cartography & Applications Using Satellite Images - Satellite Cartography.
Digital Geotags and SDB. Digital cartography and crisis and disaster management.
Virtual and Augmented Reality: its use in digital cartography.

Laboratory Exercises

. Project management SDB - Digital Cartography.
. Conceptual models.
. Election of cartographic / spatial entities.
. Logical SDB models.

. Import and visualize raster (vector) and vector (vector) data in GIS software.
. Geo-reference map of G.Y.S. and satellite image.
. Geobase creation, digitization and creation of simple and complex spatial objects.
. Correlation of spatial and alphanumeric databases.
. SDB topology: creation and control.
. Digital terrain, building and surface models.
. WEB MAPPING, creating a map on the internet
. Dynamic Cartography Exercise.
. Virtual and Augmented Reality: its use in digital cartography.
. Special issues.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face. Distance learning through e-class platform (training materials, exercises, data, software, reductions, etc.)	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Slides, use of softwares, software, video, use of internet, smart phones, Tablet, GPS / GIS handheld.	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	13 X 3 = 39 hours
	Seminars (by invited speakers)	5 hours preparation of questions by groups
	Laboratory Exercises / Field Exercises	2 X 13 = 26 hours + 6 preparation = 32 hours of teaching+preparation
	Training visits 5 hours	5 hours
	Elaboration of a group study (project)	10 hours
	Preparation of an individual study	7 hours
	Educational presentation of the works	5 hours (preparation)
	Course preparation / weekly study	20 hours
	Course total	**120 hours**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	***Language of assessment:*** *Greek or English or French (for ERASMUS students)* ***Evaluation methods:*** • *Written examination at the end of the semester: 60%* • *Laboratory Exercises / Field Exercises: 20%* *Personal study and presentation: 20%*	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Shashi Shekhar and Sanjay Chawla, 2003, Spatial Databases: A Tour, Prentice Hall.*
- *Rigaux & Scholl & Voisard, 2001, Spatial Databases, Morgan Kaufmann.*
- *Albert K. W. Yeung, G. Brent Hall, 2007, Spatial Database Systems: Design, Implementation and Project Management, Springer.*
- *Sandra Lach Arlinghaus , Joseph J. Kerski ,2014, Spatial mathematics-Theory and practice through mapping , Taylor & Francis Group , Boca Raton, FL .*
- *Raghu Ramakrishnan, Johannes Gehrke , 2003, Database management systems ,third edition , McGraw-Hill Higher Education , 1221 Avenue of the Americas, NY , US.*
- *Philippe Rigaux , Michel Scholl , Agnes Voisard , 2002 , Spatial databases with applications to GIS , Elsevier , 340 Pine st. , San Francisco , CA , US .*
- *Robert Laurini , Derek Thomson , 1999 , Fundamentals of spatial information systems, 7th printing , Academic Press , San Diego , CA , US .*
- *Albert K.W. Yeung , Brent G. Hall , 2007 , Spatial Database Systems: Design, Implementation and Project Management , Springer.*
- *Ramez Elmasri , Shamkant B. Navathe , 2007, Θεμελιώδης αρχές συστημάτων βάσεων δεδομένων , έκτη έκδοση , Εκδόσεις Δίαυλος , Μαυρομιχάλη 72-74 , Αθήνα.*
- *Αθανάσιος Σταυρακούδης, 2010 , Βάσεις δεσομένων και SQL – Μια πρακτική προσέγγιση , Εκδόσεις Κλειδάριθμος , Στουρνάρη 27Β , Αθήνα .*

- Related academic journals:

- *International Journal of Spatial Data Infrastructures Research - published by European Commission. ISSN: 1725-0463 http://ijsdir.jrc.ec.europa.eu/index.php/ijsdir*
- *Journal of Geographic Information System- published by Scientific Research Publishing Editor-in-Chief: Francisco J. Tapiador . Editorial Board: Alia I. Abdelmoty , Tofael Ahamed , Dafer Algarni , Carlos Marcelo Di Bella , Christophe Claramunt , Weihong Cui , Fuchu Dai , Anrong Dang , Hossein Ghadiri , Shuanggen Jin , Saro Lee , Xiang Li , Hervé Martin , Mainguenaud Michel , Jordi Martí-Henneberg , Xiaosheng Qin , Shih-Lung Shaw , P. S. Sriraj , Eddy Lynn Usery , Herna Viktor , Jianhua Xu , Xiaohuan Yang , Axing Zhu , Liangfeng Zhu .ISSN Print: 2151-1950 ISSN Online: 2151-196 http://www.scirp.org/journal/jgis/*
- *ISPRS International Journal of Geo-Information- published by MDPI AG Editor-in-Chief : Prof. Dr. Wolfgang Kainz, Editors : Yuanyuan Yang, Martyn Rittman, Ozgun Akcay, Christoph Aubrecht , Emmanuel Baltsavias, Norbert Bartelme , Carlos Granell Canut, Jun Chen, Tao Cheng, Mahmoud R. Delavar, Sisi Zlatanova, ISSN 2220-9964, http://www.mdpi.com/journal/ijgi*

-Useful Webpages

- *http://www.spatial.cs.umn.edu/Book/sdb-chap1.pdf*
- *http://dna.fernuni-hagen.de/papers/IntroSpatialDBMS.pdf*
- *http://gunet2.cs.unipi.gr/eclass/modules/document/file.php/TMD109/%CE%A3%CE%B7%CE%BC%CE%B5%CE%B9%CF%8E%CF%83%CE%B5%CE%B9%CF%82%20%CE%94%CE%B9%CE%B1%CE%BB%CE%AD%CE%BE%CE%B5%CF%89%CE%BD/3-SDBMS-logical.pdf*

7th Semester

GEO7010 – LAND MANAGEMENT & REAL ESTATE

COURSE OUTLINE: GEO07010 - LAND MANAGEMENT & REAL ESTATE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Level 6		
COURSE CODE	**GEO7010**	**SEMESTER**	7th
COURSE TITLE	**LAND MANAGEMENT & REAL ESTATE**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	3
Laboratory exercises and semester project	1	2
Total	**4**	**5**

COURSE TYPE	Skills development
PREREQUISITE COURSES:	..
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

After completing the course students will have:

- knowledge of the goals and tools of land management
- knowledge of the economic theories for land rent and land uses
- understanding of the institutions and the operation of the real estate market
- knowledge of the data required for the analysis of the real estate market
- understanding of the definition of market value and its relation to assessed (tax) value
- knowledge of the factors influencing property value
- knowledge of the procedure for property valuation
- the ability to implement appraisal methods according to the property type
- knowledge of mortgage loans, legislation and taxation concerning property in Greece
- information on the appraisal profession and the required qualifications
- the ability to understand scientific publications and data concerning the real estate market

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
- Working independently
- Team work
- Production of creative thinking

(3) SYLLABUS

1. Basic concepts and definitions (property, land rent, value)
2. Land policy (tools, institutions, legislation, methods and measures) – Land policy and cadastre
3. Basic concepts on land management and relevant economic theory
4. Real estate market:
   a. Definitions of market value and other property values
   b. Factors influencing property values
   c. Actors, bodies and institutions (real estate agents, webpages for real estate data, the appraisal profession, international organizations)
5. Real estate appraisal (definition, purpose, procedure, appraisal methods)
6. Appraisal methods (market approach, residual approach, income approach, discounted cash flow, cost approach) – land-for-apartment exchange system in Greece – mass appraisal – property valuation outside town plans
7. Real estate legislation (types of ownership, tenancies, brokerage)
8. Property taxation (types of property taxes, assessed or tax values)
9. Residential mortgage loans (interest rates, compound interest, types of loans, loan procedures in Greece)

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
<i>Face-to-face, Distance learning, etc.</i></td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>Powerpoint for presentations, the course website (e-class) for uploading course material and students' assignments. Spreadsheets, statistical analysis software and GIS software for teaching and carrying out exercises and projects.</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td>
<table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory practice</td><td>13</td></tr>
<tr><td>Project and essay writing</td><td>40</td></tr>
<tr><td>Study and analysis of bibliography</td><td>58</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>150</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek

Methods of evaluation:
1. Final exam (60%) which includes open- ended questions and problem solving
2. Laboratory work (10%)
3. Project, writing essay and oral presentation (30%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- ***Suggested bibliography:***

In Greek

1. Karanikolas N. 2010. Property Valuation, Disigma, Thessaloniki.
2. Kiochos P. 2010. Introduction to property valuation and appraisal methods, E. Kiochou publications, Athens.
3. Zentelis P. 2011. About real estate and cadastre, Athens, Papasotiriou.
4. Zentelis P. 2015. Real Estate. [e-book.] Athens Hellenic Academic Libraries Link (Heal Link). Available at: http://hdl.handle.net/11419/4235.
5. Scarrett D. 2012. Property valuation: the five methods, Kleidarithmos publishing, Athens

In English

1. Shapiro E. , Mackmin D. and Sams G. 2013. Modern Methods of Valuation, New York: Routledge.
2. Baranzini A., Ramirez J., Schaerer C. and Thalmann P. (eds.) 2008. Hedonic Methods in Housing Markets, New York: Springer.

3. Ratcliffe J., Stubbs M. and Keeping M. 2009. Urban Planning and Real Estate Development, London: Routledge.
4. Rattermann M.R. 2009.The Student Handbook to the Appraisal of Real Estate, 13th Edition, MAI, SRA.
5. The European Group of Valuers' Associations (TEGoVA) 2016. European Valuation Standards 2016, 8th edition, http://www.tegova.org/

- ***Related academic journals:***

Journal of European Real Estate Research, Emerald Group Publishing
Land, MDPI
Journal of Real Estate Research, American Real Estate Society

GEO7020 – PHOTOGRAMMETRY III (Digital Photogrammetry & Computer Vision)

COURSE OUTLINE: GEO7020 – PHOTOGRAMMETRY III (Digital Photogrammetry & Computer Vision)

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 6		
COURSE CODE	**GEO7020**	**SEMESTER**	7th
COURSE TITLE	**GEO702 Photogrammetry III (Digital Photogrammetry & Computer Vision)**		
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 Labs		4(2/2)	5
TOTAL		**4**	**5**
COURSE TYPE	Specialized general knowledge		
PREREQUISITE COURSES	Photogrammetry I, Photogrammetry II Suggested completion of course *Digital Image Processing*		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
OFFERED TO *ERASMUS* STUDENTS	Can be taught in English		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75		

(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.*
Following the two previous courses (*Photogrammetry I* and *II*), the purpose here is first to convey necessary knowledge regarding certain concepts and tools of image processing. This will help understand the logic, the mathematical models and the methods of automatic photogrammetric techniques in today's digital environment. A further task is to effectively insert modern photogrammetric approaches (orientations and reconstruction) into the wider context of a rapidly evolving geospatial technology as well as into a more general inter-disciplinary framework involving automatic extraction of geometric and semantic information from images, which includes fields such as computer vision and pattern recognition. The combination of theoretical lectures and implementation (in the Lab) of algorithms of digital photogrammetry by the students themselves aims at equipping them with the capability to address new problems and adapt to specific requirements Successful completion of this third compulsory course in photogrammetry means that students:

- Have understood the theoretical background of image processing techniques, of image transformation methods and of today's automatic photogrammetric tools, and thus are in position to plan and carry out digital photogrammetric projects.
- Have understood basic mathematical models from computer vision (e.g. fundamental and essential matrices) and their relation to standard photogrammetric formulations.
- Are capable of controlling the performance of current photogrammetric software (methods and strategies of multi-view matching, robust estimation techniques etc.) and are in principle competent to assess results and tackle basic problems encountered.
- Have also the capability of programming computer modules for basic tasks of photogrammetry and computer vision (radiometric/geometric image transformations, image matching) according to the problem involved.
- Have good understanding of the potential of photogrammetry and computer vision as well as their relation to relevant fields to which they provide important input data (digital terrain models, orthomosaics, textured 3D models etc.), such as cartography and GIS.
- In view of the above, the students may successfully design, execute and evaluate today's photogrammetric projects, and at the same time follow and integrate into their activity current scientific and technological developments.

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?

- Working independently
- Teamwork
- Criticism and self-criticism
- Adapting to new situations

(3) SYLLABUS

Introduction to digital photogrammetry and computer vision. Radiometric and spatial resolution. The meaning of scale in a digital image. Radiometric image transformations (histogram transformations, thresholding, image convolution, linear and non-linear filters, smoothing, enhancements, automatic edge detection). Geometric image transformations. Colour interpolation and image resampling. Image pyramid. Panoramic images. Digital rectification, orthorectification, digital surface development and cartographic projections. Photogrammetric automation and real-time solutions. Epipolar geometry and epipolar rectification of the stereopair. Computer vision and photogrammetry (essential matrix, fundamental matrix), robust estimators, RANSAC. Point operators and descriptors. Point extraction and point matching. Automatic relative orientation. Automatic phototriangulation. Digital image matching / correlation and generation of depth maps. Methods for automatic stereo and multi-view matching. Introduction of geometric constraints. Automatic DSM generation and 3D reconstruction.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY	- Support by the electronic asynchronous course platform *eclass* (exchange of information and digital data

Use of ICT in teaching, laboratory education, communication with students	between tutors and students - Use of electronic material as teaching aid (ppt slides). - Solution of photogrammetric problems using *Matlab*. - Use of photogrammetric software for Lab exercises.

TEACHING METHODS

The manner and methods of teaching are described in detail.

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

Activity	***Semester workload***
Lectures	26
Laboratory / Exercises	26
Preparation of Exercises	36
Non-directed study	62
Course total	**150**

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.

Language of evaluation: Greek

Methods of Evaluation:

- Written examination in the end of the semester (70%), which combines open-ended questions and numeric calculations.
- Evaluation of performance in the Lab exercises (30%)

(5) SUGGESTED BIBLIOGRAPHY

6. ASPRS, 2013. *Manual of Photogrammetry*. 6th edition, J. Chris McGlone (editor).
7. Luhmann T., Robson S., Kyle S., Harley I., 2006. *Close Range Photogrammetry: Principles, Techniques and Applications*. Whittles Publishing, Scotland.
8. Szeliski R., 2010. *Computer Vision: Algorithms and Applications* (draft). Springer (http://szeliski.org/Book/).
9. Hartley R., Zisserman A., 2000. *Multiple View Geometry in Computer Vision*. Cambridge University Press.
10. Förstner W., Wrobel B. P., 2016. *Photogrammetric Computer Vision*. Springer.
11. Schenk T., 1999. *Digital Photogrammetry*. TerraScience, Laurelville, Ohio, USA.

In Greek:

12. Kraus K., 2003. *Photogrammetry.* Vol 1. TEE Editions, Athens.
13. Petsa E., 2019. *Couse Slides for "Digital Photogrammetry and Computer Vision"*. UniWA.
14. Grammatikopoulos L., Kalisperakis I., Karras G., Petsa E., Tsironis V., 2018. *Elements of Projective Geometry in Computer Vision*. UniWA

GEO7030 – CADASTRE

COURSE OUTLINE: GEO7030 - CADASTRE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7030**	**SEMESTER**	7th
COURSE TITLE	**CADASTRE**		
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 TEACHIN GHOURS**	**CREDITS**
		4	5
Total		**4**	**5**
COURSE TYPE	General background [obligatory]		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75		

(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.

The course aims to introduce students to the Hellenic (National) Cadastre and main cadastral surveys/works in Greece, such as Urban Plans implementation, roads opening-up or widening. During the course students get familiar with Hellenic Cadastre development and operation, which due to its technical and legal aspects is complicated. Furthermore, students elaborate projects on cadastral surveys, such as Urban Plans implementation and roads opening up or widening in respect to property rights that are within the main aspect of their profession as Surveyors and Geoinformatics Engineers. Students also learn main principles of Land Administration.

After successful course completion, students are expected to have knowledge on:

a) Basic principles of Greek Property Law
b) Structure and operation of modern cadastral systems
c) Legislation on the Hellenic Cadastre, implementation of that legislation
d) Legislation on Urban Plans Implementation
e) Basic principles of INSPIRE Directive, in respect to Cadastre

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 • Adaption to new work conditions • Decision-making • Independent work • Team work • Self-evaluation • Free, creative and inductive thinking

(3) **SYLLABUS**

Theory

- Greek Property Law and Deeds analysis
- Legislation of Hellenic Cadastre
- Property Declaration on Hellenic Cadastre during its development
- Spatial adjustments on operational Hellenic Cadastre
- Legislation on Urban Plans Implementation and its applications (technical & legal)
- Principles on structure and operation of modern cadastral systems
- INSPIRE Directive and Cadastre
- Roads opening up or widening and property rights alteration (technical & legal)
- Cadastre and Land Administration

Course exercises
Practical exercises on:

- Property Declaration on Hellenic Cadastre and process analysis
- Cadastral survey on urban plan implementation (includes Group presentation and individual analytical technical report submission)
- Spatial adjustments on operational Hellenic Cadastre
- Roads opening up or widening and property rights alteration (technical & legal)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY .	Face-to-Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (legislation and literature review) • E-class UNIWA platform and office Microsoft 365 UNIWA tools (TEAMS, Class Notebook, Shared docs, email) • GIS and CAD software • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Evaluation Language: Greek (English) Evaluation methods: • Written exam (winter or September exams period) • Team project official presentation, final personal technical report on the team project, class exercises.

Activity	***Semester workload***
Lectures (Theory – exercises)	52 (13*4)
Home Study	35
Team project	38
Course total	**125**

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Arvanitis, A., 2014, Cadastre 2020 [in Greek: Ktimatologio 2020], Ziti Publications ISBN: 960-431-606-0 (in greek language)

www.ypeka.gr
www.ktimatologio.gr
www.et.gr
www.fig.net
https://inspire.ec.europa.eu/

- Related academic journals:
MDPI Sustainability
MDPI Land
Elsevier Land Use Policy

GEO7040 – ERROR THEORY & OBSERVATIONS ADJUSTMENT II

COURSE OUTLINE: GEO7040 - ERROR THEORY & OBSERVATIONS ADJUSTMENT II

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7040**	**SEMESTER**	7th
COURSE TITLE	**ERROR THEORY & OBSERVTIONS ADJUSTMENT II**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		4	5
Lab exercises			
Total		**4**	**5**
COURSE TYPE	Specialized general knowledge		
PREREQUISITE COURSES:	GEO301 – Error Theory and observation adjustment II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. It can be offered in English if there are foreign students		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75		

(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.

Upon successful completion of the course, the student:

- will be able to distinguish and categorize the basic methods of observations adjustment,
- will have understood parameter estimation methods with emphasis on practical problems,
- will have the ability to analyze the data of each problem based on them to apply the appropriate adjustment method and to interpret and evaluate the results,
- will be able to develop methods of analysis of specialized algorithms for optimal data processing in Geosciences,
- will have the ability develop algorithms for adjustment methods.

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, analysis and synthesis of data and information, using the necessary technologies
- Decision making
- Working independently
- Working in an interdisciplinary environment
- Develop of new research ideas
- Promoting free, creative and inductive thinking

(3) SYLLABUS

Data analysis and observations adjustment, main features of adjustments methods, alternative adjustment methods, the method of observation equations, examples, accuracy of adjustment results, special cases of observation equations, the concept of rank defect to solve problems, constraints (minimum, redundant, internal constraints), adjustment in sequence stages, adjustment with pre-existing information on unknown parameters, method of condition equations, examples, method of mixed equations, mixed equations with commitments, examples, comparison , statistical testing and evaluation of adjustment results, statistical hypotheses, general hypothesis, total control and data scanning, interpolation and forecasting, models with stochastic parameters, estimation of variability components.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">• Lectures: use of multimedia (presentations and videos)
• Lab exercises: specialized software and libraries for surveying studies
• Utilization of e-class UNIWA platform (file exchange among professors and students)
• Web search (literature review and data sources)</td></tr>
<tr><td rowspan="5">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Study and analysis of bibliography</td><td>40</td></tr>
<tr><td>Exercises/Projects</td><td>48</td></tr>
<tr><td>Course total</td><td>150</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Language of evaluation: Greek
Method of evaluation:
• Written exams: 70%
• Laboratory exercises/projects: 70%</td></tr>
</table>

	Written, graded difficulty, problems - exercises

(5) ATTACHED BIBLIOGRAPHY

In Greek:

1. Dermanis A. (1987). Observation adjustment and evaluation theory, Vol. 2, ed. Ziti.
2. Dermanis A. & Foriou A. (1992). Methods and applications of observation adjustment, Ed. Ziti

In English:

3. Dermanis A., A. Grun and F. Sanso eds. (2000) Geomatic methods for the analysis of data in the Earth Sciences. Springer.
4. Ghilani C.D. and P.R. Wolf (2006) Adjustment computations and spatial data analysis. John Wiley and Sons.
5. Koch K.R. (1999) Parameter estimation and hypothesis testing in linear models. Springer.
6. Teunissen P.J.G. (2003) Adjustment theory. Series on Mathematical Geodesy and Positioning, Delft, The Netherlands.
7. Teunissen P.J.G. (2000) Testing theory. Series on Mathematical Geodesy and Positioning, Delft, The Netherlands.

GEO7050 – SPATIAL PLANNING AND REGIONAL DEVELOPMENT

COURSE OUTLINE: GEO7050 - SPATIAL PLANNING AND REGIONAL DEVELOPMENT

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7050**	**SEMESTER**	**7th**
COURSE TITLE	**SPATIAL PLANNING AND REGIONAL DEVELOPMENT**		
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	3	
Lab exercises	1	2	
Total	**4**	**5**	
COURSE TYPE	Specialised knowledge		
PREREQUISITE COURSES:	..		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	..		

(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.

The course aims to elaborate on the economic, social and environmental dimensions of sustainable development with emphasis on spatial planning. A long-term analysis of institutional developments for spatial planning and regional development at the national and European levels is also carried out. The spatial planning system is examined in relation to the administrative system, and the special categories of areas (mountainous, coastal, etc.) are also examined. An important part of the course focuses on analysing the interconnections between land uses, infrastructure networks, housing networks, protected areas and location of activities. In addition, the objectives, tools and strategies of physical and financial spatial planning concerning the available national and European financial instruments are examined. Through the analysis of these issues, the course aims to familiarise the students with the tools of regional policy and concepts such as the regional problem, regional inequalities, spatial cohesion and regional specialisation. The students are also introduced to Integrated Coastal Zone Management and Marine Spatial Planning approaches.

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
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

1. Introduction: Region, development and spatial planning.
2. Economic, social and environmental aspects of sustainable development.
3. Natural and man-made environment. Indicators for measuring spatial phenomena.
4. Land use/ coverage, infrastructure networks. The housing network and its dynamics. Protected areas
5. Location of activities.
6. Integrated regional development. Regional inequalities, convergence, cohesion, regional specialization, integration. The regional problem and the need for regulation-management. Motivation, knowledge, innovation, new technologies. SWOT analysis.
7. The administrative system of Greece. Spatial planning at different levels. Special categories of areas (mountainous, coastal, border, metropolitan, etc.).
8. Physical and financial planning: Objectives, Strategies. Financial instruments at Greek and European level.
9. Integrated Coastal Zone Management and Marine Spatial Planning.
10. Spatial studies and regional development studies. The role of surveyors/ geoinformatic engineers.
11. Recent institutional developments concerning spatial planning and regional development in national/ european levels.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Email • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek - Methods of evaluation: • Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) • - Homework/ Essay (Essay on the theoretical and practical objectives of the course)

Activity	***Semester workload***
Lectures	39 (13 X 3)
Study and analysis of bibliography	39 (13 X 1)
Preparation of exercises	58
Study-Essay	50
Course total	***160***

(5) ATTACHED BIBLIOGRAPHY

- Atzema O. et al. (eds), ‘Regions, Land, Consumption and Sustainable Growth, Edward Elgar, 2005.
- European Commission, ‘A new Partnership for Cohesion; Convergence, Competitiveness, Cooperation (3rd report on economic and social cohesion’, European Communities, 2004.
- European Commission, ‘ESDP, European Spatial Development Perspective’, European Communities, 1999.
- European Commission, ‘Investing in Europe’s future’ (5th Report on Economic, Social and Territorial Cohesion), European Communities, 2010.
- Hall P. ‘Urban and Regional Planning’. 4th Edition. Routledge. London and New York, 2002.
- OECD, ‘Towards a New Role for Spatial Planning, OECD Publications, 2001.
- Petrakos G., Psycharis G., Regional development in Greece, Kritiki Editions, Athens, 2016.
- Reimer M., Getimis, P., Blotevogel H. ‘Spatial Planning Systems and Practices in Europe. A Comparative Perspective on Continuity and Changes’, (eds), Routledge, New York, 2014.
- Wassenhoven, L. ‘Maritime Spatial Planning: Europe and Greece’, Crete University Press, 2017.

Websites

- ECTP-CEU (European Council of Spatial Planners - Conseil européen des urbanistes), http://www.ectp-ceu.eu/
- European Commission / Regional Policy, http://ec.europa.eu/regional_policy/index_el.cfm/
- ESPON, (European Observation Network for Territorial Development and Cohesion), http://www.espon.eu/main/
- ISOCARP (International Society of City and Regional Planners), http://www.isocarp.org/
- United Nations Development Programme , http://www.undp.org/content/undp/en/home.html/

GEO7060 – GEODETIC-SURVEYING APPLICATIONS

COURSE OUTLINE: GEO7060 - GEODETIC-SURVEYING APPLICATIONS

(1) GENERAL

SCHOOL	ENGINEERING			
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING			
LEVEL OF STUDIES	Graduate – Level 7			
COURSE CODE	**GEO7060**	**SEMESTER**	7th	
COURSE TITLE	**GEODETIC-SURVEYING APPLICATIONS**			
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 TEACHIN GHOURS**	**CREDITS**
Lectures and Labs			4(2/2)	5
TOTAL			4	5
COURSE TYPE	Special background			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Can be taught in English			
COURSE WEBSITE (URL)	UNIWA Open eClass | Γεωδαιτικές - Τοπογραφικές Εφαρμ...			

(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.

- **Metrology** (Introduction, errors, checking and calibration, ISO standards)
- **Special levelling methods** (precise levelling, digital levelling, special trigonometric levelling, heighting with GPS)
- **Underground Surveying** (optical and mechanical methods, gyro-theodolite, line and level)
- **Laser Scanning** (Principles of 3D Laser Scanning, principles of pulsed time of flight TLS technology and Georeferencing in TLS, Issues in Laser Scanning)
- **Special Construction Stakeout Surveys** (Introduction, Construction Stakeout Fundamentals, Levelling methods, basic procedures, office and field preparations and procedures, errors in Stakeout Surveys)
- **Cultural Heritage Surveying** (The aims of a cultural heritage survey, basic methods of cultural heritage surveying)

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?*
After completion of the course students will be able to design and implement special geodetic and surveying methodologies and techniques required for design, construction and monitoring of technical projects, industrial applications in surveying underground works and cultural heritage documentation. Also, they will become familiar with state-of-the-art geodetic equipment and techniques in order to be able to apply them in a number of geodetic applications.

(3) SYLLABUS

- Metrology
- Special levelling methods
- Underground Surveying
- Laser Scanning
- Special Construction Stakeout
- Cultural Heritage Surveying

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Support by the electronic asynchronous course platform *eclass* (exchange of information and digital data between tutors and students) - Use of software - Use of programming environment for preparing projects. - Use of Surveying software for Lab exercises.

TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	52
	Laboratory / Exercises	48
	Non-directed study	50
	Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek or English Methods of evaluation: Final exam (60%) which includes open- ended questions and problem solving Laboratory work (40%)

(5) ATTACHED BIBLIOGRAPHY

- **Suggested bibliography:**

1. Allan A.L., Hollwey J.R., Maynes J.H.B., Amin A., 1980. Practical Field Surveying and Computations. Heinmann, Portsmouth (USA).
2. Baarda W., 1967. Statistical Concepts in Geodesy. Netherlands Geodetic Commission, Publications on Geodesy, New Series, Vol. 2, No. 4, Delft.
3. Heritage G., Large A., 2009. Laser scanning for the environmental sciences. Wiley-Blackwell.
4. Howard P., 2007. Archeological Surveying and mapping. Recording and depicting the landscape. Routledge Taylor & Francis Group, London and New York.
5. Mikhail E. M., Gracie G., 1981. Analysis and Adjustment of Survey Measurements. Van Nostrand Reinhold, New York.
6. Shan J., Toth Ch., 2008. Topographic laser ranging and scanning. Principles and processing. CRC Press, Taylor & Francis Group

GEO7070 – SPECIAL TOPICS IN REMOTE SENSING

COURSE OUTLINE: GEO7070 - SPECIAL TOPICS IN REMOTE SENSING

(1) GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate – level 7		
COURSE CODE	**GEO7070**	**SEMESTER OF STUDIES**	7th
COURSE TITLE	**Special Topics in Remote Sensing**		

INDEPENDENT TEACHING ACTIVITIES *in case the credits are awarded in discrete parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDIT**
Lectures	3	3
Laboratory Exercises	1	2
TOTAL	**4**	**5**

TYPE OF COURSE	ELECTIVE COURSE FOR THE DIRECTION IN GEO-INFORMATICS
PREREQUISITE COURSES:	Remote Sensing I & II
C.LAUSSA OF TEACHING AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (English)
ONLINE COURSE PAGE(URL)	https://eclass.uniwa.gr/courses/GEO707/

(2) LEARNING OUTCOMES

Learning Outcomes
The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that students will acquire after the successful completion of the course.

The aim of the course is to understand specialized applications of remote sensing in:

- Urban environment
- Agricultural crops
- Monitoring of natural disasters
- Water management
- Marine environment
- Monitoring of targets and environmental pollution
- Infrastructure and energy projects
- Specialized methods of Artificial Intelligence and analysis of large amounts of satellite data

General Competencies
Taking into account the general skills that the graduate must have acquired (as these are listed in the Diploma Supplement and listed below) which / which of them is the subject of the course intended for?

- *Search, analysis and synthesis of data and information, using the necessary technologies*
- *Decision-making*
- *Autonomous work*
- *Project planning and management*

(3) COURSE CONTENT

- Spatial Changes in urban environment and atmospheric quality
- Flood monitoring
- Monitoring earthquakes, micro-movements and erosion
- Fire monitoring and mapping
- Estimation of rainfall and snowfall
- Classification of agricultural crops
- Mapping of inaccessible coastal areas and wetlands
- Water quality techniques and river sediment calculation techniques
- Extraction of bathymetry from satellite data
- Archaeological depictions and excavations
- Specialized machine learning methods in satellite image classification
- Time series and techniques for large volume of satellite data mining (Big dada and Datamining).
- Identifying and tracking goals
- Use of Remote Sensing in infrastructure and energy projects
- Special applications of remote sensing software (ENVI, eCognition)

(4) TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face to face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of TEIs in Teaching, Laboratory Education, Communication with students*	Lectures: Use of ICT (power point presentations) Laboratory exercises: use of specialized software for the analysis of digital image data. Communication: use of asynchronous tele-education platform-eclass
TEACHING ORGANIZATION *The way and methods of teaching are described in detail.* *The student's study hours for each learning activity are listed, as well as the hours of a non-guided study according to the principles of ECTS*	
STUDENT EVALUATION *Description of the evaluation process* *Evaluation Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Report/ Report, Oral Examination, Public Presentation, Laboratory Thesis, Clinical Examination, Clinical Examination, Artistic Interpretation, Other/ Other* *Explicitly defined assessment criteria are mentioned and if and where they are accessible to students.*	• Multiple-choice final written exam and development questions(60%) • Semester theme(4 0%) Language of the examination: Greek (English if needed, e.g., Erasmus+students)

Activity	*Semester Workload*
Lectures	60
Study & analysis of bibliography	60
Laboratory Exercises	30
Total Course	**150**

(5) RECOMMENTED BIBLIOGRAPHY

Greek:

7. Skianis Eim. G., Nikolakopoulos G. K., Vaiopoulos A. D. 2012. "Remote Sensing" ION Publications 336sel.
8. Kartalis K., C., 2007, Fidas, "Principles & Applications of Satellite Remote Sensing", V. Gkiourdas Ekdotiki, Athens.
9. Mertikas S.P., 2006, "Remote Sensing and Digital Image Analysis", ION Publications

English:

13. Campbell J.B., 2006. *Introduction to Remote Sensing*, The Guilford Press, New York.
14. Cracknell A.P., L. Hayes, 2007. *Introduction to Remote Sensing*, CRC Press.
15. Jensen J.R., 2005. *Introductory Digital Image Processing: A Remote Sensing Perspective*. Prentice Hall.
16. Lillesand S. M.,R.W. Kiefer, J.W. Chipman, 2007. *Remote Sensing and Image Interpretation*. Wiley.
17. Mather P., 2004. *Computer Processing of Remotely Sensed Images: An Introduction*. Wiley.
18. Sabins F.F., 1997. *Remote Sensing: Principles and Interpretation*, W. H. Freeman & Co., New York.
19. Schowengerdt R.A., 2006. *Remote Sensing: Models and Methods for Image Processing*, Academic Press.

GEO7080 – ANALYTICAL METHODS IN GIS

COURSE OUTLINE: GEO7080 – ANALYTICAL METHODS IN GIS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7080**	**SEMESTER**	7th
COURSE TITLE	**Analytical Methods in GIS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	3
Projects/ Exercises	1	2
Total	**4**	**5**

COURSE TYPE	Special background/ skills development
PREREQUISITE COURSES:	GIS Applications and Spatial Decision Support
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75 https://eclass.uniwa.gr/courses/TOP147/

(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.

The scope of the course is to have in depth knowledge and develop skills on the complexity and variability of geographical/ spatial problems, under GIS science in theoretical and practical level.
The course covers a wide range of subjects on understanding and using GIS in spatial analysis, and 3D analysis, network analysis and location and access models implementation.
The course syllabus includes practical exercises and project elaboration, in respect to planning and implementation solutions, for spatial problems in local or regional level.
Course's scope is that students understand the theoretical background and develop skills on definition, analysis, techniques implementation for spatial problems solution on regional and urban scale, and their presentation.
After successful course completion, students are expected to:

- Know geographic information selection and management methodologies appropriate for definition and classification of spatial problems in respect to their size, time and scale
- Understand the theoretical background on spatial analysis methods definition and

function with GIS use, so as to be able to analyze spatial phenomena and their intercorrelations

- Apply analysis and management techniques on raster data models, transformations, classification and creation of data sets
- Design surface analysis models and 3D sets and to apply interpolation methods
- Design location solution scenarios and develop the appropriate cartographic products for the analysis and synthesis of spatial information
- Develop applications and design solutions for spatial and environmental problems in any geographic reference scale and to conduct technical reports with the spatial analysis results
- Evaluate scenarios results, perform comparative analysis and define best practices in GIS in respect to the analytical methods
- To elaborate with other students in project elaboration and oral presentation

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, analysis and synthesis of data and information, with the use of the necessary technology
- Adaption to new work conditions
- Decision-making
- Independent work
- Team work
- Self-evaluation
- Free, creative and inductive thinking

(3) SYLLABUS

i. Introduction. Geographic data models review. GIS analytical methods and spatial problems. Conceptual framework. Terminology. Application field.
ii. Continuous data models. Grid formats and geographic data (grid datasets). Spatial Analysis, structures and functions. Advantages and problems. Discrete and continuous fields. Vector and raster data integration. Representation, geographic reference, accuracy and resolution of raster data. Transformations. Cell values, bands and ranges. Attribute Tables in raster files. Reclassification. Derivative information.
iii. GIS and three-dimensional analysis. Features and application fields. Surface Models. Analytical procedures and derivative information. Interpolation methods. Production of isarithmic lines. Slope maps, aspect models, shaded relief and sun exposure models. Visibility Analysis. Calculating distances and directions. Cost surface models.
iv. Grid models and spatial analysis methods. Features and application fields. Analytical geometric functions, spatial relationships and zonal statistics. Calculations and mathematical operations on raster files. Logical inquiries and combined information. Distance analysis, proximity and adjacency. Deriving combined statistical information. Density models and spatial distributions. Grid operations and Map Algebra. Location-allocation methods using grid data. Spatial classifications, cost models and accessibility models.
v. Geometric networks and GIS. Principles and scopes. Network elements and structure. Information associated with the network elements. Construction of a network model. Topology. Location-allocation models within a geometric network. Optimal route operations.
vi. GIS Applications and environmental problems - applications: Water resources management. Feasibility study of a reservoir. Hazard Maps (Risk Mapping). Applications on flood phenomena and diseases dispersions.
vii. Programming in GIS environment. Analytical procedures and creation of corresponding operating models. (Model Builder). Applications in Archaeology.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (legislation and literature review) • E-class UNIWA platform and office Microsoft 365 UNIWA tools (TEAMS, Class Notebook, Shared docs, email) • GIS and CAD software, WEB-GIS • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures Theory	35
Exercises	25
Individual projects	40
Team project	30
Home study	20
Course total	***150***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Evaluation Language: Greek (English) Evaluation methods: • Written exam (winter or September exams period) • Exercises evaluation • Individual project evaluation • Team project evaluation

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. ESRI (2012) Using ArcGIS 3D Analyst

2. ESRI (2012) Using ArcGIS Spatial Analyst, Advanced Raster Spatial Analysis

3. ESRI (2012) Using ArcGIS Network Analyst

4. M. de Smith, M. Goodchild, P. Longley; Geospatial Analysis - a comprehensive guide. 3rd edition © 2006-2009, Published by Matador (an imprint of Troubador Publishing Ltd) on behalf of The Winchelsea Press; ISBN 13: 9781848761582; Free web version site: Spatial Analysis site (http://www.spatialanalysisonline.com/output/)

5. DeMers, M., 2002, GIS modeling in raster, New York, Wiley.

6. Dibble C, Feldman P G (2004) The GeoGraph 3D computational laboratory: Network and terrain landscapes for Repast. J. of Artificial Societies and Social Simulation, 7(1): http://jasss.soc.surrey.ac.uk/7/1/7.html

7. Dodge M, Kitchin R (2001) Atlas of Cyberspace. Available as a free PDF file from: http://www.kitchin.org/atlas/index.html (originally published by Adison-Wesley).

8. ESRI (1996) Automation of map generalization — the cutting edge technology. ESRI, Redlands, CA, USA: http://downloads.esri.com/support/whitepapers/ao/mapgen.pdf

9. Eastman J R (1989) Pushbroom algorithms for calculating distances in raster grids. Proceedings, Autocarto 9, 288-97. Available as a downloadable pdf from: http://mapcontext.com/autocarto/proceedings/auto-carto-9

http://www.geodata.gov.gr/

INSPIRE
http://europa.eu/legislation_summaries/environment/general_provisions/l28195_el.htm
The INSPIRE geoportal http://inspire-geoportal.ec.europa.eu/
www.ktimatologio.gr
Joint Research Centre - JRC - European Commission: https://ec.europa.eu/jrc/en/about
7. Environmental Systems Research Institute http://www.esri.com/

- Related academic journals:
MDPI Geographies, Geoscience

GEO7090 – ARCHITECTURE

COURSE OUTLINE: GEO7090 - ARCHITECTURE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7090**	**SEMESTER**	7th
COURSE TITLE	**ARCHITECTURE**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	2	
Lab exercises	2	
Total	**4**	**5**

COURSE TYPE	In-depth, consolidation of the specialty
PREREQUISITE COURSES:	--
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO267/

(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.

The learning objectives are achieved by the analytical and synthetic approaches as described below, as well as the feedback of the theoretical and laboratory part of the course.

The analytical approach mainly concerns the theoretical part of the course and the formation of the terms of the architectural problem per historical period and in different cultural environments and spatial areas but also by the special characteristics of the place, natural and man-made. It also includes the acquaintance with main exponents "teachers" of architecture and their work and the development of students' means of expression. The above concerns a series of lectures, which will seek and encourage the active participation of students.

Introduction to architectural design which is primarily a research process therefore cultivates special skills in students.

After the successful completion of the course, students are expected to:

o know the general principles of architecture and to understand how they can contribute to the projects implemented by surveyors-geoinformatics engineers.

o know the basic architectural currents and the work of important architects.

o Have consolidated the principles of ergonomics and apply them.

o be aware of the importance of the environment in architecture.

o Understand the basic requirements of the functional program and develop the skills to transform it into a designed space, obeying the regulatory frame of the relevant regulations.

o evaluate-analyze the architectural solutions with criteria of functionality and construction possibilities.

o choose the appropriate materials and building methods

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?

After the successful course attendance, students are expected to acquire the following General Competences:

o Search, analysis and synthesis of data and information, using the necessary technology
o Decision making
o Autonomous and team work
o Project design and management
o Respect for the natural environment
o Promoting free, creative and inductive thinking

(3) **SYLLABUS**

Theoretical part of the Course

1. History of Architecture. Socio-economic correlation / documentation of the architectural project.
2. Introduction to the basic parameters of architecture (human scale, function, form, aesthetics, construction, economy, respect for the environment, etc.).
3. Basic principles of ergonomics.
4. Analysis of issues of orientation, ventilation, lighting, gradation of spaces, etc.
5. Geometric approach to architectural design.
6. Building and surrounding area.
7. Relationship between architectural form and structural function.

Lab Part of the Course

1. Essay: Selected Architect’s Monograph. Study of major architect’s life and work and to analyze a specific project.
2. Architectural Design. Project : Residential building

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY METHOD</td><td>Face-to-Face
Lectures - interactive classroom teaching.
Encourage students in the preparation of the next lesson.
Encouraging students to attend related Workshops, Conferences, etc.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>Web search (literature review and data sources)
Utilization of E-class UNIWA platform (file exchange among professors and students)
Email
Specialized software and libraries (both commercial and open source) for architectural design
Office software (word, presentations, spreadsheets editors)</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures/ Presentations</td><td>26</td></tr>
<tr><td>Study and analysis of bibliography (Homework)</td><td>26</td></tr>
<tr><td>Laboratory Exercises (Essay)</td><td>50</td></tr>
<tr><td>Laboratory Exercises (Project)</td><td>58</td></tr>
<tr><td>Course total</td><td><i>160</i></td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek

Methods of evaluation:
Essay and design project after successful attendance of the course (min.50%)
Public presentation & oral examination (theoretical and lab exercises) (max.50%)</td></tr>
</table>

(5) RECOMMENDED BIBLIOGRAPHY

-History of Architecture (20th century)

- Jencks, Charles The Language of postmodern architecture, Academy Editions, London 1977
- Κόνραντς Ούρλιχ Μανιφέστα και Προγράμματα της αρχιτεκτονικής του 20ου αι, Επίκουρος, Αθήνα 1977
- Φιλιππίδης, Δημήτρης Νεοελληνική Αρχιτεκτονική, Μέλισσα, Αθήνα 1984
- Frampton Kenneth,

"Towards a Critical Regionalism: Six Points for an Architecture of Resistance", in The Anti-Aesthetic: Essays on Postmodern Culture. edited by Hal Foster, Bay Press, Port Townsen (1983).

Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture. MIT Press, Cambridge, Mass., 1995.

The Evolution of 20th-Century Architecture: A Synoptic Account. Springer, New York, 2006.

Modern Architecture: A Critical History (World of Art), Thames & Hudson, London, Fifth Edition (2020).

- Χολέβας, Νικόλαος Αρχτεκτονική του μεσοπολέμου στα Βαλκάνια, Φιλιππότη, Αθήνα 1994

-Architectural Design

- Baker Goefry, Le Corbusier An analysis of form Van Nostrand Reinhold, 1996
- Ching Francis Archtecture: Form Space and order, Van Nostrand Reinhold, 1996
- Ζάννος, A.I. Αρχιτεκτονική μορφή και στατική λειτουργία, Αθήνα 1983
- Μιχελής, Π. Η αρχιτεκτονική ως τέχνη, Αθήνα 1979
- Μιχελής, Π. Η αισθητική της αρχιτεκτονικής του μπετόν αρμέ, Αθήνα 1975
- Mitchell, William The logic of architecture, MIT Press 1990
- Μπίρης Τάσος, Αρχιτεκτονικής σημάδια και διδάγματα. Στο ίχνος της συνθετικής δομής, ΜΙΕΤ, Αθήνα 1996
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- Πεπονής, Γιάννης Χωρογραφίες, Ο αρχιτεκτονικός σχηματισμός του νοήματος, Αλεξάνδρεια, Αθήνα 1997
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- Τζώνος Π., Αρχιτεκτονικός Σχεδιασμός / Τι είναι αυτό; ο πειρασμός μιάς θεωρίας, Παπασωτηρίου, Αθήνα 1996
- Τσακόπουλος Π., ΑΝΑΓΝΩΣΕΙΣ της ελληνικής μεταπολεμικής αρχιτεκτονικής, Εκδόσεις Καλειδοσκόπιο, Αθήνα 2014

-Major Architect’s Monographs

- Αρβανίτη- Κρόκου, Λέττη Για τον Κυριάκο Κρόκο, ενθύμηση, Ίκαρος 2008
- Boesiger, W., Girsberger H. Le Corbusier 1910-1965, Artemis, Zurich 1993
- Dal Co, Francesco Tadao Ando Complete work, Phaidon Press, 1995
- Δεκαβάλλας Κωνσταντίνος Από τη μεγάλη κλίμακα στη μικρή, Κατάλογος έκθεσης Μουσείο Μπενάκη, Αθήνα 2008
- Καλαφάτη, Ελένη Παπαλεξόπουλος, Δημήτρης, Τάσος Χ. Ζενέτος Ψηφιακά οράματα και αρχιτεκτονική, Libro, 2006
- Καρδαμίτση –Αδάμη, Μάρω Ο αρχιτέκτων Κλέων Κραντονέλλης, Μουσείο Μπενάκη, Αθήνα 2009
- Κωνσταντινίδης, ‘Αρης, Μελέτες και κατασκευές Άγρα, Αθήνα 1992

- Πικιώνης Δημήτρης, Μια συναισθηματική τοπιογραφία, Architectural Association, 1989
- Rossi, Aldo Επιστημονική Αυτοβιογραφία, Εστία 1995
- Μονογραφία, Τάκης Χ Ζενέτος 1926-1977, Αρχτεκτονικά θέματα, Αθήνα 1978
- Μονογραφίες TASCHEN Louis Kahn 1901-1975, Hans Scharoun etc
- Συλλογικό έργο Αρχιτεκτονική Ιδέες που χάνονται, ιδέες που συναντιούνται, Παπασωτηρίου, Αθήνα 2004

-Περιοδικά
Αρχιτεκτονικά θέματα
Δομές
El Croquis

-Ταινίες
Bêka, Ila, Lemoine, Louise: Koolhaas Houselife (2013)
Cohn, Jason, Jersey, Bill : Eames: The Architect and the Painter (2011)
Kahn, Nathaniel My architect, documentary film (2003)
Koolhaas, Thomas: REM (2016)
Wachtmeister, Jesper Kochuu: Japanese Architecture (2003)
Wolf, Barbara: Philip Johnson: Diary of an Eccentric Architect (1997)

-Ιστοσελίδες
www.archisearch.gr
www.architectural-review.com
www.domesindex.com
www.dezeen.com

GEO7100 – SOIL MECHANICS AND FOUNDATIONS

COURSE OUTLINE: GEO7100 - SOIL MECHANICS AND FOUNDATIONS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7100**	**SEMESTER**	7th
COURSE TITLE	**SOIL MECHANICS AND FOUNDATIONS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	4	
Lab exercises	0	
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	Preferred prerequisite knowledge: *Mechanics of materials*
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

This a dual course that combines knowledge of soil mechanics with the design of foundations. Upon successful completion, the students will be able to:

- Differentiate between the various categories of soils and their geological characteristics
- Understand the mechanical response of the various soils and problems associated with the ingress of water
- Develop their understanding of soil movement and soil improvement methods
- Understand the basic principles of Eurocode 7 and limit state design
- Choose between the various types of shallow foundations the most suitable for a given soil profile

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
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

Soil Formation and Nature

Soil Particles

Soil Structure

Soil Description and Classification

Permeability

Groundwater Flow problems

Stability problems

Seepage

Total head, elevation head and pressure head

Pore pressure and uplift pressure

Effective Stress and Pore Pressure

Total stress

Pore pressures below the water table

Present state of stress in the ground

Contact Pressure and Stress Distribution

Uniform loading

Point loading

Stress distribution

Stresses beneath point load and line load

Stresses beneath uniformly loaded areas

Principle of superposition

Stresses beneath flexible area of any shape

Eurocode 7 Limit state analysis

Compressibility and Consolidation

Shear Strength

Mohr – Coulomb failure criterion

Shallow Foundations - Settlements

Isolated footings & combined footings

Strap footings

Raft/mat foundation

Diaphragm walls

Lab Part of the Course-

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Videos • Email • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written test mid- semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) accounting for 20% • Written test end of semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) accounting for 80%

Activity	***Semester workload***
Lectures	52 (13 X 4)
Study and analysis of bibliography	52 (13 X 4)
Laboratory practice	-
Lab exercises	-
Educational visits	-
Course total	***104***

(5) ATTACHED BIBLIOGRAPHY

33. Barnes G. E. 1995. Soil Mechanics - Principles and Practice-Macmillan Education UK
34. Burland, J. B. and Chapman, T. 2012. ICE manual of geotechnical engineering -ICE

Publishing
35. Lecture notes

GEO7110 – PHYSICAL GEODESY

COURSE OUTLINE: GEO7110 - PHYSICAL GEODESY

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO7110**	**SEMESTER**	7th
COURSE TITLE	**PHYSICAL GEODESY**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	4
Laboratory exersices	1	1
TOTAL	**4**	**5**

COURSE TYPE	Specialized general
PREREQUISITE COURSES:	No prerequisite courses needed
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr /courses/GEO190

(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.

Basic course goals:

- Gravity field estimation methods and relations with the Surveyor science
- Observation corrections and reductions due to the gravity field effect
- Connection with the vertical datum definition
- Algorithms of spherical harmonics expansion. Analysis and Synthesis
- Combination of GNSS and gravity observations in height estimation
- Heterogeneous data combination in gravity and geoid modelling

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*
- *Decision-making*
- *Working independently*
- *Working in an international environment*
- *Production of new research ideas*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

Earth's gravity field parameters, Newtonian attraction field, Earth's gravity field and its components. Geodetic boundary value problems and the solutions. Classical Stokes' solution. Modern Molodensky approach. Local and geocentric reference system. Gravity data reductions in geoid modelling. Gravity field dedicated satellite missions. Gravity reductions and anomalies. Height systems. Spherical harmonics and geopotential earth models. The geoid. Basic methodologies of gravity field and geoid estimation using spectral and stochastic methods. Geoid estimations using surface and satellite data. GNSS levelling.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY.</td><td colspan="2">Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">e-class, software development, communication with students through e-class</td></tr>
<tr><td rowspan="5">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Laboratory practice</td><td>58</td></tr>
<tr><td>Study and analysis of bibliography</td><td>40</td></tr>
<tr><td>Course total</td><td>150</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">The final course evaluation is based on written examination (70%) and laboratory work (30%)
Language of evaluation: Greek (English if needed, e.g., Erasmus+ students)
Written examination with short-answer questions, problem solving and laboratory work</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- ***Suggested bibliography:***

- *Heiskanen W. A., Moritz H., 1967. Physical Geodesy. Freeman & Co, San Francisco.*
- *Hofmann-Wellenhof B. and H. Moritz. 2005. Physical Geodesy. Springer eds.*
- *Moritz H. 1989. Advance Physical Geodesy. Wichmann eds.*
- *Torge W., 2001. Geodesy. 3rd Edition. Walter de Gruyter, Berlin.*
- *Torge W. 1989. Gravimetry. Walter de Gruyter, Berlin.*
- *Vanicek P., Krakiwsky E., 1992. Geodesy: The Concepts. Elsevier, New York.*

- ***Related academic journals:***

- Journal of Geodesy
- Journal of Geodetic Sciences
- IAG Series publications

GEO7120 – APPLIED GEOPHYSICS

COURSE OUTLINE: GEO07120 - APPLIED GEOPHYSICS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO7120**	**SEMESTER**	7th
COURSE TITLE	**APPLIED GEOPHYSICS**		

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 TEACHIN GHOURS**	**CREDITS**
LECTURES	3	4
LABORATORY EXERCISES - FIELDWORK	1	1
TOTAL	**4**	**5**

COURSE TYPE	*skills development*
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK (English for Erasmus Students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO207/

(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.

Upon successful completion of the course, students are expected to:

- Recognize the different methods of subsoil geophysical research (surveys) currently used with examples from their application to tracking various objectives of excavation interest (archeometry), technical interest (design of technical projects) as well as in the investigation of complex geodetic and territorial structures formations for hydrological applications
- Distinguish between design requirements and expected geophysical results in the context of tackling a geological problem in relation to geophysical properties of the "target" and the selection of the appropriate method.
- Calculate the "resolution" of geophysical methods but also the way with which the measurements are taken.
- Combine the results of geophysical and geological data and evaluate results.
- compose high-resolution subsoil maps using advanced methods of graphic editing
- Support decision-making of excavation or technical interest using soundings' results
- Know the basic geophysical organology and field measurement techniques

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, analyze and synthesize data and information, using both necessary technologies • Project planning & management • Autonomous work in an interdisciplinary environment • Promotion of free, creative and inductive thinking • Decision making • Time management - Working with deadlines

(3) SYLLABUS

- Introduction - Basic concepts of geophysics.
- Geophysical surveys (Introduction, basic principles and constraints)
- Seismic surveys (seismic refraction, seismic reflection, seismic tomography), Equipment - Measurements - processing - interpretation and evaluation. Applications in problems of topographic engineer interest.
- Geoelectric surveys (Introduction, theoretical foundation), Vertical and lateral electrical resistivity distribution, geoelectric tomography. Equipment. Measurements, processing, interpretation and evaluation. Applications in geoenvironmental, geotechnical, etc. problems.
- Electromagnetic (EM) observations (Introduction, Theoretical Foundation, Propagation and electromagnetic field attenuation). EM Controlled Source Methods, horizontal Frequency Field Imaging (VLF), Vertical Time Field Imaging (TDEM), Ground penetration radar (GPR). Measurements, processing, interpretation and evaluation. Examples and applications.
- Illustrations of high resolution results with advanced processing graphic methods

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	• Face-to-face • Practical training in ICT lab	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• *Use of ICT in teaching (PowerPoint presentations, videos)* • *Use of an asynchronous e-learning platform (e-class).* • *Use of messaging and social media as additional communication channels*	
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.*	***Activity***	***Semester workload***
	Lectures	39
	Personal study and analysis of bibliography	30
	Fieldwork - practice	13
	Laboratory preparation and essay writing	35
	Project	33

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	**Course total**	**150**

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.*	Assessment language: Greek (English for ERASMUS students upon request) Performance evaluation method: • Final Written Exam (50% of the final grade) of graded difficulty, which include short-answer questions, open-ended questions and solving simple problems. • Evaluation of laboratory work (30% of the final grade) from fieldwork • Evaluation of project (20% of the final grade) The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography (in Greek):

1. Εφαρμοσμένη Γεωφυσική, Τσελέντης Άκης, Παρασκευόπουλος Π., 2018

2. Εισαγωγή στην εφαρμοσμένη γεωφυσική, Παπαζάχος Β. Κ. , 2011

3. Εισαγωγή στη γεωφυσική, Παπαδόπουλος Ταξιάρχης - Αθήνα : Εκδόσεις Νέων Τεχνολογιών,2010.

- Suggested bibliography (in English):

1. Milsom, M., Filed Geophysics, 4th edition, Heal link Wiley ebooks, 2011

2. Qingyun Di, GuoqiangXue,Jianghai Xia, Technology and Application of Environmental and Engineering Geophysics, HEAL-Link Springer ebooks, 2017

GEO7130 – APPLIED OPTICS AND LASER TECHNOLOGIES

COURSE OUTLINE: GEO07130 - APPLIED OPTICS AND LASER TECHNOLOGIES

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO7130**	**SEMESTER**	7th
COURSE TITLE	**APPLIED OPTICS AND LASER TECHNOLOGIES**		

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 TEACHIN GHOURS**	**CREDITS**
LECTURES	3	3
LABORATORY EXCRCISES	1	1
TOTAL	**4**	**5**

COURSE TYPE	*skills development*
PREREQUISITE COURSES:	PHYSICS II (ELECTROMAGNETISM AND OPTICS)
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP176/

(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.

The main objectives of this course is the specialization of students' knowledge and the acquisition of skills in selected technological applications topics based on the interaction of radiation with matter, optical instruments and complex optical systems technologies, laser technologies and photonics.

Upon successful completion of the course students will be able to:

- explain to non-experts the interaction of radiation with matter taking into account elements from quantum mechanics,
- design complex optical systems and identify their characteristics,
- critically evaluate the different types and technologies of lasers, their operation characteristics and their applications in industry, in telecommunications, in information technologies, in remote sensing and geoinformatics,
- identify the characteristics of fiber optics and evaluate their applications in optical communications,
- identify and critically evaluate interferometry techniques and their applications,
- determine the characteristics of spectrometers, radiation detection and spectral analysis technologies,
- analyze and take advantage of upcoming technological developments in the field of

photonics and critically evaluate their effect on geoinformatics, information technologies and telecommunications,
- evaluate bibliographic sources for the study of research topics in various scientific areas of Optics and Lasers,
- collaborate with their colleagues for the preparation and presentation of an experimental project.

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*
- *Working independently*
- *Team work*
- *Decision-making*
- *Working in an interdisciplinary environment*
- *Production of new research ideas*

(3) SYLLABUS

Theoretical part:

- Advanced topics of geometrical optics, lenses, aberrations, composite optical systems, matrix theory.
- Radiation-Matter Interaction: introduction to the quantum structure of matter, optical properties of materials, energy zones, optical absorption mechanisms, fluorescence - spontaneous emission of radiation, scattering, refraction, reflection, polarization of light, Fresnel equations, atmospheric optics.
- Fiber optics & waveguides: light propagation, fiber optics and applications, optical communications, optical information transmission, optical modulation.
- Interference-Diffraction: optical coherence, interferometers and applications, diffraction (Fresnel and Fraunhofer), Fourier spectroscopy.
- Photometry, light sources and radiation laws.
- Optical instruments, detectors and applications: microscope, electron microscope, telescope, spectral analysis and applications, spectrographs, Fourier optics, light detection and recording systems, signal amplifiers, photomultipliers and ICCD devices, thermal imaging-thermography, hyperspectral cameras.
- Introduction to laser technology: Einstein coefficients, stimulated emission, amplification, population inversion, optical cavities-resonators, properties of laser radiation, laser beam propagation.
- Laser systems: common laser types, continuous wave lasers, pulsed lasers, laser operation parameters, Q-switching, laser safety, non-linear optics, laser applications, optical beam control technologies-laser scanners.
- Introduction to modern photonics, quantum optics, quantum computing, quantum computers, quantum cryptography.

Laboratory part:

Study of laser beam propagation properties, spectrometry of known and unknown light sources, safety - protection from laser radiation, laser scanners, laser beam interference and diffraction, optical communications – fiber optic cable signal attenuation and dispersion.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	*Face-to-face*
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching (PowerPoint presentations και PDF)* *• Use of an asynchronous e-learning platform (e-class).* *• Use of e-mail* *• Use of simulations for demonstration of natural phenomena and experiments.* *• Use of the Excel software in laboratory.*

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,*	***Activity***	***Semester workload***
	Lectures	39
	study and analysis of bibliography	30
	laboratory practice	13

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*	*Research Project (literature review)*	35
	Laboratory preparation and essay writing (team work)	33
	Course total	**150**
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.*	Assessment language: Greek (English for ERASMUS students upon request) Performance evaluation method: • Final Written Exam (60% of the final grade) of graded difficulty, which may include short-answer questions, open-ended questions and solving simple and complex problems. • Evaluation of the individual research project and its presentation using ICT (20% of the final grade). • Evaluation of laboratory work and its presentation using ICT (20% of the final grade). The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. B. E. A. Saleh, M. C. Teich, 2007, Fundamentals of Photonics, Second Edition, John Wiley and Sons Ltd
2. Eugene Hecht, 2016. Optics, Pearson Education.
3. M. Young, 2000 , Optics and Lasers, Springer-Verlag Berlin Heidelberg
4. Das, Pankaj K., 1991, Lasers and Optical Engineering, Springer-Verlag Berlin Heidelberg
5. Charles A. DiMarzio, 2011, Optics for Engineers, CRC Press

- Related academic journals:

1. Applied Optics, Optical Society of America Publishing
2. Advances in Optics and Photonics, Optical Society of America Publishing
3. Journal of Physics B: Atomic, Molecular and Optical Physics, IOP Publishing
4. Journal Of Optics A: Pure and Applied Optics, IOP Publishing
5. IEEE Photonics Journal, IEEE
6. Laser Physics, IOP Publishing

GEO7140 – SYSTEM THEORY, SDB AND ELECTRONIC MAPS AND INFORMATION SYSTEMS (ECDIS)

COURSE OUTLINE: GEO7140 - SYSTEM THEORY, SDB AND ELECTRONIC MAPS AND INFORMATION SYSTEMS (ECDIS)

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Surveying and Geoinformation Engineering		
LEVEL OF STUDIES	Undergraduate – Level 7		
COURSE CODE	**GEO7140**	**SEMESTER**	7th
COURSE TITLE	**SPECIAL TOPICS OF SPATIAL DATABASES AND SYSTEM THEORY (SYSTEM THEORY, SDB AND ELECTRONIC MAPS AND INFORMATION SYSTEMS (ECDIS)**		

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**
Theory	3	4
Laboratories Exercises	2	2
Total	**5**	**6**

COURSE TYPE	Special Background
PREREQUISITE COURSES:	There are no prerequisite courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek - English (for ERASMUS students) - French (for ERASMUS students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (In English and French)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP104/

(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.

The course aims at

A.Knowledge

- In-depth understanding and learning of all stages of creating Spatial Databases (including "spatila databases of multiple scales"), the analysis and design of information systems (IS) and spatial information systems (SIS), the modeling of space-time.
- Understanding and learning the basic methodologies of analysis and design of IS. Their application in the analysis and design of SIS.
- Understanding the parts and functions of an ECDIS. Understand how ENC (Electronic Navigational Charts) and AIS (Automatic Identification Systems) operate within an ECDIS.
- Understanding and learning normalization and relational algebra.

- Learning the ways of integrating SDB in IS.
- Learning the modeling of data, actions and decision-making procedures. Understanding advanced concepts and applications of the O / S and UML model.

B.Skills

- Apply all of the above to specific examples of system development.

C.Abilities

- Skills for analysis, design, creation, control, and creation of metadata of DB and SDB using CASE-tools in any case (new system, replacement of older system, partial system change, merger / evolution of systems, etc.

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?

Taking into account the general skills that the graduate must have acquired, the course aims at:

12. *To understand a) the design, development, implementation and control of BXD and (Spatial) Information Systems, b) the integration of SDB in such systems c) the complex role of CASE-tools in the design of SDB.*
13. *Understanding the operation of ECDIS and the GPS systems (Global Positioning System), AIS (Automatic Identification System) and ENC (Electronic Navigational Charts) that integrates in a complete way and familiarity with the ways of creating and updating its spatial databases. Familiarity with air navigation systems (basic concepts).*
14. *In adapting to new situations that require the creation of complex spatial information through new techniques and tools.*
15. *In making decisions regarding the correct choice of data, techniques and tools for the creation and discovery of new information through a large volume of spatial and other data.*
16. *In autonomous work through the theoretical development and practical elaboration of issues related to advanced SDB concepts and practices aimed at developing skills necessary for SDB design and development studies and Information Systems.*
17. *In teamwork aimed at the theoretical development and practical elaboration of issues related to advanced SDB concepts and practices aimed at developing skills necessary for SDB design and development studies and information systems in a team environment where collaboration is necessary.*
18. *The ability to work in an international environment supported by learning both "standardized knowledge" SDB and I (C) S taught in most universities around the world and by using and learning English and French IS / SDB / SD terminology.*
19. *In the work in an interdisciplinary environment supported by the nature of the course of SDB and SD that is directly related to computer projects, three-dimensional representation of objects, environmental protection, etc.*
20. *In the production of new research ideas that is supported and developed through a) individual and group work but also b) by informing about the research programs of the Department in relation to the SDB and SD and the possibilities of students' participation in them.*
21. *In the design and management of development projects, information and control of SDB and SD.*
22. *Demonstrating social, professional and ethical responsibility in data and software copyright issues.*
23. *In the exercise of evaluation, self-evaluation and development of critical ability through the presentation day of the semester assignments (individual and group).*
24. *In the promotion of free, creative and inductive thinking.*

(3) SYLLABUS

Theoretical part- Lectures

System: Basic concepts, principles, definitions. The parts of a system.
Systemic theory and the Cartesian approach.
Systems of different types and systems of different levels. The perfect system. Information - Procedure - Decision. Production systems - Information systems - Decision systems.
The concept of the system for the Surveyor engineer and his profession.
Life cycle and development cycle of a system.
Systems Analysis and Design - Systems Implementation. Tools and theories for the design and implementation of systems, and in particular information systems. Examples and applications of systems.
Models of representation of reality. Basic concepts of space-time and possibilities of its modeling. Spatial Databases. Types of entities and types of relationships. Topology - Topological relations.
ECDIS definition. ECDIS Parts. Completion of ENC (Electronic Navigational Charts), GPS (Global Positioning System), AIS (Automatic Identification Systems). ECDIS types and features. ECDIS and G.U.I. (Graphic User Interface) utility of ECDIS. Nautical charts and ECDIS. RNC (Raster Nautical Charts). VNC (Vector Nautical Charts). RNC and ENC (Electronic Charting System). ECDIS and ECS. ENC toponyms and borders sources of an ENC. ENC and RNC differences. NOAA ENC online. Vessel Finder. AIS Greece. Marine Traffic. AIS Marine Traffic ship map. Real time AIS Vessel Tracker with ship and Port Database. Real-time AIS terrestrial and satellite system.
Basic concepts of air navigation systems.
Computational Geometry and its applications in Spatial Databases.
Spatial digital databases and management systems - Design levels - Peculiarities of Spatial Databases and their design.
Entity / Relation and UML.
Spatial / Cartographic / Geographical / Spatial questions and answers.
Data Warehouse and Spatial Data Warehouse. Data Mining / Spatial Data Mining. SDB and decision making.
Conceptual design of Spatial Databases and CASE - tools. Comparative presentation of conceptual models.
Spatial Databases of multiple scales / multiple representations. Suggested solutions and unsolved problems.
Metadata and data dictionaries for Spatial / Cartographic Databases
multiple scales. Tools offered. Unanswered questions.
Integration of Spatial Databases into Systems (actions / processes / production, information, decisions): their roles and their interrelationships.
Correlation of spatial and alphanumeric databases within Systems. Critical presentation of the offered solutions.
Virtual and augmented reality: their application and uses in DB / SDB

Laboratory Exercises

Consolidation and practical application of the concepts as mentioned in the theoretical part, through the execution of exercises on PC. Specifically, the aim of the laboratory exercises is to get acquainted with ECDIS, with systems design tools and SDB, to get acquainted with the advanced SDB techniques and the use of CASE-tools

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Blended learning: A: Classroom lectures (Face to face learning) B: Distance learning through e-class platform (training materials, exercises, data, software, reductions, etc.)
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Slides, use of softwares, software, video, use of internet, smart phones, Tablet, GPS / GIS handheld. Use of specialized software tools and libraries (commercial and open source) for the management and processing of numerical and geospatial data
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	***Language of assessment:*** *Greek or English or French ((for ERASMUS students)* ***Evaluation methods:*** • *Written examination at the end of the semester: 60%* • *Laboratory Exercises / Field Exercises: 20%* • *Personal study and presentation: 20%*

Activity	***Semester workload***
Lectures	13 X 3 = 39 hours
Seminars (by invited speakers)	5 hours preparation of questions by groups
Laboratory Exercises	2 X 13 = 26 hours
Preparation of an individual study	16 hours
Educational presentation of the works	15 hours
Course preparation / weekly study	39 hours (preparation)
Course total	**140 hours**

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Pantazis D., Donnay J-P, 1996, La conception de SIG, methode et formalisme, Editions HERMES, Paris.Shashi Shekhar and Sanjay Chawla, 2003, Spatial Databases: A Tour , Prentice Hall.*
- *Rigaux & Scholl & Voisard, 2001, Spatial Databases, Morgan Kaufmann.*
- *Albert K. W. Yeung, G. Brent Hall, 2007, Spatial Database Systems: Design, Implementation and Project Management, Springer.*
- *Michael Havey , 2005 , Essential business process modeling , O' Reilly Media Inc. , Gravenstein Highway North Sebasatopol , CA , US .*
- *Ian T. Cameron, Katalin Hangos, 2001 , Process Modelling and Model Analysis, Academic Press , San Diego , CA, US .*
- *Sandra Lach Arlinghaus , Joseph J. Kerski ,2014, Spatial mathematics-Theory and practice through mapping , Taylor & Francis Group , Boca Raton, FL, US .*

- *Dominique de Werra , 1990, Elements de programmation lineaire avec application aux graphes , Presses polytechniques romandes , Lausanne .*
- *Robert Damelio , 2011, The basics of process mapping , 2nd edition , Productivity Press , Third Avenue , NY, US .*
- *Alec Sharp , Patrick McDermott , 2009, Workflow modeling – Tools for process improvement and application development , 2nd edition , Artech House Inc. , Canton str., Norwood , MA, US .*
- *Theodore Panagacos , 2012, The ultimate guide to business process management- Everything you need to know and how to apply it to your organization , Theodore Panagacos , San Bernardino , CA, US .*
- *Patricia Wallace , 2014, Πληροφοριακά συστήματα διοίκησης – Άνθρωποι, τεχνολογία , διαδικασίες , Εκδόσεις Κρητική , Νευροκοπίου 8, Αθήνα , μετάφραση από Patricia Wallace, 2013, Information systems in organization –People , technology and processes , Pearson Education Inc ,Upper Sadle River , New Jersey*
- *Kenneth C. Laudon , Jane P. Laudon , 2011, Πληροφοριακά συστήματα διοίκησης , 8η έκδοση , Εκδόσεις Κλειδάριθμος , Αθήνα , μετάφραση από Kenneth C. Laudon , Jane P. Laudon, 2009, Essentials of management information systems, 8th edition , Pearson Education Inc, Upper Sadle River , New Jersey*
- *David Arctur , Michael Zeiler, 2004, Designing geodatabases- Case studies in GIS data modeling , ESRI, Redlands, CA, US.*
- *Κωστής Κουτσόπουλος , Νικόλαος Ανδρουλάκης , 2012, Γεωγραφικά συστήματα πληροφοριών με το ArcGIS 10 –Θεωρία και πράξη , Εκδόσεις Παπασωτηρίου , Λεωφ. Κηφισού , Αθήνα .*
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- *Information System – published by ELSEVIER B.V. Impact Factor: 1.768 Thomson Reuters Journal Citation Reports 2013 ISSN: 0306-4379 http://www.journals.elsevier.com/information-systems/*
- *Computer Science and Information Systems– published by ComSIS Consortium Impact factor Two-year impact factor (2012): 0.549 ISSN: 1820-0214 http://www.comsis.org/*
- *European Journal of Information Systems – published by Macmillan Editor-in-Chief: Frantz Rowe, France Editors: Par Agerfalk, Sweden Dov Te'eni, Israel 2012 5-year Impact Factor:2.422 ISSN: 0960-085X http://www.palgrave-journals.com/ejis/index.html*
- *International Journal of Spatial, Temporal and Multimedia Information Systems- published by Inderscience Publishers Editor in Chief: Prof. Wassim Jaziri ISSN online: 2052-3564 ISSN print: 2052-3556 http://www.inderscience.com/jhome.php?jcode=ijstmis*
- *International Journal of Spatial Data Infrastructures Research - published by European Commission ISSN: 1725-0463 http://ijsdir.jrc.ec.europa.eu/index.php/ijsdir*
- *JEDM –Journal of educational data mining – Editor : Michel C. Desmarais Associate*

Editors : Ryan S. Baker , Agatha Merceron , Mykola Pechenizkiy , Kalina Yacef, ISSN: 2157- 2100 http://www.educationaldatamining.org/JEDM/index.php/JEDM

- *Data Mining and Knowledge Discovery- published by Springer Editor-in-Chief: Geoffrey I. Webb 2012 Impact Factor: 2.877 ISSN: 1384-5810 (print version) ISSN: 1573-756X (electronic version) http://www.springer.com/computer/database+management+%26+information+retrieval/journal/10618*
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-Useful Webpages

http://www.itl.nist.gov/div898/handbook/index.htm
http://www.businessballs.com/business-process-modelling.htm
http://dna.fernuni-hagen.de/papers/IntroSpatialDBMS.pdf
http://sevenseas-marine.com/wp-content/uploads/2015/07/ECDIS-Complete-brochure-preview.pdf

GEO7160 – Cadastral, Urban Planning & Infrastructure Systems

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	GEO703	SEMESTER	7th
COURSE TITLE	Cadastral, Urban Planning & Infrastructure 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	3	3
Project	1	2
Total	**4**	**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*	Special background/ skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(6) 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*

Worldwide, cadastral systems, are the only systems that document 3D Rights -Rules -Regulations relevant to immovable things. Official administrative acts, such as urban plans, sea-shore declaration, expropriations, forest areas declaration etc., produce institutional spatial data imposing specified rules or/and restriction on immovable things. Spatial and descriptive correlation of rules and restrictions, imposed by institutional spatial data, to rights on immovable things and their integration to the current Hellenic Cadastre Data Base is of great importance.

By attending this course students acquire specialized knowledge on multipurpose cadastral system in which spatial and descriptive data of institutional spatial data are presented in detail. Focus on integrated data management with use of GIS and relevant data bases is given. Students are encouraged to use knowledge acquired by other courses such as, Cadastre, Urban Planning, Topography, 3D modeling, GIS.

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

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adaption to new work conditions
- Decision-making
- Team work
- Self/ team evaluation
- Free, creative and inductive thinking

(7) SYLLABUS

i. Multipurpose cadastral system
ii. 3D Cadastre
iii. Research of official administrative acts
iv. Spatial/ descriptive analysis of official administrative acts
v. Spatial/ descriptive integration of official administrative acts and the Hellenic Cadastre Technical Specifications
vi. Integration problems (record and analysis)
vii. 3D modeling of administrative acts

(8) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (legislation and literature review) • E-class UNIWA platform and office Microsoft 365 UNIWA tools (TEAMS, Class Notebook, Shared docs, email) • GIS and CAD software • Office software (word, presentations, spreadsheets editors)

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

Activity	*Semester workload*
Lectures (Theory – exercises)	52 (13*4)
Team project	73
Course total	*125*

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.*	Technical report and oral presentation of the team project

(9) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Legislation on Cultural Heritage Protection, Legislation on Urban Planning and Traditional Settlements, 3D Cadastre

- Related academic journals:
MDPI Heritage,
MDPI Land

GEO7170 – BUILDING CONSTRUCTION DESIGN. TECHNOLOGY & MATERIALS

COURSE OUTLINE: GEO7170 - BUILDING CONSTRUCTION DESIGN. TECHNOLOGY & MATERIALS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7170**	**SEMESTER**	7th
COURSE TITLE	**Building Construction Design. Technology and Materials**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	
Lab exercises	1	
Total	**4**	**5**

COURSE TYPE	In-depth, consolidation of the specialty
PREREQUISITE COURSES:	--
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO268/

(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.

Building Construction focuses on the study and design of the construction elements and details of the buildings, so that they are functional and provide the required level of quality and safety during their construction phases and then during their use.

After the successful completion of the course, students are expected to:

o know the general principles of construction and to understand how they can contribute to the projects that topographic engineers have the right to implement.

o Understand the construction phases of a building project.

o Understand the function of the load-bearing structure and the individual components of a building project.

o know the properties and possible combinations of basic building materials.

o evaluate and select the best building materials, within the framework of architectural and construction needs

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?

After the successful course attendance, students are expected to acquire the following General Competences:

- Search, analysis and synthesis of data and information, using the necessary technology
- Decision making
- Autonomous and team work
- Project design and management
- Respect for the natural environment
- Promoting free, creative and inductive thinking

(3) SYLLABUS

Theoretical part of the Course

1. Introduction to the object of building construction into the historical perspective.
2. Building construction's site elements and organization: demolition, excavations, scaffolding. Excavation diagram.
3. Excavations and foundation: waterproofing, drainage.
4. Structural design. Bearing and non bearing elements
5. Masonry: types and materials of masonry construction according to the needs of thermal insulation, waterproofing and sound insulation. Interior and exterior masonry. Coatings and claddings. Types and materials of coating and cladding: marble, tile, wood, etc.
6. Thermal insulation, waterproofing and sound insulation.
7. Terraces and roofs: Thermal insulation and waterproofing. Formation of drains for water runoff.
8. Doors and windows: Internal and external. Types and materials. Selection Criteria.
9. Floors: The types and materials of floor construction. Interior and exterior floors. Elevations for floor construction. Exterior floor drainage solutions.
10. Staircases: The types and materials of construction. Geometric staircase design.
11. Reinforced concrete and its applications.
12. Steel, and other metals. Wood as a building material, applications.
13. Other technical materials and their applications in construction.
14. Solving construction problems. Preparation of a technical report.

Lab Part of the Course

- Detailed design of a small scale residential building

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	• Face-to-Face • Lectures - interactive classroom teaching. • Encourage students in the preparation of the next lesson. • Encouraging students to attend related Workshops, Conferences, etc.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Email • Specialized software and libraries (both commercial and open source) for • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures	39
Study and analysis of bibliography	13
Homework	48
Detailed design (project)	50
Course total	***150***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Design work (20%) • Oral exams (20%) • Detailed Design (project) (60%)

(5) Recommended References

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46. Κούκης, Σ., Σ., Δομική Τεχνολογία, Υλικά και Εφαρμογές. Αθήνα, 2001.
47. Μιχελής, Π. Η αισθητική της αρχιτεκτονικής του μπετόν αρμέ, Αθήνα 1975
48. Neufert Ernst. Οικοδομική., Γκιούρδας, Αθήνα 2000
49. Παπαλεξόπουλος, Δημήτρης, Σταυρίδου Αθηνά, Εννοιολογικός προσδιορισμός παραμετρικών ιδιοτήτων αρχιτεκτονικών κατασκευαστικών στοιχείων και δομικών υλικών. ΣΕΒΕ, σχολή Αρχιτεκτόνων Ε.Μ.Π. ,2010
50. Τζώνος Π., Τυπολογία της κατοικίας. Θεσσαλονίκη, 1983.
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52. Wenderhorst, R., Τουλιάτος, Δ., Λεονταρίτης, Μ., Παπαγιάννης, Δ., & Μπίσμπος, Χ., (μτφρ). Δομικά Υλικά. Αθήνα: Εκδόσεις Μ., Γκιούρδας, 1981

GEO7180 – STRUCTURAL EQUIPMENT & CONSTRUCTION SITE MANAGEMENT

COURSE OUTLINE: GEO7180 – STRUCTURAL EQUIPMENT & CONSTRUCTION SITE MANAGEMENT

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate – Level 7		
COURSE CODE	**GEO7180**	**SEMESTER**	7th
COURSE TITLE	**STRUCTURAL EQUIPMENT & CONSTRUCTION SITE MANAGEMENT**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	
Lab exercises	1	
Total	**4**	**5**

COURSE TYPE	Extra knowledge for the discipline
PREREQUISITE COURSES:	--
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	

(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.

Upon successful completion of the course, students are expected to:

o Understand the different types of construction equipment and machines and their use.

o Understand the principles of construction site design and be able to design basic construction site technical provisions.

o Calculate the productivity of the basic construction machines, as well as the execution time - completion of an earthmoving project.

o Understand the use cost of construction machinery and calculate the cost of earthworks.

o Calculate the required number of basic earthmoving machinery so that the project is completed within the contractual deadline.

o Calculate the required number of construction machines for the basic earthworks, in order to limit the unproductive times of the machines.

o Understand the basic principles of health & safety of construction projects & sites.

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?

Upon successful completion of the course, students are expected to acquire the following General Abilities:

- Application of knowledge in practice.
- Search, analysis and synthesis of data and information, using the necessary technologies.
- Project design and management.
- Decision making.
- Adapting to new situations

(3) SYLLABUS

1. Overview of construction sites (construction categories, site characteristics, study of site layouts, stages and principles of site layout design, potential site installations, analysis - evaluation of construction site cases).
2. Overview of functional analysis (general principles, basic questions studied, key factors - (soil conversion factors, site employment rate, bucket fill factor, operating rate, etc.).
3. Life cycle analysis of soil material (compacted - loose - compressed) and connection with the respective earthmoving machinery.
4. Productivity overview (definition, measurement of productivity, principles - stages of analysis and recording of productivity in technical projects, productivity of construction machines, alternative ways of measuring and estimating productivity of construction machines - analytical methods, methods of rapid estimation according to Komatsu, Caterpillar, empirical methods).
5. Overview of construction machinery (general presentation) and analysis of basic earthmoving machinery (excavator, loader, dozer, transport vehicle, grader, compacter, scraper, lifting equipment, concrete production units etc). Presentation of the different types of machinery and equipment available, the uses they serve and the factors that influence the choice of the appropriate type.
6. Analysis and application of the method of rapid calculation of the productivity of the basic earthmoving machinery (excavator, loader, dozer and transport vehicle) according to the Komatsu methodology.
7. Analysis of the economics of construction machinery (cost of ownership and operating costs). Cost calculation applications.
8. Functional analysis applications (calculation of time for completion of earthworks and costing of technical projects). Analysis of combined works e.g. loading and transporting of soil material, calculating the number of the required combination of machines for standard combined activities (excavator - loader / loader - transport vehicle) in order to complete the project within the required time with the minimum non-productive time in construction machinery.
9. Overview of safety of technical works. Health & Safety issues at construction sites.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	o Lectures - interactive teaching in the classroom. o Encouraging students to prepare for the next lesson. o Encouraging students to attend related Workshops, Conferences, etc.
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	○ Teaching using electronic presentation tools. ○ Support of learning process with asynchronous education platform.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written exam at the end of the semester • Examination of exercises. (max 10%) • Mid-term examination (max 30%)

Activity	***Semester workload***
Lectures	65
Lab exercises	25
Independent Study	60
Course total	***150***

(5) ATTACHED BIBLIOGRAPHY

1. Petroutsatou K., Marinelli M. (2018). *Construction equipment, functional analysis and cost of civil engineering projects*. 2nd edition ISBN 978-960-586-253-4. KRITIKI Publishing S.A.
2. Efraimidis X. (2002). *Construction equipment*, Athanassopoulos
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7. Hegazy T. (2002). *Computer-Based Construction Project Management*, Prentice-Hall.
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GEO7190 – AGRICULTURAL DRAINAGE SYSTEMS

COURSE OUTLINE: GEO7190 - AGRICULTURAL DRAINAGE SYSTEMS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7190**	**SEMESTER**	7th
COURSE TITLE	**AGRICULTURAL DRAINAGE 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		3	
Lab exercises		1	
Total		**4**	**5**
COURSE TYPE	Special background, specialised general knowledge		
PREREQUISITE COURSES:	Not mandatory - Preferred prerequisite knowledge: Fluid mechanics, Applied Hydraulics, Engineering Hydrology		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek Final written exam: 65% Assignments (projects, reports): 35%		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Not offered		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO256/		

(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.

By the completion of the course, the students will be able to:

- ✓ Understand the crop-soil-atmosphere relationship;
- ✓ Estimate the crop evapotranspiration using empirical and physically based methods;
- ✓ Compute the water irrigation requirements, specific discharge, dose, frequency and duration of irrigation applications;
- ✓ Design the discharges of irrigation networks according to delivery systems of irrigation water;
- ✓ Apply the irrigation methods: surface, sprinkle and local (trickle irrigation);
- ✓ Design the irrigation networks;
- ✓ Understand the origin and quality of irrigation water and soil, as well as the suitability criteria of their use;
- ✓ Understand and design the functionality of irrigation pumps;

- ✓ Understand water measuring devices and their operation in irrigation systems
- ✓ Manage the irrigation water and environmental consequences coming from irrigation works.

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, Criticism and self-criticism* *• Working independently and Team work* *• Production of free, creative and inductive thinking*

(3) SYLLABUS

General description: Basic principles, design and operation of irrigation works. Irrigation water requirements, irrigation water delivery systems and crops irrigation methods, sources and quality of irrigation water and soil. Irrigation pumps, flow measurement devices, irrigation water management, environmental consequences, legislation of water resources availability.

More specifically, the course syllabus is summarized as follows:
1 Introduction: Basic principles and definitions. Historic evolution of irrigation studies and works.
2 Crops and irrigation: Crop-soil-atmosphere relationships. Measurement of soil water capacity, useful soil water capacity, description of root zone systems - crop water uptake. Methods of computing reference crop evapotranspiration (physically and empirically based). Crop growth stages, crop coefficient and actual crop evapotranspiration.
3 Irrigation water requirements: Methodology of estimating the gross irrigation water requirements and the irrigation scheduling (irrigation dose, time, frequency and efficiency) including water to combat soil salinity.
4 Design discharge of irrigation networks: Design water supply of irrigation networks under the water distribution systems of continuous water supply, rotation and free demand (probability concept).
5 Surface irrigation methods: Basic principles and computational methods for the design and operation of surface irrigation systems (flood irrigation, limited diffusion or furrows). Assessment of topsoil surface irrigation water flow characteristics. Assessment of computational methods of surface irrigation and water reuse from surface irrigation water losses.
6 Sprinkler irrigation systems: Hydraulics, design and operation of sprinkler irrigation systems. Water distribution uniformity and types of sprinkler irrigation systems. Move-set and solid-set irrigation systems. Sprinkler system components (pumps, main and lateral lines, sprinklers) and performance characteristics. Hydraulic computations for the assessment of flow characteristics in pipes of individual and collective sprinkler irrigation networks. Specific sprinkler irrigation systems for environmental protection, and injection of fertilizers, chemical ingredients, and fluid waste.
7 Local and trickle irrigation: Methods of local irrigation: trickle, sub-surface irrigation, fountain and spraying irrigation. Irrigation system components. Uniformity of irrigation water distribution. Irrigation layouts. Hydraulic calculations for the design and good operation of network pipes due to small design discharges. Control systems of hydraulic head for purely irrigation water and water mixed with chemicals and fertilizers. Pumps installations, cleaning filters, equipment of chemicals injection, flow and pressure meters, and automation equipment. Management and evaluation.
8 Pumps for crops irrigation systems: Description of typical parameters and efficiency characteristics for two or more pumps operating in series or in parallel. Pump efficiency consequences from speed and diameter changing of an impeller. Pump efficiency curves and irrigation system required for determining the hydraulic head and operation discharge of one or more pumps. Criteria for selecting the most suitable pump or combination of pumps.
9 Advent and quality of irrigation water-environmental consequence: Description of surface water sources for crop irrigation (rivers, lakes, central irrigation water distribution facilities, industrial and agricultural returns and urban waste), groundwater (subsurface aquifers) and irrigation wells. Suitability conditions and irrigation water quality criteria (e.g. salinity, toxicity,

content of exchangeable sodium, biocides, carbonate anions, suspended materials). Classification systems according to the appropriateness. Supply rate of water resources and soil improvement. Environmental consequences and irrigation water legislation particularly for territorial waters and water appropriation.

10 Flow meters in irrigation systems: Discharge measuring methods and devices in irrigation systems and open channels. Discharges and design of measuring devices in special applications (e.g. ultrasonic meters with or without application of Doppler phenomenon, Pitot pipelines, etc).

11 Drainage and drainage systems: Definition, necessity and factors influencing drainage. Drainage from soil surface and root zone of crops. Surface water drainage with trench networks and root zone drainage with underground closed drainage pipes-drainage networks. Drainage network design (layout, maximum flow, depth, equilibrium, dimensioning and technical works). Economic, legislative and environmental issues.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	•Web search (literature review and data sources) •Utilization of E-class UNIWA platform (file exchange among professors and students) •Email •Specialized software and libraries •Office software (word, presentations, spreadsheets editors)

TEACHING METHODS

The manner and methods of teaching are described in detail.

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

Activity	***Semester workload***
Lectures	39
Study and analysis of bibliography	39
Laboratory practice	26
Group (lab) projects	30
Laboratory exercises (personal assignments)	16
Course total	**150**

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.*	Language of evaluation: Greek Methods of evaluation: • Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) • Homework (practical exercises on both theoretical and practical objectives related to the course and project)

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Finkel, H.J. (2009). Handbook of Irrigation Technology. Taylor & Francis Inc. pp 384. ISBN: 0849332311.

James, G.L. (1988). Principles of Farm Irrigation System Design. Published by John Wiley & Sons, Inc., Canada.

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Panagoulia D. and Dimou G. (2000). Introduction in Land Reclamation Works, 3rd Edition, 444 pages. National Technical University. Athens. In Greek.

Terzidis G. (1997). Agricultural Hydraulics. Ed: Ziti. 501 pages. ISBN: 9604314041. In Greek.

Tsakiris G. (2006). Hydraulic Works, Design and Management Volume II: Land Reclamation Works. Eds: Simmetria. 776 pages. ISBN: 9602661712.

Valeria De Laurentiis, Dexter V.L. Hunt and Christopher D.F. Rogers (2016). Overcoming Food Security Challenges within an Energy/Water/Food Nexus (EWFN) Approach. Review-Sustainability 8(1), 95; doi:10.3390/su8010095.

- Related academic journals:

Agricultural Water Management, Elsevier

Journal of the American Water Resources Association (JAWRA)

GEO7200 – TRASPORTATION INFRASTRUCTURE CONSTRUCTURAL ASPECTS

COURSE OUTLINE: GEO7200 -TRASPORTATION INFRASTRUCTURE CONSTRUCTURAL ASPECTS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO7200**	**SEMESTER**	7th
COURSE TITLE	**TRASPORTATION INFRASTRUCTURE CONSTRUCTURAL ASPECTS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	2	
Laboratory Exercise	2	
TOTAL	**4**	**4**

COURSE TYPE	Special Background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO254/

(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.

After the successful completion of the course, the students shall be able to:
Have knowledge of road and airport pavement engineering principles
Follow and apply design and analysis methods for all pavement types
Utilize the capabilities of airport pavement design and analysis
Properly evaluate road and airport pavement structures

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?

The successful completion of the course will contribute the students to acquire the following general competences:

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Production of free, creative and inductive thinking

(3) SYLLABUS

(Theoretical Part)

1. History of pavement engineering. Transportation infrastructure components
2. Pavement types. unbound aggregate materials. bituminous materials
3. Subbase, base, asphalt mix layers
4. Traffic and axle loads, pavement response.
5. Mechanical properties of road and airport pavement materials
6. Flexible pavement design methods
7. Rigid pavement design and construction
8. Pavement deterioration and maintenance
9. General aspects of airport pavement engineering.
10. Airport pavement design. Structural Classification
11. Visual inspection of pavements
12. Technological applications

Lab Part of the Course

1. Exercises and applications on the major aspects of road and airport pavement enginneering

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY.</td><td>Face-to-Face
Interactive learning</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>• Web search (literature review and data sources)
• Utilization of E-class UNIWA platform (file exchange among professors and students)
• Specialized software and data sources (both freeware commercial and open source)</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>4*13=52</td></tr>
<tr><td>Laboratory Exercises</td><td>60</td></tr>
<tr><td>Study and Exam Preparation</td><td>38</td></tr>
<tr><td>Course total</td><td><i>150</i></td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Methods of evaluation:
• Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) (70% of total)
• Homework oral exam (practical exercises on both theoretical and practical objectives related to the course) (30% of total)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

1. *Α. Καλτσούνης, "ΟΔΟΠΟΙΙΑ IV - Κατασκευαστικά Στοιχεία Έργων Οδοποιίας", Σημειώσεις*
2. *Α. Λοΐζος, Χ. Πλατή, «Σημειώσεις για το μάθημα Οδοστρώματα Οδών και Αεροδρομίων», Τεύχος Α, Αθήνα, Οκτώβριος 2015.*
3. *Α. Λοΐζος, Χ. Πλατή, «Σημειώσεις για το μάθημα Οδοστρώματα Οδών και Αεροδρομίων», Τεύχος Β, Αθήνα, Οκτώβριος 2015.*
4. *E. J. Yoder , M. W. Witczak, «Αρχές Σχεδιασμού Οδοστρωμάτων» – Εκδόσεις Μ. Γκιούρδας, 2000*
5. *AASHTO, «Guide for Design of pavement structures», 1993.*
6. *Federal Aviation Administration, «Airport Pavement Design and Evaluation», Advisory Circular 150/5320-6D, Washington DC, 1995.*
7. *Federal Aviation administration, «Airport Pavement Design and Evaluation», Advisory Circular 150/5320-6E, Washington DC, 2009.*
8. *Federal Aviation administration, «Standardized Method of Reporting Airport Pavement Strength – PCN», Advisory Circular 150/5335-5, 1983.*
9. *FHWA, «Distress Identification Manual for the Long-Term Pavement Performance Program», June 2003.*
10. *Huang, Y.H. «Pavement Analysis and Design», Practice Hall, Inc., 2004.*
11. *o International Civil Aviation Organization, «Aerodrome Design Manual (Part 3 _ Pavements) second edition», I.C.A.O. publications, 1983.*

GEO7210 – SUSTAINABLE URBAN DEVELOPMENT

COURSE OUTLINE: GEO7210 -SUSTAINABLE URBAN DEVELOPMENT

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO7210**	**SEMESTER**	7TH
COURSE TITLE	**SUSTAINABLE URBAN DEVELOPMENT**		

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 TEACHIN GHOURS**	**CREDITS**
LECTURES	3	
LABORATORY EXCERSISES	1	
TOTAL	**4**	**5**

COURSE TYPE	SPECIAL BACKGROUND
PREREQUISITE COURSES:	URBAN PLANNING
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK (WITH THE POSSIBILITY FOR OTHER LANGUAGES TOO)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

(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.

After the completion of the course students:
- will have comprehended the technical, economic, social and environmental issues that affect urban development and will be able to shape arguments so as to describe forms of urban development
- will have understood the function and structure of urban agglomerations, being able to make successful projections for further development
- will have understood the challenges and opportunities related to metropolitan areas
- will familiarize with urban planning legislation, being able to recognize different scales and level of planning
- will have learned international best practices that might find analogies with Greek metropolitan areas
- will have learned effective ways to collect and combine social and spatial data, using GIS
- will have learned how to collaborate in an interdisciplinary environment

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?*
After completion of the course students: *- will be able to conduct research and proceed in data analysis using the appropriate technological tools* *- will be able to work independently and in groups* *- will learn how to work in interdisciplinary environments* *- will learn how to value multicultural environments* *- will familiarize with sustainable practices and eco-friendly strategies* *- will be able to elaborate critical thinking*

(3) SYLLABUS

1. Basic knowledge about urban areas taking into account technical, economic, social and environmental dimensions.
2. Historic patterns of urban development and contemporary approaches (compact city, urban sprawl, smart city, metropolitan district etc)
3. Urban scenery, quality of life and urban infrastructures. Various land uses, urban networks, sustainable mobility and contemporary challenges.
4. Environmental assessment of the built environment with emphasis on the reduction of energy consumption.
5. The role of climate change on urban development. Protection against natural disasters. International goals.
6. Basic principles of urban design. Standards, urban indicators etc
7. Evolution of pertinent legislation in Greece. Types of studies and special categories.
8. The role of survey and geoinformatics engineers on the implementation of sustainable urban development.

Laboratory exercises include:
- assignments involving literature review
- urban planning of small-scale urban areas
- assignments suitable for using contemporary GIS software so as to combine spatial and social data

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">Lectures, interactive educational tools
Attendance of relevant conferences and workshops
Students participation in the content of the lesson</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">Use of digital visual elements and relevant tools
Use of satellite data for urban areas
Use of CAD software and GIS software
Use of an asynchronous educational platform (eclass)</td></tr>
<tr><td rowspan="6">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Laboratory exercises</td><td>13</td></tr>
<tr><td>Completion of laboratory exercise and presentation</td><td>48</td></tr>
<tr><td>Independent study</td><td>50</td></tr>
<tr><td>Course total</td><td><i>150</i></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Written final exam (min 50%)
Project (during the whole semester) max 50%</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Aouad, D. (2016). Urban Acupuncture as a tool for today's re-naturalization of the city: The nonconstructible parcels of Municipal Beirut through the case study of Saifi district.. 10.1201/9781315226255-96. https://www.researchgate.net/publication/304774624_Urban_Acupuncture_as_a_tool_for_today's_re_naturalization_of_the_city_The_nonconstructible_parcels_of_Municipal_Beirut_through_the_case_stu dy_of_Saifi_district

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Casagrande, M. (2006). Urban Acupuncture - Treasure Hill. Taiwan Architect.https://www.researchgate.net/publication/216563643_Urban_Acupuncture_-_Treasure_Hill Casagrande, M. (2016). From Urban Acupuncture to the Third Generation City. Journal of Biourbanism. 4. 29- 42. https://www.researchgate.net/publication/309741134_From_Urban_Acupuncture_to_the_Third_Gen eration_City

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Theory to Practice. Sustainability. 8. 1224. 10.3390/su8121224., https://www.researchgate.net/publication/310840664_Urban_Sustainability_and_Resilience_From_The ory_to_Practice

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Tousi E., Serraos K. (2020) Brownfield Management in Greece. The case of Piraeus, Journal of Sustainable Architecture and Civil Engineering, Kaunas University of Technology

Vale, L. (2014). The politics of resilient cities: Whose resilience and whose city?. Building Research and
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Ecological Indicators. 93. 282–291. 10.1016/j.ecolind.2018.05.007. https://www.researchgate.net/publication/325153874_Urban_sustainability_indicators_Challenges_an d_opportunities

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Σερράος Κ., Θεολόγου Κ. (1997) Ιωάννης Δεσποτόπουλος: Η ιδεολογική δομή των Πόλεων, Πανεπιστημιακές Εκδόσεις ΕΜΠ, Αθήνα

Σιδηρόπουλος Γ., Στεργιού Μ., Αστική ανανέωση και εξευγενισμός- οι ελληνικές ιδιαιτερότητες, ERSAGR Συνέδριο: Περιφερειακή Ανάπτυξη και Οικονομική Κρίση, Διεθνής εμπειρία και Ελλάδα» Μαΐος 2011, ΙΠΑ, Πάντειο Παν/μιο, Αθήνα

Φιλιππίδης Δ. (2015) Κωνσταντίνος Α.Δοξιάδης: Αναφορά στον Ιππόδαμο, Μέλισσα, Αθήνα

Χαλ Τ. (2005) 'Αστική Γεωγραφία', Κριτική, Αθήνα

Χίρσον Ρ. (2004) Κληρονόμοι της Μικρασιατικής Καταστροφής, Μορφωτικό ίδρυμα Εθνικής Τραπέζης, Αθήνα

8th Semester

GEO8010 – TRANSPORTATION ANALYSIS AND PLANNING

COURSE OUTLINE: GEO8010 – TRANSPORTATION ANALYSIS AND PLANNING

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO8010**	**SEMESTER**	8th
COURSE TITLE	**Transportation Analysis and Planning**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures & Individual Exercise (Theoretical part of the Course)	2	
Group Exercise (Lab Part of the Course)	2	
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	New course

(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.

After the successful completions of the course, students will be able to:

- Know the basic concepts and principles of Transportation
- Understand the Transport Planning Process
- Apply the different stages of the 4-step model (trip generation, trip distribution, modal split, route assignment)
- Evaluate the transport demand / supply analysis
- Develop Logit polynomial / binary models

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?

After the successful completions of the course, students acquire the following knowledge and skills:

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Team Work
- Work in an interdisciplinary environment
- Production of free, creative and inductive thinking

(3) **SYLLABUS**

Theoretical part of the Course

1. Basic concepts and principles of Transportation
2. Transport Planning Process
3. Basic principles of systems standardization
4. Transport systems standardization approach - The 4-step model
5. Trip Generation
   - Growth rate models
   - Category Analysis Models
   - Regression Analysis Models
   - Dispersion diagrams
   - Procedure for predicting future trips
6. Trip Distribution
7. Modal Split
8. Route assignment
9. Transport Demand / Supply Analysis
   - Features of Demand for movement
   - Analysis of transport demand curve
   - Interaction of supply and demand
   - Elasticity analysis
   - Utility function
   - Indifference curves
10. Discrete Options Analysis
11. Statistics concepts
    - Data collection methods
    - Zoning system
12. Logit polynomial model, Binary Logit Model

Lab Part of the Course

Preparation of a group exercise (groups of 4) to investigate the trips from / to UNIWA Campus

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>• Face-to-Face
• Lectures - interactive teaching in the classroom
• Encouraging students to attend related Workshops, Conferences, etc.</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>• Presentations in the blackboard
• Presentations through Power Point slides</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures</td><td>52 (13 X 4)</td></tr>
<tr><td>Students create groups of 4 students and prepare a group theme to investigate movement to / from and within the campus</td><td>60</td></tr>
<tr><td>Study and preparation for the exams</td><td>38</td></tr>
<tr><td>Course total</td><td><i>150</i></td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Language of evaluation: Greek

<u>Theoretical part of the Course</u>
• Written exam (70%)

<u>Lab Part of the Course</u>
• Partial and Overall Presentation of a semester topic (30%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

1. I. Frantzeskakis, J. Giannopoulos, "Design of Transportation Systems and Traffic Engineering", Vol. 1, Paratiritis, 1986
2. K. Αμπακούμκιν, "Design of Transportation Systems", NTUA, 1986
3. P. Stopher, A. Mayburg, "Urban Transportation and Planning", Lexington, 1975
4. G. Aberle, "Transportwirtschaft", Oldenbourg, 1997

GEO8020 – GEOSPATIAL DATA MANAGEMENT IN WEB ENVIRONMENT

COURSE OUTLINE: GEO8020 – GEOSPATIAL DATA MANAGEMENT IN WEB ENVIRONMENT

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate - Level 6		
COURSE CODE	**GEO8020**	**SEMESTER**	8th
COURSE TITLE	**GEOSPATIAL DATA MANAGEMENT IN WEB ENVIRONMENT**		

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 TEACHINGHOURS**	**CREDITS**
Lectures	3	
Lab exercises	1	
Total	**4**	**5**

COURSE TYPE	General background
PREREQUISITE COURSES:	Geographic Information Systems & Science
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

The course aims to present both methods and techniques followed in an international level for the organization, visualization, management and processing of geospatial data in web, utilizing modern tools of geographic information systems including specialized software and libraries for geographic information management in web browsers.

Course objectives involve the combination of knowledge in different fields including cartography, geographic information systems and basic programming methods while, at the same time, require the understanding of basic elements related to the construction of information systems in the web. For this reason, the course includes both theoretical lectures and practical exercises aiming at the smooth shifting from theoretical concepts to the practical implementation of online maps and geospatial data infrastructures.

Considering the fact that the modern approach of distributing cartographic products is based on the utilization of the world wide web, the knowledge acquired by the students in the course includes all the necessary supplies required in the industry.

Based on the sections designed for the support of the course, the theoretical and the practical elements, which are comprehended in the framework of the course, are related to:

a. modern concepts and approaches applied in web mapping,

b. geospatial web services,

c. web map production and distribution,

d. the development and management of geospatial data infrastructures,

e. the development of specialized cartographic applications in web environment.

After the successful completions of the course, students acquire a set of knowledge and skills that allow them:

a. To organize the geographical information in appropriate structures towards its distribution in web environment, fully supporting the generation of integrated web geographic information systems and geospatial data infrastructures.

b. To successfully manage and modify existing web geographic information systems and geospatial data infrastructures.

c. To develop specialized web applications for professional, educational and research purposes.

Moreover, both the theoretical approaches and the practical tools taught in the course help students towards the elaboration of diploma theses in the field of Geoinformatics.

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
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

Theoretical part of the Course

1. Introduction to web mapping:
   - Historical evolution of cartographic products nature: from analog to digital and web maps.
   - Web maps types.
   - Interactivity and navigation on digital and web maps.
   - Data structures and file formats used for the digital representation and management of geospatial data in web environment.
   - Basic web maps applications.

2. Geospatial web services:
   - Basic principles of web services.
   - Architecture of web mapping systems.
   - Standards and protocols for the management of geographic information and the support of geospatial services in the web.
   - Geographic information servers.

3. Web maps production and distribution:
   - Cartographic visualization principles for the representation of geographical information: variables and methods for geospatial data visualization.
   - Graphic design principles of web map layout.
   - Opportunities and limitations in geographical information visualization in the web.

4. Geospatial data infrastructures:
   - Architectures of geospatial data infrastructure systems.
   - Development of geospatial infrastructure to support experts, non-experts, and stakeholders.
   - Interoperability of geospatial data infrastructures and international standards for systems development.
   - Legislative framework.
   - National and international geospatial data infrastructures.

5. Web mapping applications development:
   - Basic technologies and programming languages for the development of cartographic applications in web environment.
   - Software libraries for the management and processing of geospatial data in web environment.
   - Best practices and examples of web mapping applications.

Lab Part of the Course

- Geospatial data organization and homogenization for their distribution using web maps and geospatial data infrastructures
- Cartographic visualization of geographical information in web environment
- Geographical information retrieval and update using geospatial data infrastructures
- Source code parametrization for web mapping

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Email • Specialized software and libraries (both commercial and open source) for the management and visualization geospatial data in desktop and web environment • Source code editors • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures	40
Study and analysis of bibliography	35
Laboratory practice	55
Lab exercises	10
Educational visits	10
Course total	***150***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) • Homework (practical exercises on both theoretical and practical objectives related to the course) • Oral presentation • Semester exercise

(5) ATTACHED BIBLIOGRAPHY

1. Tsoulos, L., Skopeliti, A., & Stamou, L. (2015). Cartographic composition and production in digital environment (In Greek). [ebook] Athens:Hellenic Academic Libraries Link. Available Online at: http://hdl.handle.net/11419/2506.
2. Clarke, K. C. (2014). Maps & Web Mapping. Pearson.
3. Kraak, J. M., & Brown, A. (2003). Web cartography. CRC Press.
4. Mitchell, T. (2005). Web mapping illustrated: using open source GIS toolkits. O'Reilly Media, Inc.
5. Muehlenhaus, I. (2013). Web cartography: map design for interactive and mobile devices. CRC Press.
6. Peterson, M. P. (1995). Interactive and animated cartography. Prentice Hall.
7. Stefanakis, E. (2015). Web Mapping and Geospatial Web Services, Fredericton.

8. Williamson, I. P., Rajabifard, A., & Feeney, M. E. F. (2004). Developing spatial data infrastructures: from concept to reality. CRC Press.

GEO8030 – SIGNAL ANALYSIS & PROCESSING

COURSE OUTLINE: GEO8030 - SIGNAL ANALYSIS & PROCESSING

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO8030**	SEMESTER	8th
COURSE TITLE	**SIGNAL ANALYSIS & PROCESSING**		
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 TEACHIN GHOURS	CREDITS
LECTURES		3	4
LABORATORY EXERCISES - FIELDWORK		1	1
TOTAL		**4**	**5**
COURSE TYPE	*Specialized general knowledge*		
PREREQUISITE COURSES:	No		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK (English for Erasmus Students)		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO206/		

(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.

Upon successful completion of the course, students are expected to:

- Demonstrate knowledge of the basic concepts of signal analysis in the fields of time and frequency, the continuous time signal sampling procedure as well as the reverse process, ie their reconstruction from samples
- Distinguish and explain phenomena such as those of frequency folding, non-frequency reconstruction and generally the constraints and problems that arise against digital signal processing
- Demonstrate critical understanding of methods, ideas, results & conclusions which will be found in engineering science articles, books and journals
- Analyze signal processing problems in realistic geodetic application scenarios water resources & geoenvironment and produce solutions based on what has been learned.
- Apply spectral analysis of signals and systems using tools digital systems simulation for output calculation.
- Interpret the results of spectral analysis of digital signals and systems
- Design and develop suitable filters for sampling and processing of signals
- understand the mathematical background and the rules on which non-linear signal analysis
- analyze, model, develop, synthesize and evaluate new methods & non-linear signal analysis techniques

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, analyze and synthesize data and information, using both necessary technologies • Project planning & management • Autonomous work in an interdisciplinary environment • Promotion of free, creative and inductive thinking • Decision making • Time management - Working with deadlines

(3) SYLLABUS

- Types and categories of signals (Analog - digital, Continuous - discrete, Deterministic -stochastic signals)
- Analog-digital and digital-analog conversion
- Statistical characteristics of signal and noise.
- Types & categories of systems (Linear - Non-linear systems, Discrete systems time, time invariant systems). Complex & dynamic systems
- Spectral Analysis, Correlation Function & Spectrum.
- Fourier Transform (FT)
- Discrete Transformation (DFT)
- DFT applications (spectral system response, power spectra, energy, convolution in the field of frequencies).
- Short Time Fourier Transform (STFT).
- Filters (Purpose, Types of filters. Stochastic & deterministic filters. Mobile media filters condition, window filters, linear filters, Kalman filters, filter design).
- Non-linear signal analysis (Hurst and Lyapunov Exhibitors, correlation dimension, solution R / S, DFA, Wavelets, etc.).
- Long system memory.
- Data analysis applications in modern geodetic applications (pre-processing, normalizations, transformations, processing, results, evaluation of results)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	• Face-to-face • Practical training in ICT lab	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• *Use of ICT in teaching (PowerPoint presentations, videos)* • *Use of an asynchronous e-learning platform (e-class).* • *Use of messaging and social media as additional communication channels*	
TEACHING METHODS *The manner and methods of teaching are described in detail.*	***Activity***	***Semester workload***
	Lectures	39
	Personal study and analysis	30

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*	*of bibliography*	
	Lab practice	13
	Laboratory preparation and essay writing	35
	Project	33
	Course total	**150**

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.*	Assessment language: Greek (English for ERASMUS students upon request) Performance evaluation method: • Final Written Exam (50% of the final grade) of graded difficulty, which include short-answer questions, open-ended questions and solving simple problems. • Evaluation of laboratory work (30% of the final grade) from lab work • Evaluation of project (20% of the final grade) The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography (in Greek):
1. Α. Σκόδρας, Β. Αναστασόπουλος, Ψηφιακή Επεξεργασία σήματος και εικόνας, Εκδόσεις Ελληνικού Ανοικτού Πανεπιστημίου.
2. Γ. Δ. Κόγιας, Εισαγωγή στην Ψηφιακή Επεξεργασία Σήματος, Εκδόσεις Σύγχρονη Εκδοτική, Αθήνα, 2010.
3. M. H. Hayes, Θεωρία και προβλήματα στην ψηφιακή επεξεργασία σήματος, (μτφρ.), Εκδόσεις Τζιόλα, Θεσ/νίκη, 2000, ISBN: 9608050111.
4. Αν. Βελώνη, Ν. Μυριδάκης, Ψηφιακή Επεξεργασία Σήματος, Εκδόσεις Τζιόλα, Θεσσαλονίκη, 2018.
5. Ν. Καλουπτσίδης, Συστήματα και Αλγόριθμοι, Εκδόσεις Δίαυλος, Αθήνα 1993.
6. J. H. McClellan, R. W. Schafer, M. A. Yoder, Θεμελιώδεις έννοιες της επεξεργασίας σημάτων, (μτφρ.), Εκδόσεις Γκότση, 2006, ISBN: 9608771048.
7. A. Antoniou, Ψηφιακή επεξεργασία σήματος, Σήματα συστήματα και φίλτρα, (μτφρ.), Εκδόσεις Τζιόλα, Θεσ/νίκη, 2009, ISBN: 9604181882
8. J. G. Proakis, D. G. Manolakis, Ψηφιακή ανάλυση σήματος, Αρχές, αλγόριθμοι, εφαρμογές, (μτφρ.), Εκδόσεις Ίων, Αθήνα, 2010, ISBN: 9604117157

- Suggested bibliography (in English):
1. E. C. Ifeachor, B. W. Jervis, Digital Signal Processing, ISBN: 0201596199.
2. J. G. Proakis, D. G. Manolakis, Digital Signal Processing, ISBN: 0132287315
3. A. Oppenheim, R. Schafer, Digital Signal Processing, ISBN: 0132146355
4. S. K. Mitra, Digital Signal Processing, ISBN: 0071244670

GEO8040 – DIGITAL SYSTEMS & SENSORS

COURSE OUTLINE: GEO08040 - DIGITAL SYSTEMS & SENSORS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO8040**	SEMESTER	8th
COURSE TITLE	**DIGITAL SYSTEMS & SENSORS**		

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 TEACHIN GHOURS	CREDITS
LECTURES	3	4
LABORATORY EXERCISES - FIELDWORK	1	1
TOTAL	**4**	**5**

COURSE TYPE	*Skills development*
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK (English for Erasmus Students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO199/

(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.

Upon successful completion of the course, students are expected to:

- Describe and interpret the phenomena that take place in measuring systems.
- select the appropriate signal conditioning circuits for measuring physical and other quantities through sensors
- detect possible interferences in a measurement environment and to suggest techniques to limit them
- evaluate types of sensors by examining their principle of operation, the signal conditioning circuits, their precision characteristics, their dynamic characteristics, their applications as well as their calibration techniques
- Use measurement data collection systems and develop corresponding applications in a graphical programming environment.
- organize the basic structure of applications in wireless and wired metering networks
- Recognize common interface protocols as well as interface software systems at the level of communication and applications
- Develop solutions on popular platforms for rapid development of integrated metering systems in order to be able to implement original metering devices and

data visualization systems.
- Compile systems for measuring, recording, processing and analysis of geoinformatics data (UAV recording platforms, mobile mapping, atmospheric measurements, etc.)
- Evaluates the quality of data received from sensor networks that has developed.

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, analyze and synthesize data and information, using both necessary technologies
- Project planning & management
- Autonomous work in an interdisciplinary environment
- Promotion of free, creative and inductive thinking
- Decision making
- Time management - Working with deadlines

(3) SYLLABUS

- Introduction to measurement technology - Noise management
- Computer systems - communication protocols
- Platforms for rapid prototyping of integrated systems
- Wireless and Wired Networks
- Sensor interface protocols with microcontrollers and computer systems
- Principles of operation and types of basic sensors - Characteristics of sensors
- Environmental sensors
- Geosensors
- Optical sensors
- Atmospheric sensors
- Interface standardization of interconnected digital devices – software for digital systems connection
- Digital system data transfer protocols in wired or wireless e-communication
- Data visualization platforms

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	• Face-to-face • Practical training in ICT lab
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• *Use of ICT in teaching (PowerPoint presentations, videos)* • *Use of an asynchronous e-learning platform (e-class).* • *Use of messaging and social media as additional communication channels*

TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography,*	*Activity*	*Semester workload*
	Lectures	39
	Personal study and analysis of bibliography	30

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*	*Lab practice*	13
	Laboratory preparation and essay writing	35
	Project	33
	Course total	**150**
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.*	Assessment language: Greek (English for ERASMUS students upon request) Performance evaluation method: • Final Written Exam (50% of the final grade) of graded difficulty, which include short-answer questions, open-ended questions and solving simple problems. • Evaluation of laboratory work (30% of the final grade) from lab work • Evaluation of project (20% of the final grade) The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography (in Greek):
1. Καλοβρέκτης Κ., Κατέβας Ν., 2014. Αισθητήρες Μέτρησης και Ελέγχου. Εκδόσεις Τζιόλα,Θεσσαλονίκη.
2. BentleyJohnP., 2009, Συστήματα Μετρήσεων – Βασικές Αρχές, Εκδόσεις ΙΩΝ, Αθήνα
3. Γαστεράτος, Ι., Μουρούτσος , Κ., Ανδρεάδης, Κ., 2013, Τεχνολογία μετρήσεων – Αισθητήρια,εκδόσεις Τσότρα, Αθήνα
4. Λουτρίδης, Σ. 2008, Τεχνολογία Μετρήσεων & αισθητήρων, Εκδόσεις Σ. Παρίκου , Αθήνα

- Suggested bibliography (in English):
1. Henry Leung, Subhas Chandra Mukhopadhyay, 2015, Intelligent Environmental Sensing, Springer, New York
2. Park, J., Mackay, S., 2003, Practical data acquisition for instrumentation and control systems, Elsevier, Netherlands
3. Mukhopadhyay, S., Jiang, J.A., 2013, Wireless Sensor Networks and Ecological Monitoring,Springer, Berlin

GEO8050 – REFERENCE AND TIME SYSTEMS

COURSE OUTLINE: GEO8050 – REFERENCE AND TIME SYSTEMS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO8050**	**SEMESTER**	8th
COURSE TITLE	**REFERENCE AND TIME 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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	4
Laboratory exersices	1	1
TOTAL	**4**	**5**

COURSE TYPE	Specialized general
PREREQUISITE COURSES:	No prerequisite courses needed
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr /courses/GEO242

(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.

Basic course goals:

- Basic concepts on reference systems and time transformations
- Contemporary applications in surface and satellite geodesy
- Relations between local and global geodetic reference systems
- Algorithms on transformation in space and time

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*
- *Decision-making*
- *Working independently*
- *Working in an international environment*
- *Production of new research ideas*
- *Production of free, creative and inductive thinking*

(3) SYLLABUS

Space and Time in earth sciences. Time and Space measurements. The geometry of Decartes, coordinates and reference systems in Euclidean space. Reference and coordinate system differences. Orthonormal base. Reference frames. Reference frame relations. Curvilinear coordinates. Spherical coordinates. Geodetic and ellipsoidal coordinates. Physical systems of the gravity field. Local astronomical system. Introduction to the height systems. Basic transformation. Plane and 3D transformations. Rotation matrices. Specialized Helmert transformations. Quadratic numbers. Inertial reference systems. ICRS system. Earth – Centered – Earth – Fixed reference systems. ITRS System. Transformation between ICRS and ITRS. Nutation and Presession Theory. Earth pole coordinates. Newtonian and Relativistic Time Theory.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	e-class, software development, communication with students through e-class

TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	52
	Laboratory practice	58
	Study and analysis of bibliography	40
	Course total	***150***

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.*	The final course evaluation is based on written examination (70%) and laboratory work (30%) Language of evaluation: Greek (English if needed, e.g., Erasmus+ students) Written examination with short-answer questions, problem solving and laboratory work

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Torge W., 2001. Geodesy. 3rd Edition. Walter de Gruyter, Berlin.*
- *Vanicek P., Krakiwsky E., 1992. Geodesy: The Concepts. Elsevier, New York.*
- *Altamimi Z. and X. Collilieux (eds.), 2013. Reference Frames for Applications in Geosciences. Springer eds.*
- *Kovalevsky J., I. I. Mueller and B. Kolaczek (eds.), 1989. Reference Frames in Astronomy and Geophysics. Springer eds.*

- Related academic journals:

- Journal of Geodesy
- Journal of Geodetic Sciences
- IAG Series publications

GEO8060 – SPECIAL TOPICS IN PHOTOGRAMMETRY & COMPUTER VISION

COURSE OUTLINE: GEO8060 - SPECIAL TOPICS IN PHOTOGRAMMETRY & COMPUTER VISION

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 7		
COURSE CODE	**GEO8060**	**SEMESTER**	8th
COURSE TITLE	**Special Topics in Photogrammetry & Computer Vision**		

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 Labs	4(2/2)	5
TOTAL	**4**	**5**

COURSE TYPE	Skills development
PREREQUISITE COURSES	No prerequisite courses. Suggested completion of courses *Photogrammetry I*, *II* and *III*, *Digital Image Processing*, *Digital Image Processing*, *Error Theory & Adjustment of Observations II*, *Programming Techniques & Algorithms*.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
OFFERED TO *ERASMUS* STUDENTS	Can be taught in English
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

Basic purpose of this course is to study in more depth, on both the theoretical and the practical level, all components of a photogrammetric/computer vision process which allow the fully automatic 3D object reconstruction from images. At the same time, students will have the opportunity to become familiar with state-of-the-art technologies used in photogrammetry for the collection, processing and analysis of geospatial data. Through lab exercises and projects, the course intends to encourage student initiative towards studying recent international literature as well as writing code regarding current research subject in photogrammetry and computer vision.

Successful completion of this course means that students

- Are familiar with the scientific and technological development in today's photogrammetric practice.
- Have an in-depth insight into methods and algorithms of computer vision as now fused with conventional photogrammetric processes.

- Have a good understanding and can describe, explain and compare algorithms and techniques of sparse/dense image matching of SFM (Structure from Motion).
- Are thus capable of fully comprehending the processes of software for automatic image-based 3D scene reconstruction and use them in various contexts.
- Are in position to design, implement and apply (in small-scale projects) automated photogrammetric / computer vision procedures (regarding image orientations, camera pre- and self-calibration, 3D reconstruction); to analyze, interpret and evaluate results (regarding accuracy and reliability); and to present this in technical reports.
- Understands and can compare SLAM (Simultaneous Localization and Mapping) algorithms.
- Has adequate knowledge of algorithms for video-based optical navigation (visual odometry) and their applications in robotics.

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?

- Working independently
- Teamwork
- Adapting to new situations
- Criticism and self-criticism
- Search for, analysis and synthesis of data and information, with the use of the necessary technology

(3) SYLLABUS

Elaboration in selected topics of modern photogrammetry and computer vision. Included are lectures by faculty members and invited scientists and researchers from academia and the professional field with expertise in topics of interest.

The subjects refer to state-of-the-art automated processes in photogrammetry and computer vision:

- Algorithms of automatic image orientations
- Linear solutions of image orientations
- Methods for camera calibration and self-calibration
- Techniques for sparse and dense image matching
- Comparison of SFM (Structure from Motion) algorithms
- SLAM (Simultaneous Localization and Mapping) algorithms
- Video-based visual navigation (visual odometry) and its applications in robotics.

The students will also handle exercises and prepare an individual project (open-source software or coding) or an extended critical literature review on topics of the course.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Support by the electronic asynchronous course platform *eclass* (exchange of information and digital data between tutors and students) - Use of open-source software

	- Use of programming environment for preparing projects. - Use of photogrammetric software for Lab exercises.
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*	

Activity	***Semester workload***
Lectures	26
Laboratory / Exercises	26
Project	58
Non-directed study	40
Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of Evaluation: • Evaluation of performance in the Lab exercises. • Oral presentation of project.

(5) SUGGESTED BIBLIOGRAPHY

15. ASPRS, 2013. *Manual of Photogrammetry*. 6th edition, J. Chris McGlone (editor).
16. Luhmann T., Robson S., Kyle S., Harley I., 2006. *Close Range Photogrammetry: Principles, Techniques and Applications*. Whittles Publishing, Scotland.
17. Szeliski R., 2010. *Computer Vision: Algorithms and Applications* (draft). Springer (http://szeliski.org/Book/).
18. Hartley R., Zisserman A., 2000. *Multiple View Geometry in Computer Vision*. Cambridge University Press.
19. Förstner W., Wrobel B. P., 2016. *Photogrammetric Computer Vision*. Springer.

In Greek:

20. Dermanis A., 1991. Analytical Photogrammetry. Ziti Editions, Thessaloniki
21. Kraus K., 2003. *Photogrammetry.* Vol 1. TEE Editions, Athens.

GEO8070 – 3D DATA PROCESSING & VISUALIZATION

COURSE OUTLINE: GEO8070 - 3D DATA PROCESSING & VISUALIZATION

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 7		
COURSE CODE	**GEO8070**	**SEMESTER**	8th
COURSE TITLE	**3D Data Processing & Visualization**		

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 Labs	4(2/2)	5
TOTAL	**4**	**5**

COURSE TYPE	Skills development
PREREQUISITE COURSES	No prerequisite courses. Suggested completion of courses *Photogrammetry III*, *Error Theory & Adjustment of Observations II*, *Programming Techniques & Algorithms*, *Computer Graphics*
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
OFFERED TO *ERASMUS* STUDENTS	Can be taught in English
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

Basic purpose of this course is the familiarization of students with the prevailing methods/techniques for collection of 3D spatial information (automatic photogrammetric processes, laser scanning, optical scanners, RGB-D sensors etc.). Primarily, however, the focus is on subsequent post-processing and manipulation of 3D data and their draping with photo-texture. Ultimate goal is to provide students with skills regarding the generation of representations of 3D space with adequate geometric accuracy and high optical quality.

Successful completion of this course means that students

- Have understood and may describe, analyze and compare the different 3D data structures and their characteristics (pros – cons)
- Will be in position to choose and apply the contextually optimal method for collecting 3D information

- Has an in-depth understanding and may apply methods for the mutual registration of point clouds, and also is in position to implement basic registration algorithms.
- Is capable of processing 3D data (smoothing, hole-filling, decimation, normalization) and choose the optimal processing approach according to the type and accuracy of the data involved.
- Has understood and may describe, analyze and compare methods of triangulation and 3D surface generation.
- Is capable of registering image blocks to 3D models and rendering them with photo-texture from the images, by also considering the particular requirements of the representation.
- Is in position to study and evaluate 3D models as regards resolution, accuracy, homogeneity and type of data.
- Can implement an end-to-end process of collection, processing, visualization and analysis of date representing 3D space.

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
- Working independently
- Teamwork
- Production of free, creative and inductive thinking
- Working in an interdisciplinary environment

(3) SYLLABUS

Types of 3D data (point cloud, 3D mesh, surfaces, NURBS, Solids).
Registration of 3D point clouds (ICP registration, 3D feature matching).
3D data processing (smoothing, hole filling, relaxing, segmentation, classification, object recognition). Triangulation of point sets (2D/3D Delaunay triangulation – Voronoi diagram).
Algorithms for surface generation from point clouds, 3D mesh parameterization.
DTM generation from DSM.
Photogrammetric triangulation sensors (structured light scanners, laser-line scanner, Kinect), laser scanners, optical scanners, combination of photogrammetry and laser scanning.
“True” ortho, Photo-texturing of 3D models and their projections (texture mapping, texture atlas, ortho and true ortho, perspective views).
3D city models with level of detail (LOD), 3D mobile mapping (laser-based and image-based).
3D Printing.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education,*	- Support by the electronic asynchronous course platform *eclass* - Use of electronic material as teaching aid (ppt slides)

communication with students	- Use of software for 3D data processing	
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*	***Activity***	***Semester workload***
	Lectures	26
	Laboratory / Exercises	26
	Project	48
	Non-directed study	50
	Course total	**150**
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.*	Language of evaluation: Greek Methods of Evaluation: • Written examination in the end of the semester (50%), which combines open-ended questions and numeric calculations. • Evaluation of performance in laboratory exercises (50%)	

(5) SUGGESTED BIBLIOGRAPHY

22. Course Notes and Slides (in Greek).
23. Botsch M., Kobbelt L., Pauly M., Alliez P., Levy B., 2010. *Polygon Mesh Processing*. CRC Press
24. Hormann K., Levy B, and Sheffer A., 2008. *Mesh Parameterization: Theory and Practice*. Course Notes, SIGGRAPH Asia.

GEO8080 – CADASTRAL APPLICATIONS & LAND INFORMATION SYSTEMS

COURSE OUTLINE: GEO8080 - CADASTRAL APPLICATIONS & LAND INFORMATION SYSTEMS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO8080**	**SEMESTER**	8th
COURSE TITLE	**Cadastral Applications & Land 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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	3
Project	1	2
Total	**4**	**5**

COURSE TYPE	Special background/ skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75 https://eclass.uniwa.gr/courses/TOP133/

(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.

The scope of the course is students to have in depth knowledge and to develop skills on creation, development and modification/ exploitation of Hellenic Cadastre spatial and descriptive data/ information. Emphasis is given on cadastral data management according the methods and techniques of Land Information Systems (LIS).

In respect to sustainable development principles, during the course students learn to render spatial data relevant to natural resources and man-made/ anthropogenic interventions in relation to land-parcels, so as the necessary information background in respect to sustainable development principles.

Besides LIS applications on Hellenic Cadastre data, cadastral applications of land redistribution, forest or marine Cadastre, seashore/ beach borderlines determination techniques are also included.

During the course students capability on

After successful course completion, students are expected to:

- Have knowledge on definitions and functions of concurrent cadastral systems, Hellenic Cadastre data correlation to other cadastral applications (marine/ forest cadastres, land redistribution, other administrative acts) on administrative, legal, financial and social level
- Comprehend the methods and the techniques of records and modification of Hellenic Cadastre data base in respect to Hellenic Cadastre technical specifications (spatial/ technical, descriptive/ legal)
- Analyze and encounter problems relevant to ownership status and deeds implementation in the real word either in urban or in periurban and agricultural areas, in respect to the official Hellenic Cadastre records
- Analyze the results of simplified or advanced queries on cadastral, spatial & descriptive, data and their chartographic representation
- Have knowledge on production and application of analytic methods for the management of cadastral data and inquiries and to combine results to other statistical data.
- Evaluate solutions of detailed spatial problems (urban planning scale and geographic reference) and synthesize solutions' results to technical descriptions
- To elaborate with other students in project elaboration and oral presentation

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, analysis and synthesis of data and information, with the use of the necessary technology
- Adaption to new work conditions
- Decision-making
- Independent work
- Team work
- Self-evaluation
- Free, creative and inductive thinking

(3) SYLLABUS

i. Introduction. Hellenic Cadastre and other official cadastral records in Greece. International experience. Land Information Systems (L.I.S.) terminology, definitions, scope.
ii. Hellenic Cadastre technical aspects. Analysis and implementation of Hellenic Cadastre technical specifications on cadastral data bases and cadastral diagrams.
iii. Immovable thing's spatial identification, geometry and ownership status definition, correlation of deeds geometric description to Hellenic Cadastre spatial data base.
iv. Integration of Cadastral Survey to LIS. Geometrical – geographical aspect of LIS. Hellenic Cadastre Chartographical Backgrounds and Orthofotomaps. Transformations (coordinates systems), projections alterations, geometrical corrections.

v. Cadastral tables. Modification and data processing of descriptive cadastral data – integration to Land Information data base, joins/ relations of tables and vector layers.
vi. Integration of cadastral information to LIS. Exploitation of cadastral data, integration to statistical and spatial systems.
vii. Analytical methods on management and search of cadastral information/ data (inquiries), multi-level results. In detailed spatial problems (urban planning – cadastral scale). Solutions’ scenarios. Results chartographic representation.
viii. Olives/ vineyard cultivation registries, legal framework.
ix. Land Parcel Identification Systems (L.P.I.S.)
x. Forests Inventory/ Cadastre. Public properties.
xi. Seashore, Beach borderlines (legislation, administrative and technical procedures, topographic diagrams). Marine Cadastre.
xii. Land distribution. Land reparcelling (legislation, administrative and technical procedures, reparcelling procedure).

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
<i>Face-to-face, Distance learning, etc.</i></td><td>Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>• Web search (legislation and literature review)
• E-class UNIWA platform and office Microsoft 365 UNIWA tools (TEAMS, Class Notebook, Shared docs, email)
• GIS and CAD software
• Office software (word, presentations, spreadsheets editors)</td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td>Lectures Theory</td><td>30</td></tr>
<tr><td>Exercises</td><td>20</td></tr>
<tr><td>Individual projects</td><td>35</td></tr>
<tr><td>Team project</td><td>20</td></tr>
<tr><td>Home study</td><td>20</td></tr>
<tr><td>Course total</td><td><i>125</i></td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>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</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Evaluation Language: Greek (English)
Evaluation methods:
• Written exam (winter or September exams period)
• Exercises evaluation
• Individual project evaluation
• Team project evaluation</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Legislation on Cadastre, forests, seashors and administrative act.
2. Technical Specifications, Hellenic Cadastre
(INSPIRE)
http://europa.eu/legislation_summaries/environment/general_provisions/l28195_el.htm The INSPIRE geoportal - http://inspire-geoportal.ec.europa.eu/
Joint Research Centre - JRC - European Commission: https://ec.europa.eu/jrc/en/about E
Environmental Systems Research Institute http://www.esri.com/

In Greek:

Ζεντέλης, Π., 2011, Περί κτημάτων λόγος και Κτηματολόγιο, Αθήνα, Εκδ. Παπασωτηρίου
Αρβανίτης, Α., 2000, Κτηματολόγιο, Θεσσαλονίκη, Εκδ. Ζήτη.
Ρόκος, Δ., 2005, Περιβάλλον και Ανάπτυξη. Διαλεκτικές Σχέσεις και Διεπιστημονικές Προσεγγίσεις. (Εισαγωγή-Επιμέλεια), Εναλλακτικές Εκδόσεις, Αθήνα.
Ρόκος, Δ., 1981, Φυσικά Διαθέσιμα, Κτηματολόγιο κι Ολοκληρωμένες Αποδόσεις. εκδ. Παρατηρητής Θεσσαλονίκη
Μανιάτης, Ι., 1993, Γεωγραφικά Συστήματα Πληροφοριών Γης – Κτηματολογίου, Θεσσαλονίκη, Εκδ. Ζήτη.
Καρνάβου, Ε. 2002. Γεωγραφικά Συστήματα Πληροφοριών και Υποδομή Χωρικών Δεδομένων για τη σύγχρονη Ελλάδα. Παρατηρητής, Θεσσαλονίκη.
Στεφανάκης Ε., 2003, Βάσεις Γεωγραφικών Δεδομένων και Συστήματα Γεωγραφικών Πληροφοριών, Εκδ. Παπασωτηρίου, Αθήνα
Τεχνικές προδιαγραφές μελετών Κτηματογράφησης για τη δημιουργία Εθνικού Κτηματολογίου, 2011, Αθήνα, Κτηματολόγιο Α.Ε. – Τεύχος.
- Παράρτημα Α: Κωδικοποίηση και οργάνωση των στοιχείων
- Παράρτημα Β: Παραδοτέα Μελετών
Κύρια Νομολογία:
Ν.2308/95 ΦΕΚ 114Γ/15.6.1995, Κτηματογράφηση για τη δημιουργία Εθνικού Κτηματολογίου. Διαδικασία έως τις πρώτες εγγραφές στα Κτηματολογικά Βιβλία και άλλες διατάξεις
Ν.2664/98 ΦΕΚ 275Β/3.12.1998, Εθνικό Κτηματολόγιο και άλλες διατάξεις.
Ν.3818/2010 ΦΕΚ 17/16.2.2010, Προστασία Δασών και δασικών εκτάσεων
Ν.674/77 ΦΕΚ 242Α/1.9.1977, Περί αναδασμού της γης και μεγεθύνσεως των γεωργικών εκμεταλλεύσεων και άλλων τινών διατάξεων.
Ν.2882/2001, ΦΕΚ 17Α/6.2.2001, Κώδικας αναγκαστικών απαλλοτριώσεων ακινήτων
Ν.2971/2001, ΦΕΚ 285Α/19.12.2001, Αιγιαλός παραλία και άλλες διατάξεις

- Related academic journals:

MDPI Sustainability
MDPI Land
Elsevier Land Use Policy

GEO8090 – ROAD DESIGN II

COURSE OUTLINE: GEO8090 – ROAD DESIGN II

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO8090**	**SEMESTER**	8th
COURSE TITLE	**Road Design II**		
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 TEACHIN GHOURS**	**CREDITS**	
Lectures & Individual Exercise (Theoretical part of the Course)	2		
Group Exercise (Lab Part of the Course)	2		
Total	**4**	**5**	
COURSE TYPE	Specialization		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO182/		

(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.

After the successful completions of the course, students will be able to:

- Understand the interdisciplinary nature of road projects
- Understand the processes of road construction studies in a digital environment
- Apply basic principles and methods related to the design of road projects with emphasis on the assessment of safety
- Evaluate basic elements of selection, design and operation of nodes
- Develop a complete road design issue using a respective program

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?

After the successful completions of the course, students acquire the following knowledge and skills:

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

technology
- Team Work
- Work in an interdisciplinary environment
- Design and project management
- Respect for the natural environment
- Production of free, creative and inductive thinking

(3) SYLLABUS

Theoretical part of the Course

1. Surveying Backgrounds – Accuracy
2. Stages of Road Project Study
3. Land Movement Calculation
4. Expropriations
5. Rainwater runoff
6. Visibility
7. Typical Configurations
8. Geometric Design of Tunnels
9. Vehicle Interception Systems
10. Levels - Roundabouts - Selection – Operation
11. Overpass - Selection – Operation
12. Budget issues

Lab Part of the Course

Preparation of a preliminary design of a road project in a digital environment, which includes: hierarchy of road network, selection of a standard cross-section, preparation of a study in digital background (DTM), horizontal study - longitudinal section - cross sections, rainwater runoff, visibility, safety criteria, choice of culvert positions - preliminary hydraulic dimensioning, indicative design of technical projects, road dimensioning, environmental project visa, restoration of accesses, , budget.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	• Face-to-Face • Lectures - interactive teaching in the classroom • Encouraging students to attend related Workshops, Conferences, etc.
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Presentations in the blackboard • Presentations through Power Point slides • 0.Program FM17, Autocad
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures	52 (13 X 4)
Preparation of a preliminary design of a road project in a digital environment Delivered individually	60
Study and preparation for the exams	38
Course total	***150***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Theoretical part of the Course • Written exam (50%) Lab Part of the Course • Partial and Overall Presentation of a semester topic (50%)

(5) ATTACHED BIBLIOGRAPHY

1. Apostoleris Anastasios. "Road Geometric Design 1 ", 1st Edition, 2013, Athens.
2. American Association of State Highway and Transportation Officials (AASHTO). A Policy on Geometric Design of Highways and Streets, Fifth Edition. Washington, DC., 2011
3. Ed.German Road and Transportation Research Association, Committee, Geometric Design Standards. Guidelines for the Design of Roads, (RAA), Germany, 2008.
4. Ministry of Environment, Regional Planning and Public Works. Guidelines for the Design of Road Projects, Part 3, Alignment (OMOE-X), Greece, 2001.
5. Ministry of Environment, Regional Planning and Public Works. Guidelines for the Design of Road Projects, Alignment (OMOE-AK), Greece, 2005.
6. Ministry of Environment, Regional Planning and Public Works. Guidelines for the Design of Road Projects, Alignment (OMOE-IK), Greece, 2005.
7. Ministry of Environment, Regional Planning and Public Works. Guidelines for Tunnel Geometric Designs, (OMOE-TU), Greece, 2003.
8. Austroads. Guide to Road Design Series. Austroads, Australia, 2009.

GEO8100 – WATER RESOURCES MANAGEMENT

COURSE OUTLINE: GEO8100 - WATER RESOURCES MANAGEMENT

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO8100**	**SEMESTER**	8th
COURSE TITLE	**WATER RESOURCES MANAGEMENT**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	
Lab exercises	1	
Total	**4**	**5**

COURSE TYPE	Special background
PREREQUISITE COURSES:	Engineering Hydrology, GEO 506
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	

(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 students will:
1. Understand the importance of water resources in economic development on a local - regional - national scale and the limitation posed by the lack of water resources on the general prosperity of societies. They will understand the competitive uses of water resources, be able to identify the different projects for the exploitation of water resources and know their basic characteristics as well as understand their functioning as a system. Finally, they will understand the impact of climate change on water resources management.
2. Be able to estimate the various economic figures over time so that they have a basis for comparing the development alternatives of water systems.
3. Be able to conceptualize a hydrosystem as a network by applying the principles of subtraction, standardization and simplification.

4. Formulate a water resources problem as an optimization problem and solve it, either by analysis and graphical solution, or by formulating it in Excel and solving it with Solver.
5. Understand statistical-mathematical concepts such as: reliability, uncertainty, risk, simulation and model, sensitivity analysis and model uncertainty, synthetic time series, Monte Carlo sampling.
6. Collaborate with their fellow students for undertaking a project.

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
- Decision-making
- Working independently
- Team work
- Project planning and management
- Respect for the natural environment

(3) **SYLLABUS**

Theoretical part of the lesson

(1) Key concepts: Water uses, domestic and other - Hydrosystems and their components - Sustainable development - system analysis approach - decision support systems - goals and actions of management- legal framework in Greece. Case studies in Greece and abroad.
(2) Economic figures: Benefit and cost of water systems - useful life of components of water systems - estimation of economic figures over time – cost-benefit analysis - non-economic benefits of water systems.
(**3) Conceptualization and modeling of hydrosystems**: network representation - subtraction - standardization - simplification - input data to the model. Case study: the hydro system of Athens.
Estimates of water supply and demand: water resources - characteristic quantities of surface water and groundwater - hydrological uncertainty and reliability - characteristic quantities of water uses (urban - agricultural - livestock - hydroelectric projects).
(5) Alternative methods for model evaluation: model components - project selection and conceptualization. Methods: Optimization versus Simulation. Characteristics and limitations of each method - combination of the two (preliminary screening). Example with a reservoir and three users.
(5) Optimization methods: Introduction - Linear and non-linear optimization models (analysis - Lagrange multipliers - Steepest descent method). **Linear Programming** and Dynamic Programming (simple reference to the latter). Example of linear programming using the Simplex algorithm.
(6) Simulation methods: Uncertainty and risk in water resources exploitation projects. Stochastic simulation (Monte Carlo) and generation of synthetic time series. Sensitivity analysis of models. Uncertainty estimation using simulations.
(7) Climate change and hydrological persistence. Reference to the effects of climate change on water systems in relation to the concept of hydrological persistence.

Lab part of the lesson

The laboratory part consists of 3 laboratories, which aim to help students understand and construct the practical exercises assigned in the lectures.

These are the following:

(1) Optimization problems solved with Microsoft Excel Solver: 3 examples
(2) Lab exercise 1: Analysis and concepts of networks. Shortest path problem using Microsoft Excel Solver.
(3) Lab Exercise 2: Water Resource Management Problem using Microsoft Excel Solver.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
<i>Face-to-face, Distance learning, etc.</i></td><td colspan="2">Face-to-Face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">Learning process support through the electronic platform e-class.
Communication with students via e-class and e-mail
Extensive use of Microsoft Excel.</td></tr>
<tr><td rowspan="7">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>29</td></tr>
<tr><td>Laboratory practice</td><td>29</td></tr>
<tr><td>Individual assignments</td><td>23</td></tr>
<tr><td>Laboratory Teamwork</td><td>36</td></tr>
<tr><td>Standalone study</td><td>23</td></tr>
<tr><td>Course total</td><td>150</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2"><u>Theory</u>
• Final exam, 50%
• Practical exercises, 20%
<u>Laboratory</u>
• Laboratory exercises, 30%</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

Greek

(1) *Lecture notes on Water Resources Management - Part 1&2*, D. Koutsoyiannis, Department of Water Resources, Hydraulic and Maritime Engineering – National Technical University of Athens, 2007, http://www.itia.ntua.gr/el/docinfo/762/ (In Greek)
(2) *Data analysis and decision-making techniques, Asimakopoulous D. & Arampatzis G,* Publisher Papasotiriou, Athens, 2002 (In Greek)
(3) Elements of Physical Hydrology, G. Hornberger et al., Translated in Greek by S.H. Karalis, Publisher DISIGMA, 2019.

English

(4) *Water Resources Systems. An introduction to Methods, Models and Applications*. Daniel p. Loucks and Eelco van Beek. Studies and Reports in Hydrology. UNESCO Publishing, 2005.
(5) *Hydrosystems Engineering and Management*. Lary Mays and Yeou Koung Tung. McGraw-Hill Publishing, 1992.
(6) *Principles of Water Resources Planning*. Alvin Goodman, Prentice-Hall Inc., 1984.

- *Related academic journals:*

(7) Water Resources Research, AGU Publications, John Wiley & Sons, Inc.
(8) Water Resources Management, Springer
(9) American Water Works Association
(10) Journal of Natural Resources Policy Research, Taylor and Francis

GEO8110 – GRAVIMETRY

COURSE OUTLINE: GEO8110 - GRAVIMETRY

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO8110**	**SEMESTER**	8th
COURSE TITLE	**GRAVIMETRY**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		2	4
Laboratory exersices		1	1
TOTAL		**3**	**5**
COURSE TYPE	Specialized general		
PREREQUISITE COURSES:	No prerequisite courses needed		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr /courses/GEO245		

(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.

Basic course goals:

- Gravity field estimation methods and relations with the Surveyor science
- Establishment of gravity networks – gravity measurements
- Corrections and Reductions of gravity and surveying observations
- Measurements pre-processing and error minimization
- Adjustment algorithms and applications

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* • *Decision-making* • *Working independently* • *Team Work* • *Working in an international environment* • *Production of new research ideas* • *Production of free, creative and inductive thinking*

(3) SYLLABUS

Gravity acceleration and potential. Absolute and relative gravity measurements – instrumentation. Coriolis effect in gravity measurements and Eotvos correction. Gravity networks – establishment – adjustment. Potential second derivatives measurements. Temporary gravity changes. Geodetic applications of gravity anomalies. Gravity models and geometry. Gravity reductions and isostasy. Gravity networks of high accuracy. Gravity measurements in geophysics / geodynamics. Satellite gravity field monitoring.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	e-class, software development, communication with students through e-class	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	52
	Laboratory practice	58
	Study and analysis of bibliography	40
	Course total	*150*
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The final course evaluation is based on written examination (70%) and laboratory work (30%) Language of evaluation: Greek (English if needed, e.g., Erasmus+ students) Written examination with short-answer questions, problem solving and laboratory work	

(5) ATTACHED BIBLIOGRAPHY

- ***Suggested bibliography***:

- *Heiskanen W. A., Moritz H., 1967. Physical Geodesy. Freeman & Co, San Francisco.*
- *Hofmann-Wellenhof B. and H. Moritz. 2005. Physical Geodesy. Springer eds.*
- *Moritz H. 1989. Advance Physical Geodesy. Wichmann eds.*
- *Torge W., 2001. Geodesy. 3rd Edition. Walter de Gruyter, Berlin.*
- *Torge W. 1989. Gravimetry. Walter de Gruyter, Berlin.*
- *Vanicek P., Krakiwsky E., 1992. Geodesy: The Concepts. Elsevier, New York.*

- ***Related academic journals:***

- Journal of Geodesy
- Journal of Geodetic Sciences
- IAG Series publications

GEO8120 – NAVIGATION

COURSE OUTLINE: GEO8120 - NAVIGATION

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO8120**	**SEMESTER**	8th
COURSE TITLE	**NAVIGATION**		

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 TEACHIN GHOURS**	**CREDITS**
LECTURES	3	3
LABORATORY EXCRCISES	1	1
TOTAL	**4**	**4**

COURSE TYPE	*skills development*
PREREQUISITE COURSES:	No prerequisite courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP129/

(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.

The aim of this course is to teach the fundamental principles of navigation. Emphasis is given in surveying applications like hydrography, vehicle guidance, airborne data collection etc. Upon successful completion of the course the students will be able to:

- understand the basic principles of navigation
- choose the appropriate method and equipment for carrying out a navigational task
- process kinematic observations for determining trajectories
- plan and execute basic hydrographic works

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*
- *Working independently*
- *Team work*

- *Production of new research ideas*

(3) SYLLABUS

Theoretical part:

- Historic review of navigation techniques
- Basic principles of navigation (Line of Position, dead reckoning, position fixing, accuracy measures in navigation)
- Celestial navigation
- Nautical chart & compass
- Terrestrial radio navigation: angular, ranging, hyperbolic systems (Loran-C, OMEGA)
- Satellite Navigation (GPS, GLONASS, GALILEO, BEIDOU)
- Satellite based augmentation systems (EGNOS and WAAS).
- Accelerometers (mechanical, MEMS)
- Gyroscopes (mechanical, LRG, FOG, MEMS, gyro compass)
- Inertial navigation systems (gimbalded, strapdown, drift, alignment)
- Applications of Kalman filter in navigation
- Indoor navigation
- Drone navigation
- INS/GPS integration
- Hybrid systems

Laboratory part:

- Field measurements with GPS and GNSS receivers for navigational applications (autonomous positioning, EGNOS, DGPS)
- Processing of kinematic observation for the determination of trajectory and state vector
- Interfacing GNSS receivers and processing unit using NMEA protocol
- Estimation of radio data link range
- Processing of accelerometer data.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	*Face-to-face*	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching (PowerPoint presentations, videos)* • *Use of an asynchronous e-learning platform (e-class).* • *Use of e-mail* • *Use of the software in laboratory.*	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	39
	study and analysis of bibliography	31
	laboratory practice	25
	Laboratory preparation and essay writing	30

	Course total	**150**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Assessment language: Greek (English for ERASMUS students upon request) Performance evaluation method: • Final Written Exam (85% of the final grade) of graded difficulty, which include short-answer questions, open-ended questions and solving simple problems. • Evaluation of laboratory work (15% of the final grade) which includes exercises. The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography (in Greek):

1. *Γιαννίου Μ. 2019. Τεχνικές και Συστήματα Πλοήγησης, Διδακτικές Σημειώσεις ΠΑ.Δ.Α.*
2. *Ντούνης Χ., Δημαράκης Α., 2001. Ναυτιλία. Ίδρυμα Ευγενίδου, Αθήνα.*

- Suggested bibliography (in English):

1. *Hofmann-Wellenhof B., Legart K., Wieser M., 2003. Navigation: Principles of Positioning & Guidance, Springer, Berlin.*
2. *Prasad R., Ruggieri M., 2005. Applied Satellite Navigation Using GPS, GALILEO, and Augmentation Systems. Artech House, Norwood, MA.*
3. *Farrell J., 2008. Aided Navigation: GPS with High Rate Sensors. McGraw-Hill, New York.*
4. *Farrell J., Barth M., 1998. The Global Positioning System & Inertial Navigation. McGraw-Hill, N. York.*
5. *Allan A., 2004. Maths for Map Makers. 2nd edition, Whittles Publishing, Scotland.*

GEO8130 – GREAT GEODETIC EXERCISES

COURSE OUTLINE: GEO8130 - GREAT GEODETIC EXERCISES

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO8130**	**SEMESTER**	8th
COURSE TITLE	**GREAT GEODETIC EXERCISES**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	
Lab exercises	1	
Total	**4**	**5**

COURSE TYPE	Specialized general knowledge
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. It can be offered in English if there are foreign students
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

After the end of the course the students:

- will be able to fully undertake a large-scale geodetic, topographic, cadastral project, such us projects commissioned by Public Organizations, Local Government, and in general by Legal Entities of Public and Private Law,
- will be able to take initiatives to deal with problems may arise during the above work,
- will have understood the theoretical background of modern methodologies and techniques of surveying and will be able to design and carry out geodetic - topographic projects,
- will not only be able to understand the operation of modern geodetic instruments and software but, having consolidated the theoretical background, they will be able to evaluate deliverables and address all related problems,
- will have acquired the ability to plan the solution of surveying problems and to adapt the solution to the new requirements of the problem,

- will have understand the possibilities of topography and its relationship with related scientific fields,
- finally, based on the above, they will be able to successfully design, execute and evaluate modern surveying projects, while monitoring and assimilating modern scientific and technological developments.

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, analysis and synthesis of data and information, using the necessary technologies.
- Working independently.
- Team work.
- Criticism and self-criticism exercise.
- Work in an interdisciplinary environment.
- Project design and management.
- Demonstration of social, professional and moral responsibility.
- Adapting to new situations.
- Production of new research ideas
- Promoting of free, creative and inductive thinking

(3) SYLLABUS

Lectures

Design, implementation, measurement and computation of horizontal and vertical control networks. Integration of networks with terrestrial and satellite methods. Design of surveying works for the production of topographic-cadastral diagrams. 3D terrestrial laser scanning mapping. Production of digital backgrounds for the compilation of Land Information Systems (LIS). Technical specifications for compiling topographic diagrams. Quality control of final products.

Laboratory Exercises

The laboratory part of the course is based on the lectures and laboratory exercises of all the previous Geodesy-Topography courses (compulsory and optional) and includes a complete survey-mapping project of a semi-urban-rural area (area of about 50 - 70 acres), the densification of trigonometric network with satellite methods (GNSS), and quality assessment of the existing and new network - for the compilation of topographic - cadastral diagram in real conditions. Applications of securities and administrative acts. Also, the laboratory part includes observations using satellite (RTK) and terrestrial (geodetic stations, 3D laser scanning) techniques. Establishment of vertical networks with combined use of spatial planning, GNSS and geodynamic gravity models. After the end of the course, the students' assignments are delivered to the respective organizations.

The region, where the exercises and fieldworks take part, is defined every year by the Department of Topography-Photogrammetry-Cartography after consultation with OTA, or other Institutes and Organizations that have expressed interest in cooperating with the Department of Surveying Engineering and Geoinformatics.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">• Lectures: use of multimedia (presentations and videos)
• Lab exercises: specialized software and libraries for surveying studies
• Utilization of e-class UNIWA platform (file exchange among professors and students)
• Web search (literature review and data sources)</td></tr>
<tr><td rowspan="5">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Teamwork</td><td>68</td></tr>
<tr><td>Autonomous study</td><td>40</td></tr>
<tr><td>Course total</td><td>150</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Language of evaluation: Greek
Method of evaluation:
• Written exams: 30%
• Fieldwork-homework: 70%</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

In Greek:

1. Arvanitis A., 1999. Cadastral. Ed. Ziti, Thessaloniki
2. Vlachos D., 1987. Topography, Vol. 2, Ed. AUTH
3. Georgopoulos G., 2007. Course in Topography, Ed. Tziola.
4. Kaltsikis Ch., Foriou A., 1999. General Topography, Ed. Ziti, Thessaloniki.
5. Ntinis O., 2008. Road constructions, Ed. Ziti, Thessaloniki.
6. Torge W., 2005. Geodesy. Ed. NTUA.
7. Tsoulis D., 2004. Introduction to topography. Ed. Ziti, Thessaloniki.
8. Tsoulis D., 2012. Satellite Geodesy, Ed. Ziti, Thessaloniki.

In English:

9. Allan A.L., Hollwey J.R., Maynes J.H.B., Amin A., 1980. Practical Field Surveying and Computations. Heinmann, Portsmouth, NH.
10. Andersen J. M., Mikhail E. M., 1998. Surveying: Theory and Practice. 7th edition, McGraw-Hill, New York.
11. Blachut T., Chrzanowski A., Saastamoinen J., 1979. Urban Surveying and Mapping. Springer, Berlin.
12. Buckner R. B., 1983. Surveying measurements and their analysis. Landmark Enterprises, Cordova, CA.
13. King R. W., Masters E. G., Rizos C., Stolz A., Collins J., 1987. Surveying with Global Positioning System FERD. Dümmler Verlag, Bonn.
14. Shepherd F. A., 1977. Engineering Surveying. Edward Arnold, London.
15. Uren J., Price W. F., 2005. Surveying for Engineers. 4th edition. MacMillan Press, London.

GEO8140 – INTERGRATED URBAN INTERVENTIONS

COURSE OUTLINE: GEO8140 - INTERGRATED URBAN INTERVENTIONS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO8140**	**SEMESTER**	8TH
COURSE TITLE	**INTERGRATED URBAN INTERVENTIONS**		

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 TEACHIN GHOURS**	**CREDITS**
LECTURES	2	
LABORATORY EXCERSISES	2	
TOTAL	**4**	**5**

COURSE TYPE	SPECIAL BACKGROUND
PREREQUISITE COURSES:	URBAN PLANNING
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK (WITH THE POSSIBILITY FOR OTHER LANGUAGES)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

(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.

After the completion of the course students:
- will have comprehended the technical, economic, social and environmental issues that affect urban development and will be able to shape arguments so as to describe forms of urban development
- will have understood the function and structure of urban agglomerations, being able to make successful projections for further development
- will have understood the challenges and opportunities related to metropolitan areas
- will be able to collect and evaluate data for urban areas
- will be able to implement combined methodologies of architectural, transportation and aesthetic urban interventions
- will be able to apply urban planning methodologies so as to achieve integrated urban interventions.
- will be able to participate in interdisciplinary environments for the implementation of integrated urban interventions

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?*
After completion of the course students: *- will be able to conduct research and proceed in data analysis using the appropriate technological tools* *- will be able to work independently and in groups* *- will learn how to work in interdisciplinary environments* *- will learn how to value multicultural environments* *- will familiarize with sustainable practices and eco-friendly strategies* *- will be able to elaborate critical thinking*

(3) SYLLABUS

1. Contemporary approaches on urban development, focusing on globalization in metropolitan areas.
2. Governance of metropolitan areas, different stakeholders and their role within the urban context
3. Integrated strategies of sustainable urban development, handling of complex urban issues related to limited urban growth, lack of social and economic cohesion, environmental problems and poor quality of life.
4. Development mechanisms for the reconstruction of selected urban enclaves with emphasis to the revival of their social, economic and ecological structures.
5. Smart cities as a product of place marketing and city branding. Contemporary approaches.
6. Urban regeneration policies and the transformation of the city. International experience and the case of Greece.
7. Land uses and the expansion of the city.
8. Financial instruments. EU policies for supporting integrated urban interventions.
9. Participatory planning.
10. Pertinent Greek legislation on integrated urban interventions.
11. Collaboration among different administrative levels so as to fulfill the achievement of integrated urban interventions.

Laboratory exercises include:

- Assignments that involve literature review
- Assignments involving degraded urban areas
- Plans for integrated urban interventions
- Use of GIS systems for the implementation of integrated urban interventions.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, interactive educational tools Attendance of relevant conferences and workshops Students participation in the content of the lesson

<table>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">Use of digital visual elements and relevant tools
Use of satellite data for urban areas
Use of CAD software and GIS software
Use of an asynchronous educational platform (eclass)</td></tr>
<tr><td rowspan="7">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>lectures</td><td>26</td></tr>
<tr><td>Project/assignments</td><td>26</td></tr>
<tr><td>Completion of the project and presentation</td><td>48</td></tr>
<tr><td>Independent study</td><td>50</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td><i>150</i></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Written final exam (min 50%)
Project (during the whole semester) max 50%</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

○ ***Suggested bibliography:***

- Adams D., De Souza C. (2 007) “Brownfield development: A comparison of North American and British Approaches”, European Urban Research Association Conference ‘The Vital City ’ , University of Glasgow, 12 – 14 September 2007
- Adams D., Watkins C. (2002) “Greenfields, brownfields and housing development”, Oxford, England, Blackwell Science.
- Banai, R., DePriest, T., (2014). “Urban Sprawl: Definitions, Data, Methods of Measurement, and Environmental Consequences”, Journal of Sustainability Education Vol. 7, December 2014 ISSN: 2151-7452.
- Cheshire P. (2007), «Are m ixed community policies evidence based? A review of the research on neighborhood effects», στο H. Maarten, D. Manley, N. Bailey, L. Simpson και D. Maclenn an, Neighborhood Effects, Research: New Perspectives, Springer, new york 2012, σ. 267-294.
- Chien-hung T. (2007) From Desert Community to Prosper City? Regeneration of Urban Brownfields in Taiwan, ,
- Graduate Institute of Rural Planning, Na tional Chung-Hsing University, Taiwan, Taiwan Association for Schools of Public Administrations and Affairs
- Christiansen P., Loftsgarde n T., (2011). “Drivers behind urban sprawl in Europe” TØI Report 1136/2011, ISBN 97 882-480-1211-5 Electronic version.
- Couch C., Leontidou L., Petschel-Held G., (2007). Urban Spraw l in Europe: Landscapes, Land-Use Cha nge & Policy. Blackwell, Oxford, U.K.
- Deas I., Robson B., Bradford M. (2000) “Re-thinking the urban development corporation experiment: th e case of central Manchester, Leeds and Bristol.” Progress in planning, 54, 1-72
- Díaz-Pacheco, J., García-Palomares, J.C. (2014). “Urban Sprawl in the Mediterranean Urban Regions in Europe and the Crisis Effect on the Urban Land Development: Madrid as Study Case” Urban Studies Research, Volume2014, Article ID 807381,

http://dx.doi.org/10.1155/20 14/807381(visited: 5.3.2016).

- EEA, (2006). Urban spraw l in Europe: The ignored challenge, (repo rt). European Environment Agency, Officce for Official Publications of the European Communities, Copenhagen.
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GEO8150 – ECONOMIC GEOGRAPHY

COURSE OUTLINE: GEO8150 – ECONOMIC GEOGRAPHY

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Department of Surveying and Geoinformatics Engineering		
LEVEL OF STUDIES	Undergraduate Studies – Level 7		
COURSE CODE	**GEO8150**	**SEMESTER**	8th
COURSE TITLE	**Economic Geography**		
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	4
Assignments/Semester Assignment		1	1
Total		**4**	**5**
COURSE TYPE	Knowledge deepening & consolidation		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO205/		

(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.

The aim of the course is to provide an overview and understanding of the general principles of Economic Geography as well as (economic) planning and spatial development.

Upon successful completion of the course the student will be able to:

- Define the key concepts of economic geography.
- Understand the interrelations between economic activities and spatial planning.
- Collect, analyse, present and evaluate data on the geography of productive sectors in Greece and Europe.
- Understand the legislative framework of both economic activities and spatial planning.
- In deep analyse the spatial framework of specific economic activities and productive sectors.
- Read and understand policy making papers regarding spatial planning and its implication on economic/productive activities.

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?*
• Gathering, analysis, and synthesis of data and information, using the necessary methods, tools, and techniques regarding economic geography. • Develop semester assignment according to the guidelines. • Read, understand, and analyse scientific research papers regarding economic geography. • Read, understand, and analyse policy papers regarding economic geography.

(3) SYLLABUS

1. Overview of Political Economy, Economic Theories and Economic Geography literature.
2. Economic geography of the population.
3. Economic geography of the productive sectors.
4. Models for the location setting for the primary, secondary and tertiary sector.
5. Interactions between urban and rural areas regarding economic activities.
6. Internationalisation of the economy and its impact on spatial economic activities.
7. Economic activities at different scales.
8. Spatial interactions and transport.
9. IT and its implications in spatial planning and economic geography theories.
10. Applications and case-studies from the Greek context.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">Face-to-face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">Power point, video and multimedia, e-class platform, e-journals, e-legislation.</td></tr>
<tr><td rowspan="5">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>

<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Bibliography review</td><td>40</td></tr>
<tr><td>Semester assignment</td><td>33</td></tr>
<tr><td>Course total</td><td><i>125</i></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Language: Greek
Semester assignment: 100%</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

English:

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Greek:

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GEO8160 – INTERNSHIP

COURSE OUTLINE: GEO8160 - INTERNSHIP

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Department of Surveying and Geoinformatics Engineering		
LEVEL OF STUDIES	Undergraduate Studies – Level 7		
COURSE CODE	**GEO8160**	**SEMESTER**	8th
COURSE TITLE	**Internship**		

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**
Total		**5**

COURSE TYPE	skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	-
COURSE WEBSITE (URL)	

(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.

The internship aims to deal with the range of work of the Surveying Engineer in topographic, geodetic, photogrammetric, cadastral, environmental, and hydraulic studies, studies of transport projects and road construction projects, as well as in Geographic Information Systems, their Remote Sensing and applications.

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?*
• Applying knowledge in practice • Gathering, analysis, and synthesis of data and information, using the necessary methods, tools, and techniques regarding economic geography. • Adapting to new situations. • Decision making • Autonomous work • Team work. • Work in an interdisciplinary environment. • Project design and management. • Diversity and multiculturalism • Natural environment • Demonstration of social, professional and moral responsibility. • Criticism and self-criticism exercise. • Promoting of free, creative and inductive thinking

(3) **SYLLABUS**

The internship is carried out in the productive sector (companies, organizations, technical or design offices, etc.) in order to acquaint and familiarize the students with their future object of employment. The internship is conducted in the winter or summer semester of the 6th and 7th Semester and is addressed to students who have completed the sixth or seventh semester, so that there is the necessary knowledge and therefore the greatest benefit for students. The total duration of the internship is 12 weeks. The company / technical-design office undertakes to employ the students under the supervision of an engineer or another scientist and a faculty member of the Department. The supervisor on behalf of the company certifies with a monthly and a final report the object of employment and the smooth conduct of the internship (trainer evaluation report). The student submits to the faculty member of the department (internship supervisor) a monthly and final technical report related to his / her work, the object of employment and the smooth conduct of the internship (trainee evaluation report). Eligible to participate in the program are those students who study in the 6th or 7th Semester of Studies of the Department and have not participated in the internship program in the past.

The selection criteria are: a) Priority for 6th or 7th Semester students, b) the number of courses in which they have succeeded and c) the aggregate grade. The above criteria are in prioritized as follows: If more than one student has applied for the same position, then the semester is checked, then the number of courses and if there are still draws then the score.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Communication with trainees via e-mail
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Technical report of the student's activities. Written Assignment (Concluding).

GEO8170 – REINFORCED CONCRETE

COURSE OUTLINE GEO8170 - REINFORCED CONCRETE

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO817**	**SEMESTER**	8th
COURSE TITLE	**Reinforced concrete**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	
Exercises/ tutorials	1	
Total	**4**	**5**

COURSE TYPE	*special background*
PREREQUISITE COURSES:	Preferred prerequisite knowledge: Engineering Mechanics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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*

The successful completion of the course allows students to:

- Understand the basic properties of cement and concrete, its performance under loading
- Choose between various types of special concretes
- Design simple structural elements; beams – columns - slabs
- Understand the current design codes
- Be aware of the legal liabilities as a site engineer – Greek code of concrete technology

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 • Criticism and self-criticism • Production of free, creative and inductive thinking

(3) SYLLABUS

The main components of the syllabus are as follows:

- Strength of materials – revision on engineering mechanics
- Concrete and its constituents – stress strain curves
- Steel and its mechanical characteristics
- Reinforced concrete and limit state design – Eurocodes 1 and 2
- Special concretes (fibre reinforced, self-compacting, ultra-high performance, etc)
- Reinforced concrete beam design under Eurocode 2
- Reinforced concrete column design under Eurocode 2
- Reinforced concrete slab design under Eurocode 2
- Detailing shear walls and foundations
- Legal liabilities as a site engineer – Greek code of concrete technology

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Videos • Email • Office software (word, presentations, spreadsheets editors)

TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	52 (13 X 4)
	Study and analysis of bibliography	52 (13 X 4)
	Laboratory practice	-
	Lab exercises	-
	Educational visits	-

	Course total	***104***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written test mid- semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) accounting for 20% - 30% Written test end of semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) accounting for 80 – 70%%	

(5) ATTACHED BIBLIOGRAPHY

- Bill Mosley, John Bungey, Ray Hulse. 2012, Reinforced concrete design to Eurocode 2, 7th Edition – Bloomsbury Publishing – ISBN: 9780230302853
- Mehta P. Kumar, Monteiro Paulo J. M.2014, Concrete: Microstructure, Properties, and Materials 4th Edition, McGraw-Hill - ISBN-13: 978-0071797870
- Lecture notes

GEO8180 – DEEPENING IN GEOGRAPHIC INFORMATION SYSTEMS

COURSE SYLLABUS: GEO8180 – DEEPENING IN GEOGRAPHIC INFORMATION SYSTEMS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	MSc.		
COURSE CODE	**GEO8180**	**SEMESTER**	**8th**
COURSE TITLE	**Deepening in 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	3	4
Lab exercises	1	1
TOTALS	**4**	**5**

COURSE TYPE	Specialization
PREREQUISITE COURSES:	Spatial Decision Support Systems
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO204/

(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.

The aim of the course is to present the necessary methodologies of geospatial analysis and its applications in continuous and discontinuous spatial data models, using modern tools, methods, and techniques in an ever-changing competitive environment.

The aim of the course is to understand the theoretical framework of the methodologies of geospatial analysis and their application under the environment of Geographic Information Systems so that students are able to properly manage and structure geospatial data and to explore and interpret the results of their analyzes.

Because by its nature the science of Geographical Information is an interdisciplinary subject, which in addition to the high standards of its theoretical existence has a large section for the application of its methods, the course material is structured in two distinct but interconnected sections (theoretical and applied). It aims to deepen the specialized knowledge concerning methodological and operational issues of analysis of geospatial information in the appropriate way, which leads to its emergence, as the main factor that influences decision-making with parameters that depend on natural and man-made. The specialized knowledge and skills acquired by the students attending the course do not lead to a sterile and strictly theoretical training, but through a known and passable for the average of the students in the 7th level of complexity of the subjects that are addressed, they are faced with issues that will be called upon to face in the labor market. In addition, they receive all those cognitive supplies and skills, which in combination with the more

specific cognitive subjects of Geographical Information Science contained in their curriculum, acquire the opportunity to claim their place at the next level of their studies.
According to the design of the content of the specific subject, students cognitively approach the following:

a) Spatial relationships between continuous and discontinuous spatial entities, Spatial distribution models and the identification of spatial patterns with specific characteristics and properties
b) The results of the application of surface analysis methods
d) The methods and results of the applications of the interpolations
e) Location and network models
h) The processes of designing spatial planning and planning solutions from the perspective of decision support systems using GIS.
f) The critical evaluation of spatial analysis methods.

Therefore, the objectives of this subject matter extend to a description of those who have successfully attended this subject, which has the following characteristics:

a) The assimilation of theoretical and objective knowledge regarding the analytical and synthetic treatment of geospatial information that leads to representative and specialized geographical issues, through the knowledge of methodologies and models of spatial analysis, spatial statistics, geostatistics, models location and network theory, using modern commercial and free/open-source software and its diffusion on the internet.
b) The development of mental and practical skills in solving problems of analysis and transformation of geographical space.
c) The development of skills through the synthetic creation and support of arguments during the spatial transformation, reinforcing in terms of responsibility and autonomy for the acquisition of sufficient capacity for further professional and personal development.
d) The development of possibilities of a professional approach to the object through the use of the knowledge and understanding acquired during the design and implementation of applications that complete a spatial decision-making system.

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, analysis, and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Autonomous work
- Teamwork
- Exercise criticism and self-criticism
- Promoting free, creative, and inductive thinking

(3) SYLLABUS

Theoretical Part of the Course

1. The conceptual framework of spatial analysis using GIS
   - Terminology
   - Basic principles and methods
   - The concept of entity in spatial analysis, characteristics and properties
2. Spatial Analysis Methodology in Discontinuous and Continuous Spatial Data Models
   - Geospatial data structure
   - Spatial Relations
   - Geographic Data Interactions

- Computational methods and models in geospatial analysis
- Spatial Statistics (distance, density, regression and autocorrelation)

3. Creation of statistical surfaces through spatial interpolation
    - Statistical surfaces and surface models
    - Causal methods of interpolation
    - Geostatistical interpolation methods
    - Examples of understanding
4. Analysis of statistical surfaces
    - Detailed procedures on surfaces (slopes, orientation, shading maps, isosceles curves, sections and cross sections)
    - Visibility analysis
    - View shed Analysis
    - Volumetric calculations
5. Basic principles of location - allocation models
    - Introduction to network and location analysis
    - Basic problems in network analysis
    - Network Construction, Optimal Routes and Optimal Tours
    - Identification of accessibility problems
    - The location - allocation model
6. Support for spatial decisions in GIS:
    - Elements of multi-criteria analysis
    - Problems in multicriteria analysis
    - Distinguish between multiple goals - multiple properties
    - Decision making procedure and rules
    - Evaluation criterias
    - Sensitivity analysis
    - Multicriteria analysis functions in GIS environment

Applied Part of the Course

- Applications of Spatial Analysis functions using modern commercial and free / open source GSP software.
- Creating models in a GSP environment with specialized applications in interdisciplinary spatial problems
- Interoperability

(4) **TEACHING and LEARNING METHODS - EVALUATION**

DELIVERY	Face-to-Face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Use of email • Use of specialized software (both commercial and open source) for the manipulation, editing and mapping of the geospatial data • Use of Office software (word, presentations, spreadsheets)
TEACHING METHODS *The manner and methods of teaching are described in detail.*	

Activity	*Semester workload*
Lectures	39

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	Study and analysis of bibliography	30
	Study elaboration	35
	Lab exercise	13
	Seminar (*)	8
	(*) Specialized lecture on issues that fall within the subject matter, by scientists in the field	
	Course total (30 hours of workload per credit unit)	**120**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students..*	Language of Evaluation: Greek Evaluation Methods: • Written exam at the end of the semester (Multiple choice, short development and problem-solving exercises) • Homework evaluation (development of theoretical topic and commentary of scientific articles) • Evaluation of laboratory work (gradual development of project for management and analysis in a GIS environment) • Oral presentation of work (Ms Office presentation of the theoretical topic)	

(5) ATTACHED BIBLIOGRAPHY

Books

1. Halkias Ch., 2015. Geographical Analysis Using Geoinformatics. (Greek language) https://repository.kallipos.gr/handle/11419/4546
2. Kavouras, M. et al, 2016. Geographic Information Science - Integrated Approach and Special Topics (Greek language). https://repository.kallipos.gr/handle/11419/6381
3. Pappas, V, 2011. GIS in Spatial Planning: Scientific Edition of the University of Patra (Greek language)
4. Koutsopoulos K., 2002. GIS and Spatial Analysis, Publication in Greek language, by Papasotiriou Editions.
5. Alibrandi, M, Fitzpatrick, 2003, GIS in the classroom: Using Geographic Information Systems in social studies and environmental science, Portsmouth, NH: Heinemann
6. DeMers, M, 2002, GIS modeling in raster, New York: Wiley.
7. Hunsaker, C, 2001, Spatial uncertainty in ecology: implications for remote sensing and GIS applications, New York: Springer.
8. Lawson, A, Denison, D, 2002, Spatial cluster modeling, Boca Raton, FL : Chapman & Hall/CRC
9. Malczewski, J, 1999, GIS and multicriteria decision analysis New York: Wiley.
10. Stillwell, J, Clarke, G, 2004, Applied GIS and spatial analysis, Wiley

Web pages

11. http://www.csiss.org/ (Center for Spatially Integrated Social Science)
12. http://teachspatial.org/ (Resources for Spatial Teaching & Learning)
13. http://gispopsci.org/software/ (Advanced Spatial Analysis program)
14. http://www.spatialanalysisonline.com/ (Geospatial Analysis - A comprehensive guide)

15. http://www.gitta.info/website/en/html/index.html (Geographic Information Technology Training Alliance)

Scientific Journals

16. International Journal of Geographical Information Science, Taylor & Francis
17. Journal of Spatial Science, Taylor & Francis
18. Geoinformatica, Springer
19. Journal of Geographical Systems, Springer
20. GISciences & Remote Sensing, Bellwether Publishing, Ltd.
21. Journal of Geographic Information System, Scientific Research
22. ISPRS-International Journal of Geo-Information (IJGI is an open access journal of MDPI)

GEO8190 – ENVIROMENTAL IMPACTS

COURSE OUTLINE: GEO8190 – ENVIROMENTAL IMPACTS

(1) GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	Department of Surveying and Geoinformatics Engineering		
LEVEL OF STUDIES	Undergraduate Studies – Level 7		
COURSE CODE	**GEO8190**	**SEMESTER**	8th
COURSE TITLE	**Environmental Impacts**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	4
Assignments/Semester Assignment	1	1
Total	**4**	**5**

COURSE TYPE	Knowledge deepening & consolidation
PREREQUISITE COURSES:	-
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO246/

(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.

The aim of the course is to provide an overview and understanding of the environmental legislation as well as skills and competencies for the preparation of Environmental Impact Assessment Reports.

Upon successful completion of the course the student will be able to:

- Understand the institutional framework of Environmental Licencing.
- Understand the legislative framework of Environmental Licencing.
- Define the key issues considered for Environmental Impact Assessment.
- Use different techniques and methods for defining Environmental Impacts.
- Assess the environmental impacts of technical and construction projects at different scales.
- Focus on the European legislative framework for environmental licencing.
- Focus on the Greek legislative framework for environmental licencing.
- Participate in interdisciplinary teams for Environmental Impact Assessment Reports.

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?*
• Gathering, analysis, and synthesis of data and information, using the necessary methods, tools, and techniques regarding environmental impacts. • Develop semester assignment according to the guidelines. • Read, understand, and analyse scientific research papers regarding environmental impacts. • Read, understand, and analyse policy papers regarding environmental impacts.

(3) SYLLABUS

1. Environmental History.
2. The institutional framework of environmental licensing globally.
3. The European environmental legislation framework.
4. The Greek environmental legislation framework.
5. Differences between Environmental Impact Assessment Reports and Strategic Environmental Impact Assessment Reports.
6. Techniques, methods, and tools for minimising environmental impacts.
7. Assessing environmental impacts.
8. Categorising projects and activities regarding their environmental impacts.
9. Typical chapters of an Environmental Impact Assessment Report.
10. Developing an Environmental Impact Assessment Report.
11. Analysing an Environmental Impact Assessment Report.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Power point, video and multimedia, e-class platform, e-journals, e-legislation.	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	52
	Bibliography review	40
	Semester assignment	33
	Course total	***125***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language: Greek Semester assignment: 100%	

(5) ATTACHED BIBLIOGRAPHY

English:

- *Calvario, R., Kaika, M., & Velegrakis, G., (2022) (eds.). The Political Ecology of Austerity: environment, social movements, and economic crisis. Routledge – Explorations in Environmental Studies. DOI: 10.4324/9781003036265.*
- *Glasson J., Therivel R. and Chadwick A. 2019. Introduction to Environmental Impact Assessment, 5th Edition, Routledge.*
- *Jones, O. (2009). After Nature: Entangled Worlds. Στο Castree, N., Demeritt, D., Liverman, D., & Rhoads, B. (επιμ.) A Companion to Environmental Geography, σ. 294 - 312. Oxford: Wiley - Bleckwell.*
- *Noble B. 2016. Introduction to Environmental Impact Assessment: A Guide to Principles and Practice, 3rd Edition, Oxford Univ Pr.*
- *Robbins, P. (2015). The trickster science. Στο Perreault, T., Bridge, G., & McCarthy, J. (επιμ.) The Routledge Handbook of Political Ecology, σ. 89 - 101. London and New York: Routledge.*
- *Watts, M. (2015). Now and Then - The origins of political ecology and the rebirth of adaptation as a form of thought. Στο Perreault, T., Bridge, G., & McCarthy, J. (επιμ.) The Routledge Handbook of Political Ecology, σ. 19 - 50. London and New York: Routledge.*

Greek:

- *Βαβίζος Γ., Βερροιόπουλος Γ., Bendali F. 2008. Εγχειρίδιο Μελέτης του Φυσικού Περιβάλλοντος, Παπασωτηρίου, Αθήνα.*
- *Βατάλης Κ. 2010. Αειφορική Διαχείριση - Περιβαλλοντικές Επιπτώσεις Έργων, ΑΛΕΞΑΝΔΡΟΣ Σ. Ι.Κ.Ε.*
- *Μπάλιας Γ. 2018. Η εκτίμηση περιβαλλοντικών επιπτώσεων στην Ευρωπαϊκή Ένωση Εκδόσεις Παπαζήση.*

GEO8200 – COMPUTER GRAPHICS

COURSE OUTLINE: GEO8200 - COMPUTER GRAPHICS

(1) GENERAL INFORMATION

SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Surveying and Geoinformatics Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO8200**	**SEMESTER**	8th
COURSE TITLE	**COMPUTER GRAPHICS**		
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		4(3/1)	5
Total		**4**	**5**
COURSE TYPE	Knowledge consolidation		
PREREQUISITE COURSES:	Linear Algebra and Matrices, Analytical Geometry, Computer Science and Programming, Programming techniques and Algorithms		
LANGUAGE OF INSTRUCTION AND EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO258/		

(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.*
The goal of the course is to introduce topography engineering students to the field of computer graphics, and acquaint them to elementary notions and techniques. Furthermore, to introduce students to the understanding of the relation of computer graphics to theoretical subjects introduced in earlier semesters (e.g. analytical geometry, linear algebra) as well as provide an overview of applications and the use of graphics technology in modern topography.
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 • Working independently • Production of free, creative and inductive thinking

(3) SYLLABUS

Introduction: Introduction to graphics, historical overview, applications, elementary notions.

Drawing algorithms: Introduction, mathematical curves and finite differences, line drawing algorithms. Checking for internal points, polygon drawing. Antialiasing in space: Antialiasing with pre-filtering, antialiasing with post-filtering, clipping algorithms in 2D: point clipping, line clipping (Cohen-Sutherland, Skala, Liang-Barksy), polygon clipping (Sutherland-Hodgman, Greiner-Horman algorithms).

Coordinates systems and transformations in 2D and 3D: Introduction to transformations, affine transformations, transformation compositions, 2D and 3D homogeneous affine transformations. Representation of rotations with quaternions.

Projections: Perpsective projection, parallel projection, observation transformation.

Removing hidden surfaces: Z-buffer algorithm.

Colour in graphics and optimization: Gray-scale and colour images.

Parametric curves and surfaces: Bezier curver, deCasteljau algorithm, Bernstein polyonyms.

Lighting / shading algorithms. Phong model, Gouraud model.

A number of the presented techniques are to be implemented during the course using the Python programming language, such as line drawing techniques, point transformations, drawing of parametric curves.

(4) TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Web search (literature review and data sources) Utilization of E-class UNIWA platform (file exchange among professors and students) Email Specialized software and libraries (both commercial and open source) for the manipulation and editing of numerical and geospatial data Source code editors Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail. 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.*	see table below

Activity	*Semester workload*
Lectures	39
Laboratory practice	13
Exercise preparation	40
Study of theory	58
Course Total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure*	Language of evaluation: Greek Methods of evaluation:

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	• Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) • Homework (practical exercises on both theoretical and practical objectives related to the course)

(5) RECOMMENDED LITERATURE

1. Theocharis T., Papapioannou G., Platis N., Patrikalakis N., “Graphics and Visualization: Principles and algorithms”, 2019.

In Greek:

2. Bardis G., “Γραφικά Υπολογιστών & Προγραμματισμός WebGL”, 2020.

9th Semester

GEO9010 – TECHNICAL LEGISLATION & ADMINISTRATION

COURSE OUTLINE: GEO9010 - TECHNICAL LEGISLATION & ADMINISTRATION

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO9010**	**SEMESTER**	9th
COURSE TITLE	**TECHNICAL LEGISLATION & ADMINISTRATION ELEMENTS**		

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 TEACHIN GHOURS**	**CREDITS**
	3	5
TOTAL	**3**	**5**

COURSE TYPE	General background [obligatory]
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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*

The course aims to introduce students in technical legislation and administration basic regulation.

After successful course completion, students are expected to have knowledge on:

a) Know and understand fundamental legal terms
b) Structure and principles of Greek Constitution and Greek Legal Framework, especially in technical issues and aspects
c) Basic corporate schemes and legislation on properties
d) Legislation on topographical surveys, cadaster, spatial/ urban planning, environment, public works and public procurements
e) The structure of Courts in Greece and the EU
f) Public Bodies in Greece, local, regional governmental and the EU, especially in respect to geoinformatics/ survey aspects

g) To review and comprehend existing legislation on relevant technical issues/ aspects

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
- Adaption to new work conditions
- Decision-making
- Independent work
- Team work
- Self-evaluation
- Free, creative and inductive thinking

(3) SYLLABUS

Theory

- Fundamental legal principles.
- Greek Constitution (technical aspects). Greek legal framework and Civil Code on aspects of technical interest (topography geoinformatics).
- Relevant legislation on topographic/ geoinformatics surveys.
- Legislation on spatial – Urban Planning and the role of the Council of State.
- Legislation on Cadastre and environmental protection.
- Structure of Courts in Greece and the EU
- The regulatory impact of official legal/ administrative documents
- Structure of Greek Central, Regional and Local Administration
- Administrative Bodies, in Greece and the EU. Other Scientific Bodies (EU Council, FIG, Technical Chamber of Greece etc.)
- The use of IT on scientific search for legal documents and administrative acts/ decisions.

Course exercises

Practical exercises on:

- Review of Council of State Decision
- Review of legal technical provisions on environmental protectio

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">Face-to-Face</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">• Web search (legislation and literature review)
• E-class UNIWA platform and office Microsoft 365 UNIWA tools (TEAMS, Class Notebook, Shared docs, email)
• GIS and CAD software
• Office software (word, presentations, spreadsheets editors)</td></tr>
<tr><td rowspan="2">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures (Theory – exercises)</td><td>39 (13*3)</td></tr>
</table>

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	Home Study	81
	Course total	***120***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Evaluation Language: Greek (English) Evaluation methods: • Written exam (winter or September exams period) • Team projects personal projects, class exercises.	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Καράκωστας Ιωάννης. ‘Περιβάλλον και Δίκαιο. Δίκαιο διαχείρισης και προστασίας των περιβαλλοντικών αγαθών’, 3η εκδ. Νομική Βιβλιοθήκη, 2011.
Μέλισσας, Δημήτρης Κ.. ‘Νέος Οικοδομικός Κανονισμός (Ν. 4067/2012) - Ερμηνεία Κατ' άρθρο’. Εκδόσεις Σάκκουλα, 2012.
Παντελίδου, Καλλιρόη. ‘Γενικές αρχές αστικού δικαίου’. Εκδόσεις Σάκκουλα, 2016.
Τζίκα-Χατζοπούλου Αλίκη. ‘Στοιχεία Δικαίου, Εθνικό και Ευρωπαϊκό Δίκαιο’. ΕΜΠ, 2004
Τζίκα-Χατζοπούλου Αλίκη. ‘Δημόσια Έργα’. Παπασωτηρίου 2006.
Χριστοφιλόπουλος, Δημήτρης Γ. ‘Τροποποίηση ρυμοτομικών σχεδίων. Τόμος 1ος, Εκπόνηση - έγκριση - εφαρμογή πολεοδομικών σχεδίων- Ν.Δ.17-7-1923 περί σχεδίων πόλεων, όπως ισχύει με τους Ν.3044/2002 και 3852/2010’. Εκδόσεις Σάκκουλας Π. Ν., 2011.
Legislation.

Related web pages/ portals:

https://europa.eu/european-union/law_el
http://www.et.gr/
https://www.hellenicparliament.gr/en/
http://www.adjustice.gr
https://europa.eu/european-union/index_el
https://europa.eu/european-union/about-eu/institutions-bodies_el
https://eur-lex.europa.eu/homepage.html

GEO9020 – MOBILE MAPPING – UNMANNED AERIAL VECHICLE (UAV)

COURSE OUTLINE: GEO9020 MOBILE MAPPING – UNMANNED AERIAL VECHICLE (UAV)

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 7		
COURSE CODE	**GEO9020**	**SEMESTER**	9th
COURSE TITLE	**Mobile Mapping - Unmanned Aerial Vehicle (UAV)**		
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 Labs		4(2/2)	5
TOTAL		**4**	**5**
COURSE TYPE	Skills development		
PREREQUISITE COURSES	No prerequisite courses. Suggested completion of courses *Special Topics in Photogrammetry & Computer Vision*, *Digital Systems & Sensors*, *Theory of Errors & Adjustment of Observations II*, *Programming Techniques & Algorithms*		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
OFFERED TO *ERASMUS* STUDENTS	Can be taught in English		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75		

(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*

Basic purpose of this course is the familiarization of students with state-of-the-art methods for collecting 3D geospatial data of high resolution and in large scales (close-range), with the emphasis mainly on applications using moving recording platforms (mobile mapping) as well sensors on UAVs. The student will have the opportunity to plan such missions, follow the data collection steps and primarily to better understand the photogrammetric processes for producing 3D models from such imagery.

Successful completion of this course means that students
• Have understood and are able to describe, analyze and compare the particular types of UAVs used in precision mapping (pros – cons) as well as their systems of recording, mapping

and navigation.
• Are able to describe, analyze and compare the different Mobile Mapping Systems (MMS) and the operation principles of their mapping sensors.
• Are in position to design UAV recording flights and MMS mapping projects and ecaluate the quality of data provided be the sensors.
• Ara able to calibrate the optical sensors of these systems either by using calibration fields or during the recording phase.
• Can implement all individual steps of a photogrammetric mapping process using UAV platforms or MMSs (data collection, their processing and analysis, production of final 3D products and of metric textured projections, interpretation and evaluation of results).
• Are capable of applying Structure-from-Motion solutions in combination with synchronous GPS/INS observations or ground control point (GCP) measurements.
• Have understood and are capable of describing, analyze and compare the methods of SLAM, visual SLAM and visual odometry, and further they can apply them on video sequences from UAV platforms and MMS using open-source software.

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
- Working independently
- Teamwork
- Production of free, creative and inductive thinking
- Working in an interdisciplinary environment

(3) SYLLABUS

Analysis of stat-of-the-art technologies in mobile mapping systems and UAV. Categorization according to system type, operation principle, automated navigation (GNSS navigation, inertial systems INS-IMU, optical data obstacle avoidance), sensor types and data collected. Basic principles of planning for data recording with UAVs (fixed-wing and drone) and mobile mapping systems. Sensor calibration. Techniques of optical navigation (SLAM, visual odometry).
Photogrammetric data processing – automatic image orientation using extracted interest points and combined GPS-INS observations, introduction of ground control points and accuracy assessment, image-based generation of 3D models via dense matching techniques. Application for generation of 3D city and/or building models.
Combination/comparison with data from laser scanning and terrestrial images.
Triangulation from mobile mapping systems – accuracy of results. αποτελεσμάτων.
Automatic digitization of road signs.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face
USE OF INFOMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Support by the electronic asynchronous course platform *eclass* - Use of electronic material as teaching aid (ppt slides)

<table>
<tr><td></td><td colspan="2">- Use of software for 3D data processing</td></tr>
<tr><td rowspan="6">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>26</td></tr>
<tr><td>Laboratory / Exercises</td><td>26</td></tr>
<tr><td>Project</td><td>38</td></tr>
<tr><td>Non-directed study</td><td>60</td></tr>
<tr><td>Course total</td><td>150</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Language of evaluation: Greek

Methods of Evaluation:
• Evaluation of performance in the Lab exercises.
• Oral presentation of project.</td></tr>
</table>

(5) SUGGESTED BIBLIOGRAPHY

1. Course Notes and Slides (in Greek)
2. Szeliski R., 2010. Computer Vision: Algorithms and Application. Springer (http://szeliski.org/Book/)
3. Hartley R., Zisserman A., 2000. Multiple View Geometry in Computer Vision. Cambridge Univ. Press
4. Förstner W., Wrobel B. P., 2016. Photogrammetric Computer Vision. Springer

GEO9030 – APPLIED SATELLITE POSITIONING

COURSE OUTLINE: GEO9030 - APPLIED SATELLITE POSITIONING

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO9030**	**SEMESTER**	9th
COURSE TITLE	**APPLIED SATELLITE POSITIONING**		

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 TEACHIN GHOURS**	**CREDITS**
LECTURES	3	4
LABORATORY EXCRCISES	1	1
TOTAL	**4**	**5**

COURSE TYPE	*skills development*
PREREQUISITE COURSES:	No prerequisite courses. It is recommended that the students have obtained the fundamental knowledge of the course "Satellite Surveying".
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO200/

(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.

The aim of this course is to extend the fundamental knowledge on GNSS offered in the 5th semester by the course "Satellite Surveying" so that the student learn about more advanced methods that are used in geosciences, like multi GNSS, kinematic positioning for supporting geo-data collection on land-sea-air, GNSS networks etc. The course focuses on advanced positioning techniques, precise orbits, new satellite signals. Further, the course extends the offered knowledge from GPS to GLONASS, GALILEO and BEIDOU. Emphasis is given on processing algorithms.

Upon successful completion of the course students will be able to:

- have a more complete picture of the uses of satellite positioning for surveying and geodesy
- use all available GNSS: GPS, GLONASS, GALILEO, and BEIDOU
- understand the characteristics of the different orbits used in GNSS (MEO, GEO, IGSO)
- better understand the techniques for ambiguity resolution like linear combinations

(wide lane, narrow lane, geometry free) and the acceptance criteria
- transform between all coordinate reference frames involved in satellite surveying: WGS84, PZ90, GTRF, CGCS2000
- transform between global and local reference frames: WGS84, ITRS, ETRS89, HTRS07 and GGRS87
- apply more advanced techniques like kinematic, semi-kimematic and PPK etc.

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*
- *Working independently*
- *Decision-making*
- *Team work*
- *Production of new research ideas*
- *Criticism and self-criticism*
- *Project planning and management*

(3) SYLLABUS

Theoretical part:
- Applications of static, rapid-static, kinematic, Stop&Go, RTK and PPK
- very long baselines
- post-processing of semi-kinematic measurements,
- post-processing of kinematic measurements,
- real-time surveys, stake-out.
- linear combinations: wide lane, narrow lane, geometry free
- Orbits used in GNSS: MEO, GEO, IGSO
- Satellite ephemerides: broadcast vs. precise
- Ambiguity resolution techniques
- Precise satellite orbits.
- Establishment/densification of GNSS networks for geodetic applications: design, measurements and data processing.
- Differences between GPS and other GNSS (GLONASS, GALILEO, BEI-DOU): reference frames, time systems.
- Modern GNSS signals (L2C, L5, L1C, E5Alt-BOC).
- Multi-GNSS.
- Advanced topics in RTK Networks: single-base and network-based techniques for real-time and post-processing applications.
- Coordinate transformations between satellite-based reference frames (WGS84, ITRS, ETRS89, HTRS07) and the Greek Geodetic Reference Frame GGRS87.

Practical exercises:
- conduction and processing of measurements with single- and dual-frequency

receivers. • Measurements using base-rover as well as using networks of permanent reference stations. • RTK stake-out

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	*Face-to-face*
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	*Use of ICT in teaching (PowerPoint presentations, videos)* *• Use of an asynchronous e-learning platform (e-class).* *• Use of e-mail* *• Use of the GNSS software in laboratory.*
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see below

Activity	***Semester workload***
Lectures	52
study and analysis of bibliography	41
laboratory practice	26
Laboratory preparation and essay writing	31
Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Assessment language: Greek (English for ERASMUS students upon request) Performance evaluation method: • Final Written Exam (80% of the final grade) of graded difficulty, which include short-answer questions, open-ended questions and solving simple problems. • Evaluation of laboratory work (20% of the final grade) which includes exercises (processing of GNSS data). The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography (in Greek):

1. Φωτίου Α., Πικριδάς Χ., 2012. GPS και Γεωδαιτικές Εφαρμογές. Εκδόσεις Ζήτη, Θεσσαλονίκη.
2. Τσούλης Δ. , 2012, Δορυφορική Γεωδαισία. Εκδόσεις Ζήτη, Θεσσαλονίκη.
3. Τσούλης Δ. , 2016, Συστήματα Αναφοράς και Χρόνου. Εκδόσεις Ζήτη, Θεσσαλονίκη.
4. Δερμάνης Α., 1999. Διαστημική Γεωδαισία και Γεωδυναμική – GPS. Εκδόσεις Ζήτη, Θεσσαλονί-κη

- Suggested bibliography (in English):

1. Hofmann-Wellenhof B., Lichtenegger H., Wasle E., 2008. GNSS: Global Navigation Satellite Systems – GPS, GLONASS, Galileo, and More. Springer-Verlag, Wien/New York.
2. Xu G., 2007, GPS Theory, Algorithms and Applications, Springer-Verlag.
3. Leick A., 2015. GPS Satellite Surveying. 4th edition, John Wiley & Sons, New Jersey.

GEO9040 – INTRODUCTION TO MACHINE LEARNING

COURSE OUTLINE: GEO9040 – INTRODUCTION TO MACHINE LEARNING

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 7		
COURSE CODE	**GEO9040**	**SEMESTER**	9th
COURSE TITLE	**GEO904 Introduction to Machine Learning**		

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 Labs	4(2/2)	5
TOTAL	**4**	**5**

COURSE TYPE	Skills development
PREREQUISITE COURSES	No prerequisite courses. Suggested completion of courses *Special Topics in Photogrammetry & Computer Vision*, *Digital Systems & Sensors*, *Theory of Errors & Adjustment of Observations II*, *Programming Techniques & Algorithms*, *Geographic information Management in the Web*, *Artificial Intelligence*.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
OFFERED TO *ERASMUS* STUDENTS	Can be taught in English
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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*

Basic purpose of this course is the familiarization of students with the topic of machine learning, namely with the processes involving a computer learning concepts without the need for direct programming/coding. It is a popular field of artificial intelligence (AI), which already finds a considerable range of applications (e.g. computer vision, speech identification/understanding, effective web search, medicine, autonomous driving).

Successful completion of this course means that students

- Have understood and can describe, analyze and compare the different categories of machine learning methods (supervised, unsupervised and reinforcement).
- Are able to apply and program optimization algorithms in application examples such as price prediction as well as classification of data in classes (linear and logistic regression).
- Have understood and are in position to select suitable forms of hypothesis functions (linear, non-linear) cost functions in regression algorithms (linear and logistic), and at the same time to apply tools for avoiding overparametarization.
- Understand and can apply algorithms of binary classification or of classification in more classes.
- Are able to check and evaluate the contribution of different input variables but also to split the training data into different groups for training and validation of machine learning algorithms. They are also able to compute evaluation measures for different learning algorithms (precision, recall, f1).
- Have comprehended the operation principle of artificial neural networks and are able to train simple architectures in classification examples.
- Have understood and are in position to program clustering algorithms and apply them to image segmentation tasks.
- Have understood and are in position to apply methods and techniques for anomaly detection.
- Are able to reduce the number of variables of a machine learning algorithm by detecting via Principal Component Analysis which of these are uncorrelated.

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
- Working independently
- Working in an interdisciplinary environment
- Production of free, creative and inductive thinking

(3) SYLLABUS

- Introduction, historic review
- Optimization methods (linear and logistic regression)
- static/dynamic regression
- regression with one and more variables
- Supervised, unsupervised and reinforcement learning
- Normalization
- Artificial neural networks (models and architectures, forward-backward propagation)
- Support Vector Machines (linear and non-linear classification)
- Clustering (k-means, DBSCAN, Gaussian)
- Dimensionality reduction (Principal Components Analysis)
- Application examples and development of machine learning algorithms.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face

USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Support by the electronic asynchronous course platform *eclass* - Use of electronic material as teaching aid (ppt slides)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	*Semester workload*
Lectures	26
Laboratory / Exercises	26
Project	48
Non-directed study	50
Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of Evaluation: • Written examination in the end of the semester (70%), which combines open-ended questions and numeric calculations. • Evaluation of performance in the exercises (30%)

(5) SUGGESTED BIBLIOGRAPHY

1. Bishop C., 2006. Pattern Recognition and Machine Learning. Springer-Verlag New York
2. Goodfellow I., Bengio Y., Courville A., Deep Learning. MIT Press

In Greek:

3. Simon H., 2010. Neural Networks and Machine Learning. Papasotiriou Editions, Athens.
4. Diamantaras K., 2007. Artificial Neural Networks. Kleidaithmos Editions, Athens.

GEO9050 – PROGRAMMING IN GEOINFORMATICS

COURSE OUTLINE: GEO9050 - PROGRAMMING IN GEOINFORMATICS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate - Level 7		
COURSE CODE	**GEO9050**	**SEMESTER**	9th
COURSE TITLE	**PROGRAMMING IN GEOINFORMATICS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	
Lab exercises	1	
Total	4	5

COURSE TYPE	Specialization
PREREQUISITE COURSES:	Informatics & Programming, Geographic Information Systems & Science
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

The course aims to present the appropriate knowledge connected to basic programming techniques applied for the development of geospatial software applications, utilizing the modern programming language of Python as well as existing geospatial data management tools. Additionally, the course presents modern approaches applied in order to manage and model both geospatial information and geospatial processing algorithms.

The course provides the theoretical knowledge required to develop software applications, either as standalone applications or in combination with existing GIS tools. Specifically, the course includes theoretical lectures and practical exercises aiming at a comprehensive understanding of modern approaches for the development of software applications in the field of Geoinformatics as well as the automation of geoprocessing algorithms, utilizing modern environments and Geographic Information Systems tools.

Based on the sections designed for the support of the course, students are getting familiar with basic elements connected to related to:

a. Object-oriented programming in Python

b. the development of applications and toolboxes for the management and processing of geospatial data

c. the structure and function of basic geospatial data formats

d. the modeling of geoprocessing algorithms in Geographic Information Systems

e. best practices towards the development of software tools to support applications in geospatial technology

After the successful completion of the course, students acquire a set of knowledge and skills that allow them to develop software applications to support geospatial analysis problems utilizing modern Geoinformatics tools, such as e.g. Geographic Information Systems as well as modern programming techniques. At the same time, students acquire essential skills for solving simple and complex geospatial technology problems.

Additionally, the approaches taught in the course and their practical implementation (through practical exercises) are far too important towards the preparation of dissertations in a set of different subjects which are part of the modern field of Geoinformatics (Geographic Information Systems, Photogrammetry, Remote Sensing, Cartography, Geographical Analysis, & Geodesy). Lastly, the acquired knowledge is essential for their successful integration in the industry.

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
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

Theoretical part of the Course

1. Introduction to Python programming:

- Programming environment
- Interpreters
- Variables assignment
- Basic commands
- Logical operators
- If and for loops

2. Programming in Python:

- Basic principles of object-oriented programming
- Basic data types (structures) and variables (strings, lists, arrays, tuples, & dictionaries)
- Functions
- Toolboxes utilization and development
- Geospatial data management and processing libraries

3. File formats for geospatial data:

- Classification of basic data structures for geospatial data modeling
- Vector data formats
- Raster data formats
- Basic compression algorithms for raster data
- Applications programming to support different file formats in both local and web environment

4. Geoprocessing (modeling) in Geographic Information Systems:

- Review of basic geoprocessing algorithms
- Modeling geoprocessing algorithms in Geographic Information Systems
- Introduction of available commercial software tools and free software/open source software for the development of geoprocessing models
- Models’ parametrization

5. Programming applications in Geoinformatics:

- General principles of software application design in local and web environment
- Requirements and design of software tools in Geoinformatics
- Examples and best practices of software applications for geospatial technology problems in local and web environment

Lab Part of the Course

- Modeling geoprocessing algorithms in Geographic Information Systems utilizing vector and raster geospatial data
- Development of geospatial data processing libraries in Python language
- Literature review exercises (in both the theoretical and practical aspects of the course)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Email • Specialized software and libraries (both commercial and open source) for the management and visualization geospatial data in desktop and web environment • Source code editors • Office software (word, presentations, spreadsheets editors)

TEACHING METHODS
The manner and methods of teaching are described in detail.
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

Activity	***Semester workload***
Lectures	39
Study and analysis of bibliography	39
Laboratory practice	35
Lab exercises	30
Educational visits	7
Course total	***150***

STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.

Language of evaluation: Greek

Methods of evaluation:
- Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions)
- Homework (practical exercises on both theoretical and practical objectives related to the course)

(5) ATTACHED BIBLIOGRAPHY

1. Bunting P., Clewley D. (2015). Python Scripting for Spatial Data Processing. Teaching Notes, Aberystwyth University.
2. Manis, G., 2015. Introduction to programming using Python (In Greek). [ebook] Athens:Hellenic Academic Libraries Link. Available Online at: http://hdl.handle.net/11419/2745
3. Magoutis, K., Nikolaou, C., 2015. Introduction to object-oriented programming using Python (In Greek). [ebook] Athens:Hellenic Academic Libraries Link. Available Online at: http://hdl.handle.net/11419/1708
4. Toms, S. (2015). ArcPy and ArcGIS–Geospatial Analysis with Python. Packt Publishing Ltd.

GEO9060 – SPECIAL CHAPTERS IN CARTOGRAPHIC DATA VISUALIZATION

COURSE OUTLINE: GEO9060 – SPECIAL CHAPTERS IN CARTOGRAPHIC DATA VISUALIZATION

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate - Level 7		
COURSE CODE	**GEO9060**	**SEMESTER**	9th
COURSE TITLE	**SPECIAL CHAPTERS IN CARTOGRAPHIC DATA VISUALIZATION**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	3
Lab exercises	1	2
Total	**4**	**5**

COURSE TYPE	Specialization
PREREQUISITE COURSES:	Thematic Cartography
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75

(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.

The course aims to present methods and techniques connected to the process of cartographic data visualization using static maps, dynamic/animated maps, and maps that utilize interactive and multimedia tools. Additionally, the course introduces basic approaches and models that describe the map reading process as well as scientific methods towards the practical evaluation of the efficiency of modern cartographic products.

This course combines the theoretical knowledge required for the visualization of geospatial entities using classical and modern approaches, with the practical implementation of cartographic products using modern digital media and tools. At the same time, the analysis of perceptual and cognitive issues related to the process of map reading in combination with the acquisition of knowledge for the practical evaluation of cartographic products provides the possibility of a comprehensive understanding of the best practices referred to the process of cartographic visualization. The course includes both theoretical lectures and practical exercises aiming at to a smooth transition from theoretical concepts to the practical implementation of modern and integrated cartographic products. Given the immediate need to visualize the large amount of data collected today (using multiple techniques), the acquired knowledge includes all the necessary supplies requires in the modern industry, while it is in line with the appropriate utilization of the available digital tools.

Based on the sections designed for the support of the course, students are getting familiar with basic elements connected to related to:

a. the basic principles for cartographic visualization using static maps,

b. specialized methods of cartographic visualization,

c. the basic principles for cartographic visualization using dynamic/animated maps,

d. the basic principles for cartographic visualization using multimedia maps;

e. the basic concepts related to map reading and usability of cartographic products,

g. the practical methods for modern cartographic products evaluation.

After the successful completion of the course, students acquire a set of knowledge and skills that allow them:

a. to classify and visualize cartographic data using modern methodological approaches and tools.

b. to understand the nature of spatial entities by selecting and implementing alternative cartographic visualization techniques using digital and interactive software tools.

c. to develop and organize research studies towards the evaluation of the efficiency of existing or future cartographic products to support professional, educational and research purposes.

Additionally, both the theoretical approaches taught in the course and the complete familiarization of students with the corresponding technological tools and modern evaluation tools constitute an important point towards the elaboration of diploma theses in the field of Cartography and Geographic Information Systems.

The specialized knowledge and skills acquired by the students in the course do not lead to a strictly theoretical training, but through a knowledgeable and accessible to the average student in the 7th level of complexity of the subjects raised, they come faced with issues to be addressed in the industry. Additionally, in combination with the subject of Geographical Information Science, students acquire all the educational supplies and skills required for the next (8th) cycle of studies.

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
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

Theoretical part of the Course

1. Basic principles of static mapping:
   - Spatial data models
   - Data measurement scales
   - Visual variables in cartographic visualization
   - Traditional methods for both qualitative and quantitative differences mapping
   - Specialized methods for cartographic data visualization
   - Basic applications of static maps
2. Basic principles of dynamic/animated mapping:
   - Visualizing temporal changes
   - Dynamic variables of cartographic symbolization
   - Types of animated maps
   - Dynamic maps and user interaction
   - Software tools for dynamic and animated mapping
   - Basic applications of dynamic/animated maps
3. Cartographic data visualization using multimedia maps:
   - Sound variables of cartographic symbolization
   - Interactivity and navigation in digital and multimedia maps
   - Layout in digital and multimedia mapping
   - Software tools for multimedia maps
   - Basic applications of multimedia maps
4. Perceptual and cognitive issues in map reading process:
   - Basic concepts of visual perception and attention on maps
   - Theories-models of cartographic communication
   - The role of color in cartographic design
5. Map evaluation methods
   - Efficiency of cartographic symbolization variables
   - Users and usability issues in maps
   - Qualitative methods for map evaluation
   - Quantitative methods for map evaluation

Lab Part of the Course
- Cartographic visualization using dynamic-animated maps
- Cartographic visualization using multimedia maps
- Literature review exercises (in both the theoretical and practical aspects of the course)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Web search (literature review and data sources) • Utilization of E-class UNIWA platform (file exchange among professors and students) • Email • Specialized software and libraries (both commercial and open source) for the management and visualization geospatial data in desktop environment • Source code editors • Office software (word, presentations, spreadsheets editors)
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures	39
Study and analysis of bibliography	30
Laboratory practice	35
Lab exercises	13
Educational visits	8
Course total	***125***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written exam at the end of the semester (multiple choice questionnaires, short-answer questions, & problem-solving questions) • Homework (practical exercises on both theoretical and practical objectives related to the course) • Oral presentation (of the semester exercise)

(5) ATTACHED BIBLIOGRAPHY

1. Katsion I., & Tsatsaris A. (2014). Thematic Cartography Lectures (In Greek), Thessaloniki, Disigma Eds.
2. Tsoulos, L., Skopeliti, A., & Stamou, L. (2015). Cartographic composition and production in digital environment (In Greek). [ebook] Athens:Hellenic Academic Libraries Link. Available Online at: http://hdl.handle.net/11419/2506.

3. Dent B.D., Torguson J.S. & Hodler T.W., 2009, Cartography. Thematic Map Design (6th ed.). New York: McGraw-Hill.
4. Kraak M.J. & Ormeling F., (2003), Cartography: Visualization of Geospatial Data (2nd ed.), Prentice Hall, London.
5. MacEachren A.M., (1995), How Maps Work: Representation, Visualization, and Design. The Guilford Press. New York.
6. Peterson M.P., (1995), Interactive and Animated Cartography, Prentice Hall, London.
7. Robinson A.H., Morrison J.L., Muehrcke P.C., Kimerling A.J. & Guptill S.C., 2002, Elements of Cartography (In Greek) (Kavouras M., Nakos B., Tsoulos L., Filippakopopoulou V & Tomai E. Transl.). Zographos: University Press N.T.U.A.
8. Slocum T.A., McMaster R.B., Kessler F.C., Howard H.H., (2009), Thematic Cartography and Geovisualization (3rd ed.), Prentice Hall, London.

GEO9070 – OPEN CHANNEL HYDRAULICS AND RIVER ENGINEERING

COURSE OUTLINE: GEO9070 - OPEN CHANNEL HYDRAULICS AND RIVER ENGINEERING

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO 9070**	**SEMESTER**	9th
COURSE TITLE	**OPEN CHANNEL HYDRAULICS AND RIVER ENGINEERING**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		3	
Lab exercises		1	
Total		**4**	**5**
COURSE TYPE	Special background		
PREREQUISITE COURSES:	URBAN HYDRAULIC WORKS, GEO 404		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)		
COURSE WEBSITE (URL)			

(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.

Upon successful completion of the course the students will:

1. Understand the peculiarities of flow in open channels and natural streams and will be able to classify flows (steady - unsteady, uniform - non-uniform, gradually - rapidly varying), understand the phenomenon of hydraulic jump and identify the curves of non-uniform gradually varying flow and the method of calculating the backwater curve, know the basic characteristics of sediment transport in rivers and the environmental impact of engineering works.
2. Understand the role and function of basic hydraulic structures such as spillways, weirs and sluice gates.
3. Be familiar with the legislation concerning river engineering works including channelization.
4. Be able to do hydraulic calculations in simple cases of steady flow.
5. Be able to use HEC-RAS (River Analysis System) software for river analysis studies.
6. Be able to collaborate with their fellow students for undertaking relevant projects.

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?

- Project design and management
- Working independently
- Team work

(3) SYLLABUS

1. Introduction - Subject. Basic equations of steady flow. Critical flow theory overview. Applications.
2. Uniform flow. Hydraulic design for uniform flow. Most efficient hydraulic cross section.
3. Non-uniform gradually varying flow. Classification of curves. Qualitative analysis, control sections. Backwater curve. Quantitative analysis- estimation of free surface in artificial and natural channels.
4. Hydraulic jump. Properties and jump control. Energy destruction. Stilling basins and weir with free overflow.
5. Rapidly varying flow. Thin-plate and broad-crested weirs. Side weirs. Dam spillways. Stepped spillways. Sluice gates.
6. Unsteady Flow: Gradually varying flow. St. Venant equations. Kinematic wave. Rapidly varying flow. Flood routing. Hydrological methods (Muskingum).
7. Sediment transport: Initiation of sediment motion, riverbed formations, bedload and suspended load. Measurement methods - estimation.
8. River channelization. Bridge scour. The HEC-RAS (River Analysis System) code. Presentation and applications.
9. River engineering works: legislation and applications.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face and e-class (for the practical exercise).
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Specialized Software (MATLAB, VBA for Excel) Learning process support through the electronic platform e-class, use of PowerPoint presentations.

	Activity	***Semester workload***
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	Lectures	29
	Laboratory practice	29
	Individual assignments	23
	Laboratory Teamwork	36
	Standalone study	23
	Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Theory • Final exam, 70% • Practical exercises, 30%

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. HYDRAULICS, Daugerty – Franzini. Publisher Fountas
2. Elements of Physical Hydrology, G. Hornberger et al., Translated in Greek by S.H. Karalis, Publisher DISIGMA, 2019.

- Related academic journals:

3. Journal of Hydraulic Engineering, American Society of Civil Engineers
4. Water Science and Technology, IWA Publishing
5. HYDROTECHNICA, Journal of the Hellenic Hydrotechnical Association.

GEO9080 – TRAFFIC FLOW AND TRAFFIC MANAGEMENT

COURSE OUTLINE: GEO9080 - TRAFFIC FLOW AND TRAFFIC MANAGEMENT

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO9080**	**SEMESTER**	9th
COURSE TITLE	**Flow and Traffic Management**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures & Individual Exercise (Theoretical part of the Course)	2	
Group Exercise (Lab Part of the Course)	2	
Total	**4**	**5**

COURSE TYPE	Specialization
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	New course

(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.

After the successful completions of the course, students will be able to:

- Know the basic concepts and parameters of traffic flow and traffic management
- Realize the physical importance of traffic, how to count traffic volumes and traffic management measures
- Understand the importance of analytical and statistical approaches to the analysis of traffic flow in conditions of uninterrupted flow
- Develop basic macroscopic models of traffic analysis
- Calculate using models the traffic capacity and the level of service of a road section

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?

After the successful completions of the course, students acquire the following knowledge and skills:

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adaptation to new situations
- Decision making
- Autonomous work
- Team Work
- Production of free, creative and inductive thinking

(3) **SYLLABUS**

Theoretical part of the Course

Traffic Flow

- Definitions and characteristics of traffic parameters
- Traffic volume variability
- Traffic Composition and Traffic Volume Charts
- Fundamental traffic flow relationship and fundamental diagrams
- Macroscopic traffic flow patterns
- Traffic Capacity and Level of Service (LoS)
- Methods and technologies of traffic observations and data collection

Traffic Management

- Vehicle Flow Management
- Traffic Restrictions,
- Reduction of trips during Peak-Hour,
- Prioritizing Public Transportation Means,
- Traffic for Pedestrians, Bicyclists

Practical Part of the Course

Students (in groups of 3-4) conduct traffic counts and vehicle conflicts at predetermined intersections on a central urban highway in Athens. Based on the counts, the first task concerns the analysis of counts and traffic conflicts diagrams and the second the identification of high-risk sites.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td colspan="2">• Face-to-Face
• Lectures - interactive teaching in the classroom
• Encouraging students to attend related Workshops, Conferences, etc.</td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td colspan="2">• Presentations in the blackboard
• Presentations through Power Point slides</td></tr>
<tr><td rowspan="5">TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><i>Activity</i></td><td><i>Semester workload</i></td></tr>
<tr><td>Lectures</td><td>52 (13 X 4)</td></tr>
<tr><td>Students create groups of 4 students and conduct traffic measurements at predetermined locations in central nodes of the Athens area. Based on the measurements, they solve 2 different tasks related to statistical standardization and calculation of traffic volumes.</td><td>60</td></tr>
<tr><td>Study and preparation for the exams</td><td>38</td></tr>
<tr><td>Course total</td><td><i>150</i></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>
<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td colspan="2">Language of evaluation: Greek
Theoretical part of the Course
• Written exam (70%)
Lab Part of the Course
• Delivery of individual exercises and oral examination (30%)</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

1. " Book: "Traffic Management", J. Frantzeskakis - M. Pitsiava-Latiopoulou, D. Tsampoulas, 2008.
2. Daganzo C. F., (1997). "Fundamentals of transportation and traffic operations." Pergamon, ISBN 0-08-042785-5.
3. Hall F. D., (1994), Traffic Stream Characteristics, Monograph on Traffic Flow Theory Institute of Transportation Engineers (ITE) (1993).Traffic Engineering Handbook. Editor Pline, J. L., Prentice Hall, Englewood Cliffs, N. J., 07632, ISBN 0139267913.
4. May, A. D. (1990). Traffic Flow Fundamentals. Prentice-Hall Englewood
5. Roess, R. P., Prassas, E. S., McShane W. R. (2011). Traffic Engineering (4th Edition). Prentice Hall, Englewood Cliffs, N. J., 07632, ISBN 0139261486.
6. Salter R. J. Housell N. B. (1996). Highway Traffic Analysis and Design 3rd edition Palgrave McMillan, ISBN.

GEO9090 – OCEANOGRAPHY AND HYDROGRAPHY

COURSE OUTLINE: GEO9090 - OCEANOGRAPHY AND HYDROGRAPHY

(1) GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate – Level 7		
COURSE CODE	**GEO9090**	**SEMESTER OF STUDIES**	9th
COURSE TITLE	**OCEANOGRAPHY AND HYDROGRAPHY**		

INDEPENDENT TEACHING ACTIVITIES *in case the credits are awarded in discrete parts of the course e.g. Lectures, Laboratory Exercises, etc. If the credits are awarded uniformly for the entire course, enter the weekly teaching hours and the total credits*	**WEEKLY HOURS**	**CREDIT UNITS**
Lectures	2	4
Laboratory Exercises	1	1
TOTALS	**3**	**5**

TYPE OF COURSE	ELECTIVE COURSE FOR SPECIALIZATION IN GEODESY
PREREQUISITE COURSES:	No prerequisite courses
C.LAUSSA OF TEACHING AND EXAMINATIONS:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES (English)
ONLINE COURSE PAGE(URL)	https://eclass.uniwa.gr/courses/GEO909/

(2) LEARNING OUTCOMES

Learning Outcomes

The learning outcomes of the course are described, the specific knowledge, skills and abilities of an appropriate level that students will acquire after the successful completion of the course.

The aim of the course is for students to acquire the basic knowledge in:

(a) Physical Oceanography (environmental factors salinity-temperature-pressure, ocean geomorphology, marine circulation, wave mechanics)

(b) Principles of sound propagation in water, sound systems and modern methods and specifications of hydrographic mapping and delineating infrastructure facilities for marine and coastal areas

(c) marine data in operational form (forecasts, historical measurements).

As part of the course, a demonstration of measuring marine instruments and the presentation of research projects of the Hellenic Centre for Marine Research (HCMR) with a visit to Anavyssos, Attica, are included. The knowledge that students are going to acquire at theoretical and laboratory level is put into practice for coastal and marine studies (Topographical, Port, Hydraulic) and technical works.
After the end of the course, students will have understood the basic concepts and principles

of Physical Oceanography (Descriptive and Dynamic), and the collection/ processing and visualization of hydrographic field measurements in the riverine, coastal and marine environment.

General Competencies

Taking into account the general skills that the graduate must have acquired (as these are listed in the Diploma Supplement and listed below) which / which of them is the subject of the course intended for?.

- Search, analysis and synthesis of data and information, using the necessary technologies and software
- Adaptation to new situations
- Decision-making
- Autonomous work
- Teamwork
- Criticism and self-criticism
- Promoting free, creative and inductive thinking

(3) COURSE CONTENT

Theoretical Part of the Course

A. PHYSICAL OCEANOGRAPHY

- Introduction to the physical parameters and properties of seawater. (Salinity, temperature, density, water types and sea water masses)
- Ocean geomorphology and deep zones
- Mixing of water masses. Quality, color and transparency of seawater
- Maritime traffic - Equations of movement and conservation
- Currents and operative causes of their creation: Density currents, windgenic, geostropic/baroclinical, inertial, tidal. Currents in absence of friction, shallow ocean, Currents in the presence of friction (Wind circulation, Ekman theory, Sverdrup theory, intensification of flow at the western boundary of oces)
- Thermohaline circulation (semi-operation of water masses in the ocean, global thermosallic belt)
- Surface and long waves; waves in the absent and in the presence of Earth's rotation. Tides. (forces, main characteristics and action of ocean topography)
- Propagation of ripples from deep water to the shore. Rifting, refraction, drizzle, reflection and breakage of ripples
- The dynamic circulation of the Mediterranean Sea and the Greek Seas (Aegean, Ionian, Levantine)
- Methods of observation and forecasting of maritime traffic, tidal graphs, instruments and methods for measuring physical parameters at sea
- Numerical models and operational physical oceanography.

B. HYDROGRAPHY.

- Single- and multi-beam echosounding systems
- Methods, instrument calibration and errors of hydrographic data

- Use of Scanners, Lidar, drones, infrared sensors, radar and satellite altimetry in hydrographic mappings
- Modern methods of surveying and installing coastal and offshore works (telecommunications cables, pipelines, wind turbines, gas/oil extraction platforms), and shoreline changes from natural and man-made causes
- Oceanographic databases
- The Copernicus Marine and EMODnet hydrographic data platforms
- Software EIVA, Qinsy processing and performance of hydrographic measurements.
- The territorial sea (definition and engraving), EEZ (Exclusive Economic Zone) and related legislation.

Laboratory Part of the Course

- Calibration of a echosound system
- Processing and interpretation of hydrographic data
- Combine satellite data with field measurements
- Shoreline extraction methods
- Study of the formation and engraving of the seashore

(4) TEACHING AND LEARNING METHODS - EVALUATION

<table>
<tr><td>METHOD OF DELIVERY</td><td>In the hall</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES Use of
<i>TEIs in Teaching, Laboratory Education, Communication with students</i></td><td>• Use of the Internet (search for bibliographic information and sources of digital geographic data and Web-GIS applications)
• Use of the"open e-class" platform of the University of West Attica (exchange of course data and digital data between teachers and students)
• Use email
• Use of specialized remote sensing software
• Use of specialized design software
• Use of presentation software</td></tr>
<tr><td>TEACHING ORGANIZATION
<i>The way and methods of teaching are described in detail.</i>
<i>The student's study hours for each learning activity are listed, as well as the hours of a non-guided study according to the principles of ECTS</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester Workload</i></th></tr>
<tr><td>Lectures</td><td>70</td></tr>
<tr><td>Study & analysis of bibliography</td><td>40</td></tr>
<tr><td>Laboratory exercises</td><td>35</td></tr>
<tr><td>Educational visits</td><td>5</td></tr>
<tr><td>Total Course</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT EVALUATION
<i>Description of the evaluation process</i>

<i>Explicitly defined assessment criteria are mentioned and if and where they are accessible to students.</i></td><td>Language of the examination: Greek (English if needed, e.g., Erasmus+students)

Written examination at at the end of the semester (Multiplechoice questions and developmentalquestions, problem solving) or by project</td></tr>
</table>

(5) RECOMMENDED -BIBLIOGRAPHY

Greek:

1. Albanakis, K. (1999). Courses in Oceanography. University Studio Press, Thessaloniki.
2. Giannakidis, A. (2004). Issue of notes "Introduction to Oceanography", Technical University of Crete, Department of Electronic and Computer Engineering
3. Zervakis V. (2007). Introduction to Dynamic Oceanography,Course Teaching Notes, University of the Aegean.
4. Zafeiropoulos, I. (1998). Oceanography. Translated into Greek from the book "American PracticalNavigation" Vol. I, Part 6, Oceanography-Pub. No 9, EugenidesFoundation.
5. Kapsimali V. and K. Pavlopoulos. (2009). Vithometry and maps, Course teachingnotes, Harokopio University.
6. Koutitas, C. (1996). Introduction to coastal engineering and port works. Ziti Publications.
7. Sukisian, T. Oceania circulation and the phenomenon El Niño, HCMR.

English:

1. Barale V. and Gade M. (2008). Remote sensing of the European seas, Springer.
2. Maul G.A. (2012). Introduction to satellite oceanography**.** Springer Science & Business Media 606pp
3. Mellor, G.L. (1996). Introduction to Physical Oceanography. Princeton Unicersity.
4. Niedzielski Tomasz (2015). Satellite Technologies in Geoinformation Science. Birkhäuser Basel Springer Basel 310pp
5. Pickard, G.L. and W.J. Emery. (1990). Descriptive Physical Oceanography. An introduction. Pergammon Press.
6. Pinet, R. Paul. (2009). "Invitation to Oceanography", chapter The Growth of Oceanography. Jones and Bartlett Publishers.
7. Practical Navigation" Vol. I, Part 6, Oceanography-Pub. No 9, Eugenides Foundation, Higher Public Schools of merchant navy, Navy Library, Athens.
8. Robinson, Ian S (2010). Discovering the Ocean from Space. Springer-Verlag Berlin Heidelberg 638pp
9. Stewart R. H. (2008). Introduction to Physical Oceanography. Department of Oceanography, Texas A&M University.
10. Stewart, R. H. (2009)." Our Ocean Planet Oceanography in the 21st Century".
11. Summerbayes, C.P. and S.A. Thorpe. (1996). Oceanography, An Illustrated Guide. Manson Publishing.
12. Thurman, H.V. (1997). Introductory Oceanography. Pentice-Hall.

GEO9100 – EARLY WARNING SYSTEMS & NATURAL DISASTER MANAGEMENT

COURSE OUTLINE: GEO9110 - EARLY WARNING SYSTEMS & NATURAL DISASTER MANAGEMENT

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO9110**	**SEMESTER**	9th
COURSE TITLE	**Early Warning Systems & Natural Disaster Management**		

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 TEACHIN GHOURS**	**CREDITS**
LECTURES	3	4
LABORATORY EXERCISES - FIELDWORK	1	1
TOTAL	**4**	**5**

COURSE TYPE	*Skills development*
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK (English for Erasmus Students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (ENGLISH)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO194/

(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.

Upon successful completion of the course, students are expected to:

- recognize the type, the importance but also the possibility of a natural disaster
- Demonstrate knowledge and critical understanding of the basic methods and techniques of data collection for use in integrated early warning information systems.
- Develop methods to generate forecasts and estimate their application limits.
- Support decision-making in working groups of Civil Protection bodies
- Establish procedures for control, evaluation and validation of early warning methods
- produce complete early warning systems solutions
- Have the ability to manage risk in natural disaster events
- apply cutting-edge technologies and research tools in disaster management
- Evaluate (using studies and estimates) the effects of natural disaster

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, analyze and synthesize data and information, using both necessary technologies
- Project planning & management
- Autonomous work in an interdisciplinary environment
- Promotion of free, creative and inductive thinking
- Decision making
- Time management - Working with deadlines

(3) SYLLABUS

- Introduction to Risk Analysis & Management (Risk, Vulnerability, Risk. Disaster Management Cycle, Risk Perception and Assessment, Crisis Management and Emergencies)
- Geodynamic Hazards (Landslides: Types, causes & treatment of landslides, Earthquakes: Causes and Distribution of Earthquakes, Accompanying Seismic Phenomena, Volcanoes: Description, Distribution and Classification of Volcanoes, Volcanic Activity)
- Hydrometeorological Disasters (Climate Change: Causes of the Greenhouse Effect, Impacts of Climate Change, Extreme Weather Phenomena and Expected Natural Resources Disasters: Tornado, Heat, Storms, Floods, Extreme Rainfall, Frost)
- Forest fires (phenomenon description, causes, disaster distribution zones, management stages, actions, interventions and actions for each stage, national and international management framework)
- Detection of precursors (Introduction to precursors, physicochemical processes and occurrence of natural disasters, validity and confidence intervals, use of historical records, retrieval of information from time series)
- Early warning systems and methodologies (measurement sensors, interconnected systems, field installations, real-time logging, with short- and long-term forecasting methodologies, sensor network pattern recognition, cost-tracking analysis & monitoring system, monitoring system, crowdfunding & crowd tracking systems)
- Real-time decision-making methods (Introduction to Decision Theory, Probability of Error, Satisfaction of Constraints, Rivalry, Decision-Making Phases, Decision Support Information Systems, Management Support Systems)
- Disaster modeling (evolution models and disaster simulation software applications)
- Disaster & Crisis Management (Introductory Concepts, Disaster and Crisis Management Systems. The role of information in crisis management. The role of Coordination Business Centers. Crisis Management Systems, Emergency Planning, Rehabilitation and Reconstruction. Project failures, Training and preparation citizenship. Development of crisis management skills. Crisis Management, Political Disaster Risk Reductions)
- Economic & Social Impacts of Disasters (Injuries, Deaths and Damages, Depending on the Type of Disaster, Psychological Impact, Demographic Impact political implications, destabilization. Indirect financial losses, Feasibility study of infrastructure rehabilitation programs.)
- Management of media - internet - social networks in natural disasters (Request for information, Time pressure conditions and the dramatic nature of events, risks of

slipping from objective and valid information. Requirements of the public and authorities, appropriate way of providing information at the site of Disaster, kind, quantity and quality of information. Social Media: modes of operation, techniques of transmitting accurate, reliable and vital information, eliminating false news)

- Risk Management & Business Planning (Introduction, Basic Risk Management Principles: Immediate Response, Human Factor Priority, Leader Position, Information. Reasons for Failure to Disaster Management, Coordination and Event Management. removal of citizens)

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
<i>Face-to-face, Distance learning, etc.</i></td><td>• <i>Face-to-face</i>
• <i>Practical training in ICT lab</i></td></tr>
<tr><td>USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY
<i>Use of ICT in teaching, laboratory education, communication with students</i></td><td>• <i>Use of ICT in teaching (PowerPoint presentations, videos)</i>
• <i>Use of an asynchronous e-learning platform (e-class).</i>
• <i>Use of messaging and social media as additional communication channels</i></td></tr>
<tr><td>TEACHING METHODS
<i>The manner and methods of teaching are described in detail.</i>
<i>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</i></td><td><table>
<tr><th><i>Activity</i></th><th><i>Semester workload</i></th></tr>
<tr><td><i>Lectures</i></td><td>39</td></tr>
<tr><td><i>Personal study and analysis of bibliography</i></td><td>30</td></tr>
<tr><td><i>Lab practice</i></td><td>13</td></tr>
<tr><td><i>Laboratory preparation and essay writing</i></td><td>35</td></tr>
<tr><td><i>Project</i></td><td>33</td></tr>
<tr><td>Course total</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
<i>Description of the evaluation procedure</i>

<i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></td><td>Assessment language: Greek (English for ERASMUS students upon request)

Performance evaluation method:
• Final Written Exam (50% of the final grade) of graded difficulty, which include short-answer questions, open-ended questions and solving simple problems.
• Evaluation of laboratory work (30% of the final grade) from lab work
• Evaluation of project (20% of the final grade)

The evaluation criteria have been presented to the students before the final examination. Students can see their evaluation upon request and receive clarifications on their grades.</td></tr>
</table>

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography (in Greek):
1. Λεκκας, Ε. Φυσικές και Τεχνολογικές Καταστροφές,Λεκκας, Ε, Αθηνα, (2000)
2. Σαπουντζάκη, Κ., Δανδουλάκη, Μ., Κίνδυνοι & καταστροφές, Καλλιπος, 2015
3. Διονυσιαδης, Σ., Εγχειρίδιο αντιμετώπισης εκτάκτων περιστατικών και καταστροφών, εκδόσεις Ιων, Αθήνα (1997)
4. Βοργε, Δ., Το βιβλιο του κινδύνου, εκδόσεις Παπαζήση, αθήνα, (2008)

- Suggested bibliography (in English):
1. Bartlett, D., Singh, R., Exploring Natural Hazards: A Case Study Approach, CRC Press, UK, (2018)
2. Zschau, J., Küppers, A.N. , Early Warning Systems for Natural Disaster Reduction, Springer, New York, (2003)
3. Golnaragi, M., Institutional Partnerships in Multi-Hazard Early Warning Systems, Springer, New York, (2012)

GEO9110 – REFERENCE SYSTEMS AND TIME

COURSE OUTLINE: GEO9110 - REFERENCE SYSTEMS AND TIME

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**GEO9110**	**SEMESTER**	9th
COURSE TITLE	**REFERENCE SYSTEMS AND TIME**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		2	4
Laboratory exercises		1	1
TOTAL		**3**	**5**
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized general		
PREREQUISITE COURSES:	No prerequisite courses needed		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr /courses/GEO213		

(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.

Basic course goals:

- Use of recent satellite observations in earth system modelling
- Connection of physical and geometrical characteristics of the Earth system
- Basic concepts on satellite orbits and their applications to earth system monitoring
- Mathematical models of positioning using satellite data
- Satellite data contribution in recent geodetic problems
- New technology applications in geodetic science

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* • *Decision-making* • *Working independently* • *Working in an international environment* • *Production of new research ideas* • *Production of free, creative and inductive thinking*

(3) SYLLABUS

Satellite orbits. No-Disturbing satellite orbit. Geometrical issues of orbits. Kepler equation. Keplerian elements. Satellite position and velocity vector. No-disturbing orbit computations. Disturbing orbit. Kaula theory. Hill equations. Satellite positioning using electromagnetic measurements. GNSS. Satellite Laser Ranging. Lunar Laser Ranging. Satellite – to – Satellite tracking. CHAMP satellite. GRACE satellites. Time variant gravity field. Gravity gradiometry. GOCE satellite gravity mission. Earth Tides. Numerical integration of satellite orbit. Satellite altimetry. Altimetric satellites. Error budget. DORIS orbit determination system.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	e-class, software development, communication with students through e-class	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	52
	Laboratory practice	58
	Study and analysis of bibliography	40
	Course total	***150***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	The final course evaluation is based on written examination (70%) and laboratory work (30%) Language of evaluation: Greek (English if needed, e.g., Erasmus+ students) Written examination with short-answer questions, problem solving and laboratory work	

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

- *Beutler G. (2005) Methods of Celestial Mechanics, Vols I and II. Springer.*
- *Heiskanen W. A., Moritz H., 1967. Physical Geodesy. Freeman & Co, San Francisco.*
- *Hofmann-Wellenhof B. and H. Moritz. 2005. Physical Geodesy. Springer eds.*
- *Kaula, W.M. (1966) Theory of Satellite Geodesy. Blaisdel Publishing Company.*
- *Seeber, G. (2003) Satellite Geodesy (2nd Edition). Walter de Gruyter eds.*
- *Torge W., 2001. Geodesy. 3rd Edition. Walter de Gruyter, Berlin.*
- *Vanicek P., Krakiwsky E., 1992. Geodesy: The Concepts. Elsevier, New York.*

- Related academic journals*:*

- Journal of Geodesy
- Journal of Geodetic Sciences
- IAG Series publications

GEO9120 – COASTAL AREAS & MARINE SPATIAL PLANNING

COURSE OUTLINE: GEO9120 – COASTAL AREAS & MARINE SPATIAL PLANNING

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO9120**	**SEMESTER**	9th
COURSE TITLE	**COASTAL AREAS & MARINE SPATIAL PLANNING**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	
Lab exercises (essay)	1	
TOTAL	**4**	**5**

COURSE TYPE	specialised general knowledge
PREREQUISITE COURSES:	-- Preferred prerequisite knowledge: GEO_705: Spatial Planning & Regional Development
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, to English speaking.
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/TOP175/

(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.

The aim of the course is the spatial approach of both, the coastal zone and the marine environment.

Upon successful completion of the course, students will be able to:

o … know the geomorphology and other abiotic parameters of the areas under study.

o … understand related policies and legislation for governing areas under study.

o … collect/process spatial data from coastal/marine areas and have the skill to compile relevant spatial databases.

o … be aware of good practices concerning coastal and marine space management and apply them appropriately.

o … be informed about current maritime spatial events, worldwide.

o … participate in multidisciplinary study groups, in the framework of integrated coastal and marine management projects.

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?

Upon successful completion of the course, students are expected to acquire the following General Abilities:
o Search for, analysis and synthesis of data and information, with the use of the necessary technology
o Team work
o Working in an interdisciplinary environment
o Project planning and management
o Respect for the natural environment
o Production of free, creative and inductive thinking

(3) SYLLABUS

1. Introductory concepts and definitions for coastal areas and maritime space. The special case of rivers and lakes. Abiotic features.
2. Coastline and cross section of coastal areas. Geological components.
3. The marine environment and its properties.
4. Environmental, geopolitical and economic parameters. Natural and man-made environment in coastal areas and marine space. The concept of anthropogenic intensity.
5. Land uses and spatial indicators. Bearing capacity issues.
6. Integrated management of coastal areas. Methodology; historical background and events.
7. Marine spatial planning. Methodology; historical background and events.
8. U. N. Convention on the Law of the Sea.
9. Related institutional framework in Greece, in Europe (EU) and worldwide. Stakeholders; international events.
10. Greek policies-plans for the coastal and maritime space; planning levels and administrative structures.
11. Data collection tools & related spatial databases; cases studies.
12. Professional perspectives for surveyors/geoinformatics engineers.

Laboratory exercises focus on:
- Familiarity with the geometric/geomorphological characteristics of the examined areas.
- Spatial approach, with the use of indicators, at local and regional level.
- Structure of a relevant project.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures - interactive teaching face to face (distance learning, if obligatory).
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	o Teaching using electronic supervisory tools. o Use of CAD and GIS software o Communication and support of learning process with university asynchronous education platform.
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	see table below

Activity	***Semester workload***
Lectures	39
Lab exercises (essay)	13
Homework	48
Self-studying	50
Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of Assessment: Greek (English if needed). o Written evaluation (with the possibility of partial substitution with an small project), after successful attendance of Lab exercises. (min 50%) o Examination and public support of lab exercises (essay). (max 50%)

(5) ATTACHED BIBLIOGRAPHY

1. Wassenhoven, L. K. (2017), ‘Marine Spatial Planning’. Heraklion: University of Crete Publications. [in Greek].
2. Clark, J. R. (1996), ‘Coastal zone management handbook’, CRC Press, Boca Raton USA.
3. Ehler Charles & Fanny Douvere (2009), ‘Marine spatial planning: A step-by-step approach towards ecosystem-based management’, UNESCO / IOC, Paris.
4. Κιουσόπουλος, Γιάννης, (2008), ‘Appraisal of man-made interventions along the Hellenic coastal areas [AMICA]’. Athens: New Technologies. [bilingual].
5. Kiousopoulos, John, 2010. ‘Anthropogenic Intensity’ and ‘Coastality’: Two new Spatial Indicators for Exploring and Monitoring the Coastal Areas in the framework of Environmental Management. __ In: Santosh Kumar Sarkar (ed.), 2010, “Environmental Management”, pp. 217-240. Sciyo.
6. Kyvelou, Stella, (ed.), (2016), ‘Maritime dimension of territorial cohesion - Maritime spatial planning - Sustainable blue development’, Kritiki ed. [in Greek].
7. o Serraos K. & D. Melissas, (2018), ‘Marine Spatial Planning’, Sakkoulas Publications. [in Greek].
8. o Valiela Ivan (2006), “Global coastal change”, Blackwell, UK.

GEO9130 – SPATIAL DATA ADVANCED ANALYSIS METHODS

COURSE OUTLINE: GEO9130 - SPATIAL DATA ADVANCED ANALYSIS METHODS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate-level 7		
COURSE CODE	**GEO9130**	**SEMESTER**	**9th**
COURSE TITLE	**SPATIAL DATA ADVANCED ANALYSIS METHODS**		

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	4
Lab exercises	1	1
Total	**4**	**5**

COURSE TYPE	skills development
PREREQUISITE COURSES:	Spatial Analysis
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO234/

(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.

The course aims to familiarize students with geospatial data advanced analysis methods of both Statistics and Informatics.

After the successful completions of the course, students acquire a set of knowledge and skills that allow them to:

- Recognize the peculiarities of geographical data in relation to classical statistical analysis techniques
- Evaluate statistical analysis results based on statistical tests
- Propose different mathematical analysis models depending on the nature of the data
- Understand scientific publications that apply advanced statistical analysis methods

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
- Individual work
- Production of free, creative and inductive thinking

(3) SYLLABUS

1. Multiple regression analysis: variable selection methods, analysis of the residuals, spatial autocorrelation
2. Specialized regression models: trend surface analysis, regression models for discrete variables, spatial regression models
3. Multivariate analysis methods: factor analysis, cluster analysis, discriminant analysis
4. Geostatistical methods: variogram, spatial interpolation (kriging), cokriging methods
5. Geocomputation: neural networks, fuzzy logic, genetic algorithms, cellular automata, agent-based models

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-Face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Office software (word, presentations, spreadsheets editors) • Utilization of E-class UNIWA platform • Specialized statistical analysis and Geographic Information Systems software	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	39
	Lab exercises	13
	Study and analysis of bibliography	58
	Semester project preparation and writing	40
	Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: i. Written exam at the end of the semester (50%) which includes questions and exercises on both theoretical and practical objectives related to the course ii. Intermediate written exam (10%) which includes questions and exercises on both theoretical and practical objectives related to the course iii. Semester project (40%)

(5) ATTACHED BIBLIOGRAPHY

1. Iliopoulou P. 2015. Spatial Anlaysis. [e-book] Athens Hellenic Academic Libraries Link (Heal Link). Available at http://hdl.handle.net/11419/2059
2. Kalogirou, S. (2015). Spatial Analysis (in Greek). [ebook] Athens: Hellenic Academic Libraries Link. Available online at: http://hdl.handle.net/11419/5029
3. Koutsopoulos, K. (2009). Discourse essay on Spatial Analysis, Volumes A΄ and B΄ (in Greek). Athens: Papasotiriou Publications.
4. Roiger, R. J. & Geatz, M.W. (2008). Data Mining: A Tutorial-Based Primer (in Greek). Athens: Klidarithmos Publications
5. Abrahart, R. J. & See, L. (2014). Geocomputation (2nd ed.). Boca Raton, FL: CRC Press.
6. Anselin, L. & Rey, S. J. (2014). Modern Spatial Econometrics in Practice: A Guide to GeoDa, GeoDaSpace and PySAL, GeoDa Press LLC, ISBN:0986342106
7. Fotheringham, S. A., Brudson, C. & Charlton, M. (2000). Quantitative Geography-Perspectives on Spatial Data Analysis, London: SAGE Publications.
8. Haining, R. (2004). Spatial data analysis. Theory and practice. Cambridge, UK: Cambridge University Press.
9. Isaaks, E. H. & Srivastava, M. R. (1989). Applied geostatistics. New York: Oxford University Press.
10. O' Sullivan, D. & Unwin, D.J. (2010). Geographic Information Analysis, John Wiley.

GEO9140 – SPECIAL ISSUES ON REAL ESTATE VALUATION

COURSE OUTLINE: GEO9140 – SPECIAL ISSUES ON REAL ESTATE VALUATION

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO1940**	**SEMESTER**	9th
COURSE TITLE	**SPECIAL ISSUES ON REAL ESTATE VALUATION**		
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 TEACHIN GHOURS**	**CREDITS**
Lectures		3	4
Lab exercises		1	1
TOTAL		**4**	**5**
COURSE TYPE	Special background, specialised general knowledge		
PREREQUISITE COURSES:	Land management and real estate values		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO237/		

(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.

The course aims to the specialized knowledge acquisition in advanced methods of real estate valuation and the international valuation standards.
Upon successful completion of the course the student will:

- Know the real estate valuation methods
- Understand the real estate investment valuation methods
- Know the business' location criteria
- Be able to apply advanced valuation methods on commercial real estate
- Know the international valuation standards and their application on the occupation of the valuer in real estate property
- Be able to apply methods of real estate valuation by using computer
- Be able to apply geoinformatics in real estate valuation methods

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 ○ Working independently ○ Team work

(3) SYLLABUS

1. Investment valuation principles
2. Business' location theories
3. Investments on commercial real estate
4. Valuation of commercial real estate: income method, interest rates of investments, discounted cash flows analysis, internal return of investment
5. Computer Assisted Mass Appraisal (CAMA) by using computers and mathematical models
6. International valuation standards
7. Applications of geoinformatics in real estate valuation methods

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face to face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Utilization of E-class UNIWA platform (file exchange among professors and students) Power point presentations Use of office management applications and statistical analysis software for conducting studies	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *.* *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*	***Activity***	***Semester workload***
	Lectures	52
	Lab exercises	13
	Conducting studies and projects	40
	Study and analysis of bibliography	45
	Course total	**100**
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	I. Written final exam (60%) which includes: ○ Questions regarding theory ○ Problem solving questions II. Exercises (10%) III. Conducting studies and presentation (30%)	

(5) ATTACHED BIBLIOGRAPHY

In Greek:

1. Baum A., Mackmin D., Nunnington N. 2010. *Real estate valuation using the income method*, Kleidarithmos Athens.
2. Zedelis, P. 2015. *Real Estate*. [e-book] Athens: Hellenic Academic Libraries Union. Available at: http://hdl.handle.net/11419/4235. Karanikolas N. 2010. *Real estate evaluation*, Disigma Publications, Thessaloniki
3. Kiohos, P.. 2010. *Introduction to real estate valuation methods*, Eleni Kiohou Publishers, Athens.
4. Scarrett D. 2012. *Real estate valuation: the five methods*, Kleidarithmos Publishers, Athens

In English:

5. Baranzini A., Ramirez J., Schaerer C. and Thalmann P. (eds.) 2008. Hedonic Methods in Housing Markets, New York: Springer.
6. Ratcliffe J., Stubbs M. and Keeping M. 2009. Urban Planning and Real Estate Development, London: Routledge.
7. Rattermann M.R. 2009.The Student Handbook to the Appraisal of Real Estate, 13th Edition, MAI, SRA.
8. Sayce S. Smith J., Cooper R. Venmore-Rowland P. 2006. Real Estate Appraisal From Value to Worth, Blackwell Publishing Ltd.
9. Shapiro E. , Mackmin D. and Sams G. 2013. Modern Methods of Valuation, New York: Routledge.
10. The European Group of Valuers' Associations (TEGoVA) 2016. European Valuation Standards 2016, 8th edition, http://www.tegova.org/.

GEO9150 – INTELLIGENT TRANSPORT SYSTEMS

COURSE OUTLINE: GEO9150 - INTELLIGENT TRANSPORT SYSTEMS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO9150**	**SEMESTER**	**9th**
COURSE TITLE	**Intelligent Transport 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 TEACHIN GHOURS**	**CREDITS**
Lectures & Individual Exercise (Theoretical part of the Course)	2	
Group Exercise (Lab Part of the Course)	2	
Total	**4**	**5**

COURSE TYPE	Specialization
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO233/

(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.

After the successful completions of the course, students will be able to:

- Learn the characteristics of autonomous vehicles and driving assistant systems
- Realize the benefits of applying artificial intelligence to transport
- Understand real-time management systems and telematics
- Solve simple applications in a traffic simulation program

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?*
After the successful completions of the course, students acquire the following knowledge and skills: • Search for analysis and synthesis of data and information, with the use of the necessary technology • Adaptation to new situations • Autonomous work • Production of free, creative and inductive thinking • Exercise criticism and self-criticism • Work in an interdisciplinary environment

(3) SYLLABUS

Theoretical part of the Course

- Introduction to the application of artificial intelligence in transport.
- Autonomous vehicles
- Driving assistant systems
- Telematics in transport
- Network optimization
- Real-time management systems
- Centralized and distributed controls and decision-making methods
- Applied statistical standardization
- Stated Preference Surveys
- Traffic simulation software

Lab Part of the Course

Preparation of a group theme (groups of 4 people) based on a questionnaire survey with the method of stated preference analysis

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	• Face-to-Face • Lectures - interactive teaching in the classroom • Encouraging students to attend related Workshops, Conferences, etc.
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Presentations in the blackboard • Presentations through Power Point slides
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	

Activity	***Semester workload***
Lectures	52 (13 X 4)
Students create groups of 4 students and prepare a group theme in a questionnaire survey using the Stated preference analysis	60
Study and preparation for the exams	38
Course total	***150***

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Theoretical part of the Course • Written exam (70%) Lab Part of the Course • Partial and Overall Presentation of a semester topic (30%)

(5) ATTACHED BIBLIOGRAPHY

53. *Autonomous Driving, Technical, Legal and Social Aspects, by Markus Maurer, Christian Gerdes, Barbara Lenz, Hermann Winner, SpringerLInk edition*
54. *Marsland, S. (2014). Machine learning: an algorithmic perspective. CRC press.*
55. *Kruse, R., Borgelt, C., Klawonn, F., Moewes, C., Steinbrecher, M., & Held, P. (2013). Computational intelligence: a methodological introduction. Springer Science & Business Media.*
56. *Karlaftis, M. G. and Vlahogianni, E. I. (2011). Statistics versus Neural Networks in Transportation Research: Differences, Similarities and Some Insights, Transportation Research Part C: Emerging Technologies, 19(3), 387-399.*
57. *Engelbrecht, A. P. (2007). Computational intelligence: an introduction. John Wiley & Sons.*
58. *TRB (2007). Artificial Intelligence in Transportation: Information for Application, Transportation Research Circular E-C113, Transportation Research Board, Washington DC.*
59. *Bishop, C. M. (2006). Pattern recognition and machine learning. Springer.*

GEO9160 – GROUNDWATER HYDRAULICS

COURSE OUTLINE: GEO9160 – GROUNDWATER HYDRAULICS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO 9160**	**SEMESTER**	**9th**
COURSE TITLE	**GROUNDWATER HYDRAULICS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	
Lab exercises	1	
Total	**4**	**5**

COURSE TYPE	Special background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	

(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.

Upon successful completion of the course the students will:

1. Be familiar with the basic properties of groundwater movement, understand Darcy's law and its applications, know the basic hydraulic properties of groundwater aquifers such as hydraulic conductivity, permeability and porosity.
2. Ɵnderstand the basics of groundwater hydrology: groundwater distribution, aquifers and categories thereof. Confined and un-confined aquifers. Water table - groundwater level. Pumping and potentiometric surface.
3. Be familiar with the graphical construction of groundwater flow networks and the concept of the water yielding capacity of a hydrogeological basin.
4. Be able to do basic calculations with the help of specialized software programs in MATLAB.

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
- Decision-making
- Working independently
- Team work
- Project planning and management
- Respect for the natural environment

(3) SYLLABUS

Groundwater. Approach of the equivalent continuous medium. Groundwater hydraulics, steady and unsteady flow. Groundwater movement - Darcy's law and hydraulic conductivity: hydraulic head, hydraulic gradient, Darcy's experiment, Darcy's law, hydraulic conductivity, permeability, transmissivity, hydraulic conductivity estimation (types of methods). The continuity equation for flow in groundwater aquifers. Horizontal groundwater flow equations. Heterogeneity and anisotropy. Groundwater hydrology: Groundwater distribution (aquifers, aquifer categories). Confined and unconfined aquifers. Water table- water level in well. Groundwater flow networks and water yield. Well hydrographs. Aquifer tests by well methods. The Cooper-Jacob method. Hydrogeological basin - Recharge - Discharge. Aquifer storage. Groundwater balance. One-dimensional flow. Steady flow into wells. Well radius of influence. Piezometry - Flow Networks: level variation, metering, potentiometric surface maps. Pumping and pumping tests. Critical pumping discharge. Over-pumping and consequences.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Face-to-Face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Learning process support through the electronic platform e-class Communication with students via e-class and e-mail Extensive use of Microsoft Excel.	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	29
	Laboratory practice	29
	Individual assignments	23
	Laboratory Teamwork	36
	Standalone study	23
	Course total	**150**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Theory • Final exam, 70% • Practical exercises, 30%

(5) ATTACHED BIBLIOGRAPHY

In Greek

(1) Elements of Physical Hydrology, G. Hornberger et al., Translated in Greek by S.H. Karalis, Publisher DISIGMA, 2019.
(2) Groundwater Hydraulics, D. Tolikas, Publisher Epikentro (In Greek)
(3) General Hydrogeology, G. Soulios. (In Greek)

- Related academic journals:

(4) HYDROTECHNICA, Journal of the Hellenic Hydrotechnical Association
(5) Water Science and Technology, IWA Publishing
(6) Journal of Hydrogeology & Hydrologic Engineering.
(7) International Journal of Hydrology Science and Technology.

GEO9170 – ROAD SAFETY AND URBAN ROAD NETWORKS

COURSE OUTLINE: GEO9170 - ROAD SAFETY AND URBAN ROAD NETWORKS

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**GEO9170**	**SEMESTER**	**9th**
COURSE TITLE	**ROAD SAFETY AND URBAN ROAD NETWORKS**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures & Individual Exercise (Theoretical part of the Course)	2	
Group Exercise (Lab Part of the Course)	2	
Total	**4**	**5**

COURSE TYPE	Specialization
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/GEO222/

(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.

After the successful completion of the course, students will be able to:

- Know the basic concepts and dimensions of Road Safety
- realize the benefits of an integrated parking management system
- understand the characteristics of parking and the importance of data collection and analysis to identify hazardous locations and problems and evaluate relevant measures
- consolidate the influence of various factors (driver, infrastructure, vehicle) in causing and dealing with road accidents

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?

After the successful completion of the course, students acquire the following knowledge and skills:

- Search for analysis and synthesis of data and information with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Criticism and self-criticism
- Design and project management
- Production of free, creative and inductive thinking

(3) SYLLABUS

Theoretical part of the Course

Road Safety

29.Data Collection and Analysis
30.Correlation of Accidents with Road Environmental Characteristics
31.Correlation of Accidents with User and Vehicle Characteristics
32.Identification of black spots
33.Study of black spots and Improvements
34.Evaluation of Improvement results

Urban Road Network

35.Parking Characteristics – Surveys
36.Layout - characteristics of Parking places
37.Multilevel parking stations – Bus stations
38.Research - Construction – Maintenance
39.Operation & Exploitation of Parking places
40.Financial Data of Parking places

Lab Part of the Course

Students create groups of 4 students and carry out counts of pedestrians and vehicle conflicts at predetermined junctions at a major road artery of Athens area. Based on these counts, the first project concerns the analysis of data collected and the development of traffic conflicts diagrams and the second exercise concerns the calculations of concerns the identification of high risk sites.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	• Face-to-Face • Lectures - interactive teaching in the classroom • Encouraging students to attend related Workshops, Conferences, etc.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	• Presentations in the blackboard • Presentations through Power Point slides
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Theoretical part of the Course • Written exam (70%) Lab Part of the Course • Delivery of individual tasks and oral examination

Activity	***Semester workload***
Lectures	52 (13 X 4)
Students create groups of 4 students and carry out counts of pedestrians and vehicle conflicts at predetermined junctions at a major road artery of Athens area. Based on these counts, the first project concerns the analysis of data collected and the development of traffic conflicts diagrams and the second exercise concerns the calculations of concerns the identification of high risk sites.	60
Study and preparation for the exams	38
Course total	***150***

(5) ATTACHED BIBLIOGRAPHY

60. Book: "Road Safety ", J. Frantzeskakis - J. Golias, 2008
61. Book «Parking», J. Frantzeskakis, M. Pitsiava-Latiopoulou, D. Tsamboulas, 2002

GEO9180 – PROJECT (CONSTRUCTION) MANAGEMENT

COURSE OUTLINE: GEO9180 - PROJECT (CONSTRUCTION) MANAGEMENT

(1) GENERAL

SCHOOL	SCHOOL OF ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF SURVEYING AND GEOINFORMATICS ENGINEERING		
LEVEL OF STUDIES	Undergraduate – Level 7		
COURSE CODE	**GEO9180**	**SEMESTER**	9th
COURSE TITLE	**PROJECT (CONSTRUCTION) MANAGEMENT**		

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 TEACHIN GHOURS**	**CREDITS**
Lectures	3	5
Lab exercises		
Total	**3**	**5**

COURSE TYPE	Extra knowledge for the discipline
PREREQUISITE COURSES:	--
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Offered (English)
COURSE WEBSITE (URL)	

(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.

Upon successful completion of the course, students are expected to:

- Understand the life cycle of technical projects and realize the importance and implications of successful project management.
- Understand the concepts and methodologies of feasibility and value management of projects.
- Know the usefulness of scheduling technical projects, be able to schedule a simple project and be able to calculate the critical path and critical activities of a technical project.
- Understand the problem of allocating resources employed in a technical project and figure out ways to normalize resources.
- Understand the usefulness of financial planning of a technical project and calculate the cumulative cost and revenue-expenditure distribution curves.

- Perceive liquidity problems during the implementation of a technical project.
- Control the progress of the implementation of a technical project with the earned value method.
- Know the basic principles of managing studies and contracts and recognize their importance.
- Recognize the importance of quality management in technical projects and the basic principles of quality assurance.

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?

Upon successful completion of the course, students are expected to acquire the following General Abilities:

- Application of knowledge in practice.
- Search, analysis and synthesis of data and information, using the necessary technologies.
- Project design and management.
- Decision making.
- Adapting to new situations
- Respect for legality.
- Autonomous work.
- Promoting free, creative and inductive thinking.

(3) SYLLABUS

1. Introduction to the subject of project management. Life cycle overview of technical projects & project management.
2. Feasibility analysis and value management of projects.
3. Work Breakdown Structure (WBS) overview
4. Introduction to scheduling technical projects and network analysis methods
5. Overview of the most common network project scheduling methods (CPM methods, PERT. MPM), Time margins, GANTT diagram, critical path, critical activities, etc.
6. Overview of resource allocation planning methods (resource allocation problem, resource allocation diagram, smoothing).
7. Introduction to financial project planning (project budget, cumulative cost curve, direct - indirect costs, cost - revenue statement).
8. Overview of project progress control (earned value method).
9. Introduction to study management.
10. Introduction to contract management.
11. Introduction to quality management (basic infrastructure for quality, ISO 9000 in Construction - Processes. Quality Assurance, Quality Controls in technical projects, etc.)

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	o Lectures - interactive teaching in the classroom. o Encouraging students to prepare for the next lesson. o Encouraging students to attend related Workshops, Conferences, etc. Solve exercises in the classroom in an interactive way and with the participation of students	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	○ Teaching using electronic presentation tools. ○ Support of learning process with asynchronous education platform.	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Lectures	39
	Independent Study	61
	Course total	***150***
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek Methods of evaluation: • Written exam at the end of the semester • Mid-term examination (max 30%)	

(5) ATTACHED BIBLIOGRAPHY

1. Burke, R. (2002). *Project management – Design techniques & control*, KRITIKI PUBLISHING.
2. Ritz, G. (1994). *Total construction project management*. Mcgraw-Hill.
3. Efraimidis X. (1999). *Construction management.*
4. Pantouvakis, P. (2012) *Management of construction projects*, Athens ISBN 978-960-93-4595-8.
5. Polyzos, S. (2018). *Project management – Methods & Techniques*, KRITIKI PUBLISHING
6. Ypsilantis, P. (2005). *Project management – The Greek experience*, Propompos Publishing

10th Semester

GEO1001 – DIPLOMA THESIS

COURSE OUTLINE: GEO1001 – DIPLOMA THESIS

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPT. OF SURVEYING & GEONIFORMATICS ENGINEERING		
LEVEL OF STUDIES	Graduate – Level 7		
COURSE CODE	**GEO1001**	**SEMESTER**	10th
COURSE TITLE	**GEO1001 Diploma Thesis**		
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 Labs			
TOTAL			**30**
COURSE TYPE	Skills development		
PREREQUISITE COURSES			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
OFFERED TO *ERASMUS* STUDENTS	In English		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/modules/auth/opencourses.php?fc=75		

(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.

Basic purpose of the Diploma Thesis is, first, to familiarize students with the process of preparing an extensive self-standing scientific work on a topic within the subject of the Department. At the same time, it aims at a deepening of the knowledge accumulated during their studies and their use at the theoretical/research level or/and that of applications of a certain novelty. Through their Thesis, students are expected to further develop their capability of systematic, critical investigation of international literature, which basically they should gather themselves, and their ability to integrate knowledge from different sources, thus becoming able to address their subject with the appropriate approach. In this sense, the preparation of a Diploma Thesis is of high importance in order to advance the scientific way of though and research for the generation of new knowledge.

Successful completion of the Thesis implies that the students have in fact mastered the scientific fundaments of today's concepts, methodologies and techniques in the field of our Department and are in position to both analyze the components of a problem and recognize their significance, thus being able to rank them. It also means that they are in position to look for the suitable sources through the international literature, in order to have a clear overview of the state-of-the-art, and hence are able to design a both scientifically and practically sound as well effective approach. Finally, it is expected that students will thus be able to realistically evaluate the results of their work, to suggest possible alternatives and to document their conclusions in writing as well as orally during their presentation.

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?

- Practical application of knowledge
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Decision-making
- Working independently
- Production of new research ideas
- Criticism and self-criticism
- Production of free, creative and inductive thinking

(3) SYLLABUS

The Diploma Thesis is an extended work (analytic, synthetic or an application of some novelty), prepared individually by students during the 10th (and last) semester of their studies, in order to further develop their knowledge in a topic of their choice among those offered in our Department. The subject is established in collaboration of the students with the supervising professor of their choice, and the Thesis is prepared by the students under the guidance of the supervisor. The Thesis is the work of the students and documents their ability to complete an autonomous scientific work, to handle with ease the international literature, and to write and present the result by following the rules and principles of the concerned scientific domain.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION ANDCOMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	- Support by the electronic asynchronous course platform *eclass* - Use of commercial and/or self-developed software	
TEACHING METHODS *The manner and methods of teaching are described in detail.* *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*	***Activity***	***Semester workload***
	Study and review of literature	300
	Preparation of Thesis	300
	Writing of the Thesis	300
	Course total	**900**

STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Language of evaluation: Greek (in English for Erasmus students) The evaluation of the Thesis takes place in a public presentation and is rated by a three-member examining committee Criteria of Evaluation: • Originality, theoretical soundness, literature review: 15% • Scientific content (text structure, methodology, research, soundness of conclusions): 70% • Quality of oral presentation: 15%

(5) ATTACHED BIBLIOGRAPHY