

## COURSE OUTLINE

### 1. GENERAL

<b>SCHOOL</b>	Engineering		
<b>DEPARTMENT</b>	Environmental Engineering		
<b>LEVEL OF STUDIES</b>	Undergraduate		
<b>COURSE CODE</b>	<b>15HY6N-K1</b>	<b>SEMESTER</b>	<b>8th</b>
<b>COURSE TITLE</b>	Geographic Information Systems for assessment of climate change		
<b>TEACHING ACTIVITIES</b>	<b>TEACHING HOURS PER WEEK</b>	<b>ECTS CREDITS</b>	
<i>If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.</i>			
2 hours of lectures per week and 1 hour of practical problem solving with R scripts	3 hours	5	
<i>Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.</i>			
<b>COURSE TYPE</b> <i>Background, General Knowledge, Scientific Area, Skill Development</i>	Scientific area, skill development		
<b>PREREQUISITES:</b>	None		
<b>TEACHING &amp; EXAMINATION LANGUAGE:</b>	Greek		
<b>COURSE OFFERED TO ERASMUS STUDENTS:</b>	Yes. The course is offered in English for Erasmus+ students		
<b>COURSE URL:</b>	<a href="https://eclass.duth.gr/courses/TMC354/">https://eclass.duth.gr/courses/TMC354/</a>		

### 2. LEARNING OUTCOMES

<b>Learning Outcomes</b> <i>Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.</i>																
<ul style="list-style-type: none"> <li>Familiarization with the use of remote sensing data for global change detection.</li> <li>Familiarization with processing of climate scenarios.</li> <li>Development of skills through the application of GIS, to determine and model land use changes and scenario development.</li> <li>Open source code development – R scripting</li> </ul>																
<b>General Skills</b> <i>Name the desirable general skills upon successful completion of the module</i>																
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<ul style="list-style-type: none"> <li>Understanding the meaning of natural and human induced climate changes and their impacts on natural and human systems and ecosystems.</li> <li>Development of the skills to determine risk factors that are related to exposure and vulnerability to climate changes.</li> <li>Development of skills to determine land use changes.</li> </ul>																

- Development of skills to design mitigation measures at minimum cost.

### 3. COURSE CONTENT

1. Introduction to climate changes, natural and man induced climate changes.
2. IPCC climate scenarios - ensemble data - bias correction methods.
3. Determination of global changes
4. Observed and anticipated effects of climate change on natural and human environment and on ecosystems: Droughts, storm surges, sea level rise, sea waves, effects on coastal areas, landslides, coast erosion, desertification, soil water content changes, fires.
5. Observed and anticipated effects of climate change on human systems: impacts on urban areas, infrastructures, transportation, tourism, crop production.
6. Observed and expected land use changes - Land use change modeling.
7. Mitigation and adaptation: risk management and assessment through adaptation measures. Mitigation versus adaptation. Sustainable ecosystem services. The role of technology on mitigation measures, examination of alternatives and decision making.
8. Bioclimatic variables – Access WORLDCLIM data sets
9. Global Ice sheet changes – the GRACE mission. Access and analysis of GRACE Greenland and Antarctic Ice Sheet data sets
10. Land Surface Temperature Trend assessment: Access and analysis on MODIS LST datasets
11. Determination of vegetation changes: Access and analysis of MODIS NDVI datasets
12. Land use changes determination, Land use change modeling - use of explanatory variables
13. Development of REDD scenario

### 4. LEARNING & TEACHING METHODS - EVALUATION

<p><b>TEACHING METHOD</b> <i>Face to face, Distance learning, etc.</i></p>	<p>Face-to-face teaching with Power Point presentations. All presentations available with additional study material and assignments via e.class platform</p>	
<p><b>USE OF INFORMATION &amp; COMMUNICATIONS TECHNOLOGY (ICT)</b> <i>Use of ICT in Teaching, in Laboratory Education, in Communication with students</i></p>	<p><b>ICT is used throughout the course activities in teaching, laboratory exercises and communication. The course is strongly oriented to the use and application of open source software and open data analysis.</b></p>	
<p><b>TEACHING ORGANIZATION</b> <i>The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research &amp; analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.</i></p> <p><i>The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</i></p>	<p><b>Activity</b></p>	<p><b>Workload/semester</b></p>
	<p>Lectures – face to face</p>	<p>26</p>
	<p>Exercises - supervised</p>	<p>19</p>
	<p>Bibliographic research - unsupervised</p>	<p>26</p>
	<p>Problem solving - unsupervised</p>	<p>26</p>
	<p>Project development - supervised</p>	<p>40</p>
	<p>Presentation preparation - unsupervised</p>	<p>13</p>

<p align="center"><b>STUDENT EVALUATION</b></p> <p><i>Description of the evaluation process</i></p> <p><i>Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others</i></p> <p><i>Please indicate all relevant information about the course assessment and how students are informed</i></p>	<p>Assessment is based on four assignments. Students are expected to submit their assignments to e.class platform and present their findings in audience.</p>
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## 5. SUGGESTED BIBLIOGRAPHY

- IPCC. (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Core Writing Team, Pachauri , R.K. Meyer, L.A.  
<https://doi.org/10.1017/CBO9781107415324.004>  
<https://www.ipcc.ch/report/ar5/syr/>
- Working Group I Report Climate Change 2013: The Physical Science Basis:  
<https://www.ipcc.ch/report/ar5/wg1/>
- Climate Change 2014: Impacts, Adaptation, and Vulnerability  
<https://www.ipcc.ch/report/ar5/wg2/>
- Climate Change 2014: Mitigation of Climate Change:  
<https://www.ipcc.ch/report/ar5/wg3/>
- SOER 2015 — The European environment — state and outlook 2015  
<https://www.eea.europa.eu/soer-2015/synthesis/to-eyropaiko-periballon-2014-katastasi>
- Geographic information Science. PAUL A. LONGLEY, MICHAEL F. GOODCHILD, DAVID J. MAGUIRE, DAVID W. RHIND

## ANNEX OF THE COURSE OUTLINE

### Alternative ways of examining a course in emergency situations

<b>Teacher (full name):</b>	Alexandra Gemitzi
<b>Contact details:</b>	agkemitz@env.duth.gr
<b>Supervisors: (1)</b>	YES
<b>Evaluation methods: (2)</b>	Oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured
<b>Implementation Instructions: (3)</b>	The oral examinations are conducted through presentation in Teams platform of the assignment conducted by each student. Five questions are set to the student and the grade is extracted by the assessment of the quality and clarity of presentation and the correctness of answers provided to the questions. Students should be equipped with a microphone, camera, internet connection and should be connected to the Teams platform. The inviolability of the exam is guaranteed by the identification of the student and the presence of a second examiner throughout the exams process.

(1) Please write YES or NO

(2) Note down the evaluation methods used by the teacher, e.g.

- *written assignment* or/and exercises
- written or oral examination with distance learning methods, provided that the integrity and reliability of the examination are ensured.

(3) In the **Implementation Instructions** section, the teacher notes down clear instructions to the students:

a) in case of **written assignment and / or exercises**: the deadline (e.g. the last week of the semester), the means of submission, the grading system, the grade percentage of the assignment in the final grade and **any other necessary information**.

b) in case of **oral examination with distance learning methods**: the instructions for conducting the examination (e.g. in groups of X people), the way of administration of the questions to be answered, the distance learning platforms to be used, the technical means for the implementation of the examination (microphone, camera, word processor, internet connection, communication platform), the hyperlinks for the examination, the duration of the exam, the grading system, the percentage of the oral exam in the final grade, the ways in which the inviolability and reliability of the exam are ensured and any other necessary information.

c) in case of **written examination with distance learning methods**: the way of administration of the questions to be answered, the way of submitting the answers, the duration of the exam, the grading system, the percentage of the written exam of the exam in the final grade, the ways in which the integrity and reliability of the exam are ensured and any other necessary information.

There should be an attached list with the Student Registration Numbers only of students eligible to participate in the examination.