COURSE OUTLINE

1. COURSE INFORMATION

SCHOOL	Mineral Resources Engineering		
DEPARTMENT	Mineral Resources Engineering		
COURSE LEVEL	Graduate		
COURSE ID		**SEMESTER**	Spring
COURSE TITLE	Data Science for Exploration and Exploitation		

COURSE MODULES *in the case of credits being awarded in distinct parts of the course eg. Lectures, Laboratory Exercises, etc. If credit units are awarded uniformly for the whole course, indicate the weekly hours of teaching and the total number of credits.*	**INSTRUCTION HOURS PER WEEK**	**CREDITS**
Lectures	3	10
Tutorial Exercises/Laboratories	2	
Total		
Add rows if needed. The teaching organization and teaching methods used are described in detail in (4).		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skills Development*	General background
PREREQUISITES:	
INSTRUCTION/EXAM LANGUAGE:	English
THE COURSE IS OFFERED TO ERASMUS STUDENTS:	
COURSE URL:	EURECA PRO LMS Moodle URL: https://moodle.eurecapro.tuc.gr/course/view.php?id=74

2. LEARNING OUTCOMES

The learning outcomes of the course describe the specific knowledge, skills and competences of an appropriate level that students will acquire after successfully completing the course.

Refer to Appendix A.

- *Description of the Level of Learning Outcomes for each course of study in line with the European Higher Education Area Qualifications Framework*
- *Descriptive Indicators of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Annex B*
- *Learning Outcomes Writing Guide*

After completing this course the student will be able to perform:

- Data input/output commands
- Use data variables
- Arithmetic operations, iterations, control structures, vectors and matrices, use of data files, subroutines and functions

General Competencies/Skills

Considering the general competencies that the graduate must have acquired (as listed in the Diploma Supplement and below), which one(s) the course enhances?

Search, analysis and synthesis of data and information, using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Project design and management
Respect for diversity and multiculturalism
Respect for the natural environment
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Exercise criticism and self-criticism

Co-funded by the Erasmus+ Programme of the European Union

Working in an international environment *Working in an interdisciplinary environment* *Production of new research ideas*	*Promoting free, creative and inductive thinking*

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 an interdisciplinary environment
Production of new research ideas
Project design and management
Respect for diversity and multiculturalism
Respect for the natural environment
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Exercise criticism and self-criticism
Promoting free, creative and inductive thinking

3. COURSE SYLLABUS

Content

Week 1. Introduction to image analysis

Week 2. Image enhancement

Week 3-4. Image analysis

Week 5. Convolutional Neural Networks

Week 6. Introduction to geophysical methods

Week 7. Gravity and magnetic methods

Week 8. Electrical and electromagnetic methods

Week 9. Data acquisition, enhancement and interpretation

Week 10-11. Spatial/spatiotemporal geostatistical analysis principles

Week 12. Conditional Simulation methods

Week 13. Uncertainty propagation

4. TEACHING and LEARNING METHODS – ASSESSMENT

LECTURE METHOD *Face to face, distance learning, etc.*	Face to Face/distance learning
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in Teaching, in Laboratory Exercises, in Communication with students*	In Teaching: - PC - eclass - web Apps In Laboratory/Tutorials Education: - PC - eclass

	- moodle In Communication with Students: - PC - eclass

TEACHING ORGANISATION

Describe in detail the way and methods of teaching.
Lectures, Seminars, Laboratory Exercise, Field Exercise, Literature review & analysis, Tutoring, Practice (Placement), Clinical Exercise, Artistic Lab, Interactive teaching, Educational visits, Project work, project, etc.

The student's study hours for each learning activity and the hours of non-guided study according to the ECTS principles are mentioned.

ACTIVITY	***Workload per semester (in Hours)***
Lectures	39
Tutorials/labs	26
Tutorials/lab assignments	30
Projects	60
Autonomous study	50
Literature Review	45
	250
Course Total (25 hours' workload/ECTS credit)	***250***

ASSESSMENT METHODS

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Public Presentation, Laboratory Assignment, Clinical Examination of Patients, Artistic Interpretation, Other

Well defined student assessment criteria are mentioned. Mention whether and how the students can access them.

Written Final Examination 40%
(Multiple Choice Questions / Matching)
(Comparative evaluation of theoretical issues)
(Short answer questions)
(Problem solving questions)

Individual Project 30%
(Public Presentation)
(Oral Exam)
(Project Score)

Tutorial/lab projects 30%
(Project Score)

5. DIGITIZATION (use of tools & software)

- Matlab software
- Open source machine learning software
- R-studio (CRAN)
- E-Z Variogram analysis

6. RECOMMENDED INTERNATIONAL LITERATURE

- Digital Image Processing by Rafael Gonzalez, Richard Woods
- Geophysics for the Mineral Exploration Geoscientist by Michael Dentith, S.T. Mudge
- Varouchakis, Emmanouil A. "Geostatistics: mathematical and statistical basis.". Elsevier, 2019. 1-38.
- Varouchakis, E.A., 2019. 2 - Background of Spatiotemporal Geostatistical Analysis: In: Corzo, G., Varouchakis, E.A. (Eds.), Spatiotemporal Analysis of Extreme Hydrological Events. Elsevier, pp. 39-57.

Acknowledgement: *"Co-funded by the ERASMUS+ Programme of the European Union" (Contractnumber: 101004049 — EURECA-PRO — EAC-A02-2019 / EAC-A02-2019-1)*