COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING		
ACADEMIC UNIT	DEPARTMENT OF MINERAL RESOURCES ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	MRE831	SEMESTER	8/3rd orientation
COURSE TITLE	Environmental Restoration in Mining and Geotechnical Operations		

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
Labs	1	1
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*
PREREQUISITE COURSES:	There are no prerequisite courses
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	
COURSE WEBSITE (URL)	https://mre.uowm.gr/wp-content/uploads/sites/6/2019/07/%CE%9C%CE%9F%CE%A0831.pdf

(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*

Students should be able to:

- make use of the rules and techniques of environmental restoration (plan and design) in mining and geotechnical operations as well as, in geotechnical infrastructure projects.
- Understand the issues of environmental-green design, of the disturbed lands after the mining activity and the positioning of new activities with emphasis on environmental, social, economic and aesthetic criteria of the new designed landscape.
- To estimate the "just transition" procedures of coal mining areas and energy alternatives in regions of high carbon footprint.

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	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Reuse / restore depleted mining and quarrying areas with the positioning of new clean and green land activities such as: (sports, leisure and cultural events, landfill-municipal or hazardous wastes, tourist and conference facilities, etc.).
- utilize the waste / by-products of the mining-quarrying activities, giving emphasis on new uses of high added value (fillers, abrasives, etc.).
- Risk assessment and management of degraded lands and polluted areas from the industrial and mining activity aiming to minimize the ecosystem impacts and protect the risk of public health as well as the remediation of the area and facilities.
- Understand the meaning of green planning and environmental protection in mining and quarrying plans and projects.
- Utilize contemporaneous methodological tools for a better environmental management and resolve Brownfield questions.
- Find solutions in a critical issues of the mining activity, achieving sustainable and regional development goals, which is based on technological innovation, the optimal exploitation of the mineral wealth, better environmental management, showing social, professional and ethical responsibility.
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(3) SYLLABUS

Introduction. Description of principles and methods of environmental design and restoration of mining and quarry's activities. Environmental restoration and rehabilitation of mining and geotechnical projects. Mineral aggregates and environment, problems of aggregates and quarry's restoration. Marbles and environment, issues of environmental restoration in depleted marble areas. Lignite and environment, models for the restoration of coal mining areas. Gold and environment, the case of Halkidiki Greece. Hydrocarbons and environment, modern management problems. Blue mining activities. General planning principles for optimal environmental protection. Decision-making process for the implementation of restoration measures. Factors affecting restoration and new land uses, alternative criteria for the evaluation of a project. The inactive mining and quarrying activities. Research techniques for the restoration of abandoned areas. Rehabilitation in underground, surface and quarry operations. Rehabilitation and remediation of contaminated soils. Aesthetic restoration and analysis of the landscape. Climatic, geological and soil characteristics, for environmental restoration. Underground and

surface hydrology of the landscape, trends in restoration. Utilization and environmental restoration of disturbed mining areas, landscaping, vegetation, aesthetic organization of the landscape. Vegetation and handling of aesthetic improvement of the landscape. Recreation and tour of restored lands. Problems of abandoned land from excavations and prospects of the restored mining areas. Brownfield land, restoration of abandoned industrial and mining facilities, The case of Lavrio, AEVAL, Zidani, etc.
Exercises: 1. Environmental impacts from the opening and operation of a surface mine - quarry. 2. Design and estimation of soil remediation costs in a surface lignite mine, 3. Design and estimation of soil remediation costs in a marble quarry, 4. Design of landscape / slope conservation projects on high traffic roads (eg Egnatia).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face-to-face, Distance learning, Lectures, Lab demonstration, Tutorials
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	E-Class, electronic communication, video demonstrations, intermediate exams via e-Class tools
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*	
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.*	Final exam (60%, minimum required grade = 4/10), Multiple choice intermediate exam (20%), Homework (20%)

Activity	*Semester workload*
Lectures	36
Lab	12
Tutorials	32
Self-study	20
Course total	***100***

(4) SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:

1. Τσαλικίδης, Ι. 2008. Αρχιτεκτονική τοπίου. Έκδοση: 1η ISBN: 978-960-458-016-3 Εκδόσεις Επίκεντρο Α.Ε.
2. Τσαλικίδης, Ι., Αθανασιάδου Ε. 2009. Αειφορικός Σχεδιασμός Χρήσεων Γής. Εκδόσεις ΓΑΡΤΑΓΑΝΗΣ ΑΓΙΣ-ΣΑΒΒΑΣ.

3. Χατζηστάθης, Α., Ισπικούδης Ι., 1995. Προστασία της φύσης και αρχιτεκτονική του τοπίου. Εκδόσεις Γιαχούδη Γιαπούλη. Θεσσαλονίκη.
4. Ανανιάδου – Τζημοπούλου, Μ. 1997. Αρχιτεκτονική Τοπίου – Σχεδιασμός αστικών χώρων. Τόμος Α., Εκδόσεις ΖΗΤΗ, Θεσσαλονικη.
5. Canter, L. 1999. Environmental impact assessment. Mc Graw Hill.
6. Meuser H. 2013. Soil Remediation and Rehabilitation: Treatment of Contaminated and Disturbed Land: Kindle Edition. Springer.
7. Berger, J. 2013. Environmental Restoration: Science and Strategies for restoring The Earth. Kindle Edition. Island Press, Washington DC.
8. Tongway D.J. and Ludwig J.A. 2011. Restoring Disturbed Landscapes: Putting Principles into Practice. The Science and Practice of Ecological Restoration Series. Society for ecological restoration International. Kindle Edition. Island Press, Washington DC.
9. Falk, D.A., Palmer M., Zedler J., Hobbs R.J. 2006. Foundations of Restoration Ecology (The Science and Practice of Ecological Restoration Series. [Kindle Edition] Society for ecological restoration International. Kindle Edition. Island Press, Washington DC.
10. Doyle, M., Drew C. 2008. Large-Scale Ecosystem Restoration: Five Case Studies from the United States. The Science and Practice of Ecological Restoration Series. Society for ecological restoration International. Kindle Edition. Island Press, Washington DC.
11. Higuchi, T. 1983. The visual and Spatial Structure of Landscape. Cambridge, MA: MIT Press.
12. LYNCH, K. HACK, G. 1984. Site planning, Mit Press, Cambridge Mass., USA
13. LOVEJOY, D. 1973. Land use and landscape planning, Leonard Hill Books, Bucks, UK.
14. THOMPSON, G., & STEINER, F. 1997. Ecological design and planning, John Wiley & Sons, New York, USA
15. Parker, J., Bryan, P. 1989. Landscape management and maintenance. Gower, UK.
16. Βουρνάς Τ. 2011. Τα Λαυρεωτικά και η χρεωκοπία του 1893. Εκδόσεις «τα Νέα & Φυτράκη», Αθήνα.
17. Λαυρεωτικά 1869-1873. (2011). Η πρώτη αρπαγή δημόσιας περιουσίας. Εκδόσεις Ιστορικά, Ελευθεροτυπία 2011, Αθήνα.

- Related academic journals:
Restoration Ecology
Ecological Management & Restoration
Restoration Ecology Journal
Ecological Restoration