1.1.1 Rock Mechanics and Tunnels

GENERAL

SCHOOL	Engineering		
ACADEMIC UNIT	CIVIL ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ΓΕΩ006	**SEMESTER**	7th
COURSE TITLE	Rock Mechanics and Tunnels		

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**
	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*	Specialization Course
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

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*

The aim of the course is the student to be able to realize and assess the basic characteristics of geological (rock) and soil formations in relation to the design and construction of tunnels and underground structures.
Upon completion of the course, the student will be able to:
• to recognize, understand and assess the basic parameters of rock and soil formations and evaluate the parameters of their mechanical behavior
• to distinguish and select among the different approaches regarding the design and construction methods of underground structures.
• to assess and evaluate the level of safety due to the various risks of failure of a tunnel

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

Respect for difference and multiculturalism

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

The course contributes to the acquirement of the following capabilities:
- Search, analysis and synthesis of information and data using the appropriate technology
- Decision making
- Student individual project
- Design of structures
- Respect of the physical environment

SYLLABUS

Design and analysis of tunnels and underground structures in a preliminary level. Excavation and support of underground structures and structural configuration based on the current code requirements.
Contents of the theory lectures and application exercises:
- Introduction to the subject of underground structures and their importance- Type of tunnels and different construction methods
- Geological and geotechnical parameters that are related to the underground structures
- Physical characteristics, mechanical behavior and failure criteria of the intact rock and rockmass.
- Mechanical behavior of rock and soil formations in relation to the construction of underground structures- pertinent laboratory tests to define critical characteristics
- Study and design of tunnels (distribution of stresses and deformations, excavation of tunnels, NATM and TBM methods, support of tunnel walls, waterproofing of tunnels, etc.). Presentation of numerical methods.
- Monitoring of the behavior of underground structures
- Specific construction subjects

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	
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*	Final written exam that comprises: •Theoretical questions of knowledge and critical thinking • Solving of problems-exercises Delivering of an individual project that comprises:

Activity	***Semester workload***
Lectures	26
Practice/exercises	26
Practice/exercises	30
Individual study	48
Course total (26 hours workload per ECTS credit)	***130***

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.*	• Processing and solving of subjects pertinent to the study of underground structures-tunnels • Examination of the basic concepts of the subject

ATTACHED BIBLIOGRAPHY

• [in Greek] Μαραγκός Δ. (2000), "Τεχνικά Έργα Υποδομής (2η έκδοση)", Εκδόσεις Νικόλαος Μαραγκός, ISBN: 960-7834-00-3
• [in Greek] Κωστόπουλος Σ. (2014), " Σήραγγες. Κατασκευαστική Τεχνική, Υπολογιστική Διερεύνηση, Συμβασιακά Θέματα", Εκδόσεις Ίων, ISBN: 978-960-508-115-7
• [in Greek] Αγιουτάντης Γ.Ζ. (2019), " Στοιχεία Γεωμηχανικής. Μηχανική Πετρωμάτων", Εκδόσεις Ίων, ISBN: 978-960-508-302-1