

**General course information:**

<b>Course title:</b>	Spatial Analysis Techniques and Remote Sensing Applications in Civil Engineering	<b>Course code:</b>	ΓΚ0910
<b>Credits:</b>	6	<b>Work load (hours):</b>	150
<b>Course level:</b>	Undergraduate <input checked="" type="checkbox"/>	Graduate	<input type="checkbox"/>
<b>Course type:</b>	Mandatory <input type="checkbox"/>	Selective	<input checked="" type="checkbox"/>
<b>Course category:</b>	Basic <input type="checkbox"/>	Orientation	<input type="checkbox"/>
<b>Semester:</b>	9th	<b>Hours per week:</b>	4
<b>Course objectives (capabilities pursued and learning results):</b>			
<p>The course is focused on applied spatial analysis using GIS and remote sensing for civil engineering applications. It includes methods and techniques for modelling spatial processes for decision making. Hence, this course strengthens students' technical and intellectual competency in spatial analysis with GIS and remote sensing in civil engineering applications. The course imparts the basic theoretical and practical understanding represented by the knowledge and skills outcomes via a mix of self-learning and formal teaching, including formal lectures and practicals in the lab sessions with active student participation. Lectures introduce theory and concepts, which are then exemplified in computer labs and exercises using specialist packages and tailored data sets. A substantial piece of coursework will test the students' ability to understand and apply the knowledge they acquire in practice at the lab sessions, including the use of methods and software. In addition, as it is an open ended work it also tests students' initiative.</p>			
<b>Prerequisites:</b> Physics I, Physics II, Probabilities and Statistics, Geographic Information Systems, Technical Drawing and CAD			

**Instructor's data:**

<b>Name:</b>	Dr. Marios Spiliotopoulos – Dr. Lampros Vasiliades
<b>Level:</b>	Laboratory Teaching Staff
<b>Office:</b>	
<b>Tel. – email:</b>	24210-74177-74115 email: <a href="mailto:spilioto@uth.gr">spilioto@uth.gr</a> , <a href="mailto:lvassil@uth.gr">lvassil@uth.gr</a>
<b>Other tutors:</b>	

**Specific course information:**

Week No.	Course contents	Hours	
		Course attendance	Preparation
1	Basic concepts of Physics and Mathematics. Methodologies and applications of Remote Sensing and Photogrammetry.	4	2
2	Electromagnetic radiation. Electromagnetic spectrum. Active and Passive Sensors.	4	2
3	Remote sensing platforms and global applications. Aerial and satellite systems. Map scale and projections. Pros and cons. Lab Applications.	4	2
4	Remote Sensing Image Analysis and Applications. Multi-raster images, radar images. Introduction to radiation, reflection and emission concepts. Preprocessing of satellite images. Radiometric, geometric and atmospheric corrections.	4	3
5	Image filtering. Spectral signatures. Histograms. Linear stretching. Filters. Data editing and standards. Transformation of multispectral images.	4	3
6	Subset and clipping. Image fusion/merge. Image algebra. Vegetation indices and soil interpretation.	4	3
7	Supervised classification. Maximum likelihood rule. Bayes theory. Classification using minimum distance and Mahalanobis distance. Classification accuracy and errors calculation. Non-supervised classifications. Pros and cons.	4	3
8	Change detection theory. Remote sensing and thematic maps analysis. Regions of interest. Applications in earth mapping, ecosystems and land use.. LANDSAT TM, ETM+, SPOT, Quickbird, IKONOS imagery and applications in Greece and worldwide.	4	3
9	Spatial analysis & processing. Accuracy assessment. Applications.	4	3
10	Applications in civil engineering (works construction, urbanization, deforestation, land	4	3

	cover and land use, irrigation, land reclamation projects, water resources, climate change, road construction, geodesy, geotechnical engineering coastal engineering, natural disasters).		
11	Introduction to Remote Sensing commercial software packages (ERDAS IMAGINE or/and ENVI). Image processing and classification techniques. Lab Exercises.	4	3
12	Classification of spatial data. Spatial correlation and autocorrelation.	4	3
13	Spatial Modelling with GIS.	4	3
14	Spatial interpolation advanced techniques (points, lines, polygons).	4	3

<b>Additional hours for:</b>			
<b>Class project</b>	<b>Examinations</b>	<b>Preparation for examinations</b>	<b>Educational visit</b>
55			

**Suggested literature:**

**In Greek:**

Καρτάλης Κ. και Φείδας Χ., 2006. Αρχές και Εφαρμογές Δορυφορικής Τηλεπισκόπησης, εκδόσεις Γκιούρδας, Αθήνα.

Μερτίκας Σ., 2006. Τηλεπισκόπηση και Ψηφιακή Ανάλυση Εικόνας, Εκδόσεις Ίων, Αθήνα.

Μηλιαρέσης, Γ. Χ., 2003. Φωτοερμηνεία – Τηλεπισκόπηση, Εκδόσεις Ίων, Αθήνα.

Περάκης, Κ., Μωυσιάδης, Α., Φαρασλής, Ι. 2015. Η τηλεπισκόπηση σε 13 ενότητες. [ηλεκτρ. βιβλ.] Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: <http://hdl.handle.net/11419/1853>.

Ηλιοπούλου, Π., 2015. Γεωγραφική ανάλυση. [ηλεκτρ. βιβλ.] Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών (<http://hdl.handle.net/11419/2059>).

Καλογήρου, Σ., 2015. Χωρική ανάλυση. [ηλεκτρ. βιβλ.] Αθήνα: Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών (<http://hdl.handle.net/11419/5029>).

**In English:**

Burrough, P.A., and R.A. McDonnell, 1998. «Principles of Geographical Information Systems», Oxford University Press, Oxford, ISBN: 978-0198233657.

Chang, K.-T., 2010. «Introduction to Geographic Information Systems», 5th Ed., McGraw-Hill, ISBN: 978-0071267588.

De Smith, M.J., M.F. Goodchild, P.A. Longley, 2018. «Geospatial Analysis: a Comprehensive Guide to Principles, Techniques and Software Tools», 6th Ed., ISBN: 978-1-912556-05-2.

Heywood, I., S. Cornelius, and S. Carver, 2012. «An Introduction to Geographical Information Systems», 4th Ed., Prentice Hall, Pearson, ISBN: 978-0273722595.  
 Longley, P.A., M.F. Goodchild, D.J. Maguire, D.W. Rhind, 2015. «Geographic Information Systems and Science», 4th Ed., Wiley, ISBN: 978-1118676950.

<b>Teaching method (select and describe if necessary - weight):</b>		
Teaching	<input checked="" type="checkbox"/>	40%
Seminars	<input type="checkbox"/>	.....%
Demonstrations	<input type="checkbox"/>	.....%
Laboratory	<input checked="" type="checkbox"/>	40%
Exercises	<input type="checkbox"/>	20%
Visits at facilities	<input type="checkbox"/>	.....%
Other (describe): .....	<input type="checkbox"/>	.....%
<b>Total</b>		<b>100%</b>

<b>Evaluation method (select)- weight:</b>				
	<u>written</u>	<u>%</u>	<u>Oral</u>	<u>%</u>
Homework	<input type="checkbox"/>		<input type="checkbox"/>	
Class project	<input checked="" type="checkbox"/>	100%	<input type="checkbox"/>	
Interim examination	<input type="checkbox"/>		<input type="checkbox"/>	
Final examinations	<input type="checkbox"/>		<input type="checkbox"/>	
Other (describe): .....	<input type="checkbox"/>		<input type="checkbox"/>	