



No. \_\_\_\_\_ of \_\_\_\_\_

Form code USAMV 0124010212

### SUBJECT OUTLINE

#### 1. Information on the programme

1.1. Instituția de învățământ superior	Universitatea de Științe Agricole și Medicină Veterinară din Cluj-Napoca
1.2. Facultatea	Facultatea de Agricultură
1.3. Departamentul	Protecția mediului și a plantelor
1.4. Domeniul de studii	Ingineria mediului
1.5. Ciclul de studii <sup>1)</sup>	Master
1.6. Specializarea/ Programul de studii	Protecția sistemelor naturale și antropice
1.7. Forma de învățământ	IF

#### 2. Information on the discipline

2.1. Name of the discipline		Environmental geotechnology						
2.2. Holder of course activities				Lecturer.PhD. Călin Safirescu				
2.3. Holder of seminar / laboratory / project activities				Lecturer.PhD. Călin Safirescu				
2.4. Year of study	II	2.5. Semester	I	2.6. . Evaluatii type	Sumative	2.7. Discipline status	Content <sup>2</sup>	FO
							Compulsoriness <sup>3</sup>	DI

#### 3. Total estimated time(teaching hours per semester)

3.1. Number of hours per week - frequency form	3	Out of which: 3.2. lecture	2	3.3. seminar / laboratory / project	1
3.4. Total hours of the educational plan	42	Out of which: 3.5. lecture	28	3.6. seminar / laboratory	14
Distribution of the time fund					ore
3.4.1. Study after manual, course support, bibliography and notes					28
3.4.2. Additional documentation in the library, on specialized electronic platforms and in the field					10
3.4.3. Preparation of seminars / laboratories / projects, topics, reports, portfolios and essays					10
3.4.4. Tutorials					5
3.4.5. Examinations					4
3.4.6. Other activities					
3.7. Total hours of individual study	58				
3.8. Total hours per semester	100				
3.9. Number of credits <sup>4</sup>	5				

#### 4. Preconditions (where applicable)

4.1. curriculum-related	Mathematics, Topography
4.2. of skills	Analysis and use of fundamental concepts and theories in the field of GIS, use of computers

#### 5. Conditions (where applicable)

5.1. for the course	Classroom with video projector
5.2. for the seminar / laboratory / project	Room equipped with computer, video projector, Internet access, blackboard. Academic discipline is required throughout the duration of seminars.



6. Specific skills acquired

Professional skills	Knowledge and understanding of the principles of satellite and aerial imaging, through unconventional methods (multispectral scanning, radiometry / spectrometry, radar, lidar, etc.) and conventional (aerophotography). Knowledge and understanding of the types of images and their characteristics. Using the criteria specific to the geographical interpretation of satellite and aerial images, the introduction of simple working techniques with remote sensing images in digital and analog format. The correct and accurate recognition of the elements of the geographical environment in the satellite and aerial images, of the phenomenology that results from them (natural and social).
Transversal competences	Responsibly applying the principles, norms and values of professional ethics in carrying out tasks and identifying the objectives to be achieved, the available resources, the stages of work, the durations execution, the terms of accomplishment and the risks involved. Identification of roles and responsibilities in a multidisciplinary team and application of relationship techniques and efficient teamwork.

7. The objectives of the discipline (based on the grid of specific skills acquired)

7.1. General objective	Prelucrarea, interpretarea și utilizarea informațiilor aerospațiale în vederea realizării de planuri și hărți de diferite tipuri.
7.2. Specific objective	Identification, definition and description of aerospace information categories based on which plans and maps are made, as well as the correct use of specific (cartographic) language in professional communication. Use of basic cartographic knowledge for the proper processing, interpretation and representation of aerospace information obtained through GPS determinations, aerial photographs and satellite scans, in the elaboration of plans and maps. Application of the basic principles and methods of cartography in the processing of aerial and satellite photographs with the help of analog and digital computer equipment, as well as with the help of digital stereoscopy and computer mapping equipment, etc. for the elaboration of the optical models (3D) of the terrain, of the different types of special maps, diagrams, alphanumeric reports etc.

8. Contents

8.1.Cours Number of hours – 28	Teaching methods	Remarks
1.General notions. Remote sensing, aerophotointerpretation, photogrammetry. History of remote sensing. Examples.	Interactive lecture Ppt presentation (updated) Practical computer demonstrations	2 ore
2. Principles of environmental geotechnology. Remote sensing, electromagnetic radiation, radiation sources, electromagnetic spectrum, radiation behavior, atmospheric windows. Passive principles (multispectral scanning, thermal scanning, television, radiometry) + aerial photography Active principles (radar, lidar, sonar)	Interactive lecture Ppt presentation (updated) Practical computer demonstrations	8 ore
3. The characteristics of images in environmental geotechnology. Scale and topographic effect, spectral signature, spatial, spectral and temporal resolution, power of resolution, contrast, digital number and radiometric resolution, detectability, geometrical properties, processing levels, auxiliary data / image metadata.	Interactive lecture Ppt presentation (updated) Practical computer demonstrations	10 ore
	Interactive lecture Ppt presentation (updated) Practical computer demonstrations	8 ore



4. Elements of image interpretation. Steps, procedures, principles. Direct criteria and indirect criteria. Digital and analog cartographic products and applications.	Interactive lecture Ppt presentation (updated) Practical computer demonstrations	
---	--	--

<b>8.2. SEMINAR</b>		
<b>Număr de ore – 14</b>		
1. Exploration of Landsat TM / ETM + / OLI multispectral satellite data, respectively Sentinel-2 MSI, at the spectral band level. Comparative view and interpretation.	Interactive lecture, Practical computer demonstrations	4 hours
2. Performing Landsat TM / ETM + / OLI and / or Sentinel-2 MSI multispectral combinations on the computer, visual analysis of images and comparisons of natural-false-color spectral signatures.	Interactive lecture, Practical computer demonstrations	4 hours
3. Basic techniques in digital image processing - calibration of multispectral data, contrast corrections, filters, data mergers at different resolutions.	Interactive lecture, Practical computer demonstrations	6 hours
4. Extraction by thematic classification of geospatial information from the Landsat TM / ETM + / OLI and Sentinel-2 MSI images, in the context of making land cover maps.	Interactive lecture, Practical computer demonstrations	4 hours
5. Mono and stereoscopic operation of analogue aerial frames using optical instruments. Visual interpretation and mapping of landforms and land use.	Interactive lecture, Practical computer demonstrations	6 hours
6. Measurements on aerial images using stereoscopic instruments.	Interactive lecture, Practical computer demonstrations	4 hours
<i>Bibliography Required:</i>		
1. Mihai, B.A., Nistor, C., Săvulescu, I. (2013) Dicționar enciclopedic de teledetecție cu elemente de fotogrammetrie și analiza imaginilor, Volumul I (A-Î), Editura Universității din București.		
2. Njoku, E. (coord.) (2014) Encyclopaedia of remote sensing, Springer Reference, Springer Science and Business Media, New York.		
3. Richards, J.A., Xiuping, J. (2006) Remote sensing digital image analysis, Springer		
<i>Optional bibliography:</i>		
1. Chuvieco, E. (2016) Fundamentals of satellite remote sensing, CRC Press, Taylor and Francis, Boca Raton-London-New York		
2. Grigore, M. (1996) Aerofotointerpretare geografică, Ed. Fundației România de Măine, București		
3. Lillesand, T., Kiefer, R., Chipman, J. (2015) Remote sensing and image interpretation, J. Wiley and Sons, London. Mihai, B.A. (2007) Teledetecție. Introducere în procesarea digitală a imaginilor., Ed. Universității din București		

**9. Corroborating the contents of the discipline with the expectations of the representatives of the epistemic communities, professional associations and representative employers in the field related to the program**

The exemplification of the theoretical topics is based on the practical activity in which the course holder and members of the department carries out within the framework of research activities, consultancy and expertise carried out with entities from the economic environment.

**10. Evaluation**

Activity type	10.1. Evaluation criterias	10.2. Methods of evaluation	10.3. Weight in the final grade
<b>10.4. Cours</b>	Assessment during the course	Written tests for about 1 hour	50%



<b>10.5. Seminar</b>	During the evaluation of the acquisition of the practical activities	Discussions, tests - duration of evaluation 2 hours	50%
<b>10.6. Minimum standard of performance</b>			
Fulfillment of at least 50% of the evaluation criteria for the course.			
Obtaining a minimum grade of 5 at the colloquium is a condition of promotability.			

- <sup>1</sup> The cycle of studies - one of the variants is chosen - Bachelor / Master / Doctorate
- <sup>2</sup> The regime of the discipline (content) - for the license level one of the variants is chosen - DF (fundamental discipline), DD (discipline in the field), DS (specialty discipline), DC (complementary discipline).
- <sup>3</sup> The regime of the discipline (compulsory) - one of the variants is chosen - DI (compulsory discipline) DO (optional discipline) DFac (optional discipline).
- <sup>4</sup> A credit is equivalent to 25-30 hours of study (teaching activities and individual study).

Date completed  
04.09.2019

Titular curs  
Lecturer. PhD. Calin Safirescu

Titular lucrări laborator/seminarii  
Lecturer. PhD. Calin Safirescu

Date of approval in the  
department  
05.09.2019

Department Director  
Professor. PhD. Ioan OROIAN