COURSE CONTENT
UNDERGRADUATE PROGRAM

GENERAL

SCHOOL	NATURAL SCIENCES			
ACADEMIC UNIT	GEOLOGY			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**Geol_001**	**SEMESTER**	1rst	
COURSE TITLE	**MINERALOGY I**			
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**	
Lectures, seminars and laboratory work		2 (lect.) 3 (lab.)	6	
COURSE TYPE	Field of Science (Introduction to Mineralogy)			
PREREQUISITE COURSES:	Typically, there are not prerequisite course.			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/GEO300			

LEARNING OUTCOMES

Learning outcomes

At the end of this course the student are able to :

1. To know the distribution of chemical elements in the crystal structure of minerals.
2. Confirm the elements of crystals symmetry and arrangement with one of the crystal systems.
3. Determinate the physical properties of minerals and their microscopic optical properties.
4. Learn the theory and recognize the minerals using X-Ray Diffraction.

At the end of the course the student have further developed the following skills/competences

1. Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories a) of crystallography, b) optical properties of minerals and c) relating to chemistry of minerals and correlation with their crystal structure
2. Ability to apply such knowledge and understanding to the solution of problems of an unfamiliar nature.
3. Ability to adopt and apply methodology to the solution of unfamiliar problems.
4. Study skills needed for continuing professional development.
5. Ability to interact with others on inter or multidisciplinary problems.

In addition students with the help of the tutor they act successively as teachers and as students as well, facing teaching problems.

General Competences

- Retrieve, analyze and synthesize data and information, using the necessary technologies
- Decision making
- Adapt to new situations
- Working in an interdisciplinary environment
- production of new research fields

SYLLABUS

1. Introduction to Mineralogy
2. Origin of chemical elements
3. Crystallography Part I
4. Crystallography Part II
5. Chemistry of minerals Part I

6. Chemistry of minerals Part II
7. Physical properties of minerals Part I
8. Physical properties of minerals Part II
9. Optical properties of minerals Part I
10. Optical properties of minerals Part II
11. Study of the minerals using optical microscopy Part I
12. Study of the minerals using optical microscopy Part II
13. Study of the minerals using X-Ray Diffraction.

Students teaching a selection of courses in front of an audience. Expanding students' knowledge, developing their skills and forming positive attitudes in relation to the use and pedagogical utilisation of Technology, Informatics and Communication tools. Using a questionnaire, with closed and open type questions, where the views of students that participated in the interdisciplinary exercises as teachers and as students have been recorded.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	**Teaching using Power point laboratory exercises, examples.**
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Laboratory work (3 conduct hours per week x 13 weeks)	3X13 = 39
Tutorial (1 conduct hour per week x 13 weeks)	1X13 = 13
Hours for private study of the student and preparation of home-works	72
Total number of hours for the Course	**150 hours**

STUDENT PERFORMANCE EVALUATION	Written final examination and problem solving. Exams on Petrographic Microscope.

ATTACHED BIBLIOGRAPHY

1. Π.Τσώλη-Καταγά, Χ. Καταγάς, Εισαγωγή στην Ορυκτολογία, 2009. 238 p.
2. Π.Τσώλη-Καταγά, Β. Τσικούρας, Εισαγωγή στις Εργαστηριακές Ασκήσεις, 2003. 107σελ.
3. Perkins, D., Mineralogy. Prentice-Hall, Inc. New Jersey. 484p, 1998.
4. Nesse, W.D., Introduction to Mineralogy. Oxford University Press. New York, Oxford, 442p. 2000.
5. Dyar, M.D., Gunter, M.E., Tasa, D. Mineralogy and Optical Mineralogy. Mineralogical Society of America, Chantilly, VA. 708p, 2008.
6. MacKenzie, W.S., Guilford, C., Atlas of the Rock-forming Minerals in Thin Section, Lonman, 98p, 1980.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_002**	**SEMESTER**	1rst
COURSE TITLE	**PLANET EARTH**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work, Fieldwork	2(L), 2(LW)	6

COURSE TYPE	General knowledge, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO339/

LEARNING OUTCOMES

Learning outcomes

Upon successful completion of this course , the students are able to:

- Define, explain and summarize the basic physical geography and surface geological processes
- Analyze and evaluate survey topographic data and maps as well as to draw and design topographic cross sections
- Clarify the dynamics of surface processes
- Introduce them to the main minerals and sedimentary rocks
- Introduce them to the water cycle and glacier, groundwater, streams and drainage systems

General Competences

Search for, analysis and synthesis of data and information, with the use of the necessary geological tools (maps, bibliography, reports etc)
Introduce the students to the main topics of Geology

SYLLABUS

Theory

- The external earth processes - surface of earth
- Strata and Stratigraphy
- Geological time and methods of determination
- Soils weathering and mass movements, landslides
- Streams and Drainage systems
- Glacial and groundwater
- Sediments and sedimentary rocks
- The dynamic earth
- Earth and internal properties
- Main tectonic structures
- History of the continents – plate tectonics
- Bowens reaction series
- Magma, Volcanoes and Igneous rocks
- Metamorphism and metamorphic rocks
- Earthquakes

Laboratory

- The use of topographic and geological maps, geological compass and draw-design geological cross sections
- The main sedimentary rocks
- The main volcanic, igneous and metamorphic rocks

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	In classroom and in laboratory (face-to-face) and in the field, as well as preparation of field work reports
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (power point) in teaching Support of Learning Process and Dissemination of educational material through the University of Patras e_class platform.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	13*2=26
Laboratory work (2 conduct hours per week x 13 weeks)	13*2=26
Interpretation and writing of the exercises	13*3=39
Project preparation	13*2=26
Individual Study	39
Course total	**156**

STUDENT PERFORMANCE EVALUATION	Final Exam (80% theory and 20% laboratory), written, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving. Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams. Marking Scale: 0-10. Minimum Passing Mark: 5. Students are obliged to attend all laboratory class and to deliver the results of all exercises. Maximum number of non delivered laboratory exercises: 2

ATTACHED BIBLIOGRAPHY

- Suggested bibliography mainly in Greek:
1. Σημειώσεις Μαθήματος Θεωρίας και Εργαστηρίου που παρέχονται σε pdf μέσω e-class.
2. Γεωλογία Αρχές και Εφαρμογές, Θ. Δούτσος 421 σελ, Παρέχεται μέσω ΕΥΔΟΞΟΣ
3. Γεωλογία Η επιστήμη της Γης, Παπανικολάου και Σιδέρης 291 σελ Παρέχεται μέσω ΕΥΔΟΞΟΣ
4. Διερευνώντας τη Γη, Δερμιτζάκης και Λέκκας 593 σελ.
5. Physical Geology, Skimmer- Porter, John Wiley & Sons 1987
6. Earth Surface Processes Landforms and Sediment Deposits, Bridge and Demicco, Cambridge Univ. Press 2008

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_003**	**SEMESTER OF STUDIES**	1rst
COURSE TITLE	**PRINCIPLES OF OCEANOGRAPHY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	2(L), 2(LW)	5

COURSE TYPE	General knowledge, Scientific Area, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO369/

LEARNING OUTCOMES

Learning outcomes

Upon successful completion of this course , the students are able to:

- Define, explain and summarize the basic principles of Oceanography
- Analyze and evaluate scientific data to create a conclusion about oceanographic processes
- Clarify the dynamics of the oceans
- Discuss and combine techniques for the management of the oceans

General Competences

- Data retrieval, analysis and synthesis of data and information through the use of new information technologies
- Adapting to new situations.
- Decision making.
- Individual work
- Production of new research ideas.
- Respect for the natural environment.
- Promotion of free, creative and inductive way of thinking

SYLLABUS

Theory

- Introduction to the oceans, including a history of oceanography and its early development
- Practices and methods in oceanography
- Introduction to the study of the seafloor and marine sediments
- Geological aspects related to ocean basins
- Basic properties of the oceans

Laboratory

- Navigation and positioning in the sea, production of maps related to the seafloor relief
- Analysis and interpretation of marine sediments
- Analysis and interpretation of physical properties of sea water (temperature, salinity, density)

Microteaching

Students develop skills to design and implement an integrated teaching intervention on topics related to Oceanography. Students, after an initial familiarization with Oceanography issues, undertake a specific subject and plan a full-scale didactic intervention, including a 20-hour assessment, which includes all stages of a full-time teaching. Emphasis is placed on the conducting of the teaching by the students / students to their classmates (simulation of classroom conditions).

TEACHING AND LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>In classroom and in laboratory (face-to-face)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of Information and Communication Technologies (ICTs) (power point) in teaching
• Support of Learning Process and Dissemination of educational material through the e_class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Work Load</th></tr>
<tr><td>Lectures (2 conduct hours per week x 13 weeks)</td><td>2X13 = 26 (hours)</td></tr>
<tr><td>Laboratory work (2 conduct hours per week x 13 weeks)</td><td>2X13 =26 (hours)</td></tr>
<tr><td>Individual Study</td><td>34 (hours)</td></tr>
<tr><td>Interpretation and writing of the exercises</td><td>3X13 =39 (hours)</td></tr>
<tr><td>Total contact hours and training</td><td>125</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>I. Theory
Final Exam, written, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving.
Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams.
Marking Scale: 0-10.
Minimum Passing Mark: 5.
II. Laboratory
Students are obliged to attend all laboratory classes and to deliver the results of all exercises.
Maximum number of non delivered laboratory exercises: 3</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Books :

«Μηχανική των ωκεανών», υπό Παπαθεοδώρου Γ., Φερεντίνος Γ., Γεραγά Μ., Εκδόσεις Πανεπιστημίου Πατρών, ISBN: 978-960-530-142-2, Ιστότοποι,

Relative scientific journals:

Marine Geology
Deep-Sea Research
Journal of Physical Oceanography
Global and Planetary Change

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol_004**	**SEMESTER**	1rst
COURSE TITLE	**CHEMISTRY**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS**
	Lectures and seminars	4 (3 lect. and 1 sem.)	5
COURSE TYPE	Field of Science (General Chemistry)		
PREREQUISITE COURSES:	Typically, there are not prerequisite courses		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes

By the end of this course the student are able to:

1. Make and record measurements of the properties and chemical behavior of matter and describe the periodic table
2. Determine the chemical formula using the mass percentage of the elements in chemical substances and calculate the reactants and products in a chemical equation
3. Establish a critical relationship between the mass of a chemical substance and the quantity of that substance (in moles). Develop a molar interpretation of chemical equations, which then allows for calculation of the quantities of reactants and products.
4. Recognize the various types of reactions occur in aqueous solutions. Determine the substances present in materials using these chemical reactions
5. Recognize gases, liquids and solids. Define the intermolecular forces in a compound. Describe the crystal lattices and unit cells
6. Describe the factors that make one substance soluble in another. Define ways of expressing solutions concentration. Determine the colligative properties of molar and ionic solutions.
7. Define acid and base according to various concepts. Decide whether reactants or products are favored in an acid–base reaction. Calculate the concentrations of H_3O^+, OH^- and define the pH value in solutions of a strong acid or base
8. Obtain an equilibrium constant from reaction composition. Calculate concentrations of species and pH value in a weak acid or base solution, as well as in a salt solution. Determine the K_α and K_b values. Calculate the pH value of a buffer solution
9. Calculate the solubility product constant, K_{sp} and the solubility of slightly soluble (or nearly insoluble) ionic compounds. Predict if an ionic salt can precipitate when the ion concentrations are known

General Competences

By the end of this course the students have developed the following skills (general abilities):

1. Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to General Chemistry.
2. Ability to apply this knowledge and understanding the solution of problems related to General Chemistry
3. Ability to adopt and apply methodology to the solution of non familiar problems of General Chemistry.
4. Study skills needed for continuing professional development.
5. Ability to interact with others in chemical or of interdisciplinary nature problems.

Generally, by the end of this course the students have developed the following general abilities (from the list above):

Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
Adaptation to new situations
Decision making
Autonomous (Independent) work
Excercise of criticism and self-criticism
Promotion of free, creative and inductive thinking
Respect to natural environment
Work design and management

SYLLABUS

1) **Chemistry and Measurements**
A brief look in modern Chemistry. Experiments and their interpretation. Measurements and significant figures.

2) **Atoms, Molecules and Ions**
Atomic Theory of Matter. Nuclear Structure; Isotopes. Periodic Table of the Elements. Molecular and Ionic Substances. Naming Simple Compounds. Writing Chemical Equations. Balancing Chemical Equations

3) **Calculations with Chemical Formulas and Equations**
Molecular Mass and Formula Mass. Determining Chemical Formulas. Stoichiometry: Quantitative Relations in Chemical Reactions. Limiting Reactant in a Chemical Equation; Theoretical and Percentage Yields

4) **Chemical Reactions**
Molecular and Ionic Equations. Precipitation Reactions. Acid–Base Reactions. Oxidation–Reduction Reactions. Balancing Simple Oxidation–Reduction Equations

5) **States of Matter; Liquids and Solids**
Comparison of Gases, Liquids, and Solids. Changes of State Intermolecular Forces; Explaining Liquid Properties. Crystalline Solids; Crystal Lattices and Unit Cells

6) **Solutions**
Solubility and the Solution Process. Colligative Properties. Ways of Expressing Solutions Concentration. Colloids Formation

7) **Acids and Bases**
Arrhenius and Brønsted–Lowry Concepts of Acids and Bases. Relative Strengths of Acids and Bases. Self-Ionization of Water and the pH of a Solution

8) **Acid-Base Equilibria**
Prediction of the Direction of a Reaction using the Equilibrium Constant. Acid or Base-Ionization Equilibria in Solutions of a Weak Acid or Base. Acid–Base Properties of Salt Solutions. Buffers

9) **Solubility and equilibria of slightly soluble (or nearly insoluble) ionic compounds**
The Solubility Product Constant. Precipitation Calculations and criterion for precipitation.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures and seminars face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. PowerPoint, video etc) in teaching. The lectures content of the course for each chapter, all problems, in the form of a series of ppt files, and announces are uploaded on the internet, from where the students can freely download them.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (3 conduct hours per week × 13 weeks)	39
Seminars (1 conduct hour per week × 13 weeks) - solving of representative problems	13
Hours for private study of the student and optional problems solving given in each lecture (3 hours per week × 13 weeks)	39+30=60
Final written examination at the end of semester (3 conduct hours × 1 time)	3
Two optional tests during the semester (1/2 conduct hour × 2 times)	1
Total number of hours for the Course	**125 hours**

STUDENT PERFORMANCE EVALUATION	1. At the end of the semester there is a final written examination with multiple choice questions and short answer questions (open text books). Minimum passing grade: 5

	2. Optional participation in two written "tests" with multiple choice questions and short answer questions during the semester (open text books). The 1/10 of the grade of each test is added to the final examination grade (if it's higher than 5) 3. Optional delivery of solved problems (at least 2) each week, given in each lecture. Addition of 1 grade to the final exam grade (if it's higher than 5) of the students who have delivered all the solved problems and the percentage of the unit to the others, according to the number of solved problems each person has delivered.

ATTACHED BIBLIOGRAPHY

1) «Chemical Principles, The Quest For Insight», Peter Atkins, Loretta Jones, Leroy Laverman, 7η Edition, (Greek Translation by Petros Koutsoukos, Violeta Konstantinou, Paulos Klepetsanis, Christos Kontogiannis, Nikolaos Mpouropoulos, Kelly Velonia, Christos Pappas), Utopia Publications, Athens / 2018
2) «GENERAL CHEMISTRY», Brown, Lemay, Bursten, Murphy, Woodward, Stoltzfus, 13η Edition, (Greek Translation by Periklis Akrivos), TZIOLA Publications, Thessaloniki / 2016
3) «MODERN GENERAL CHEMISTRY»,, Ebbing and Gammon, 10η Edition, (Greek Translation by Nikolaos Klouras), P. TRAYLOS Publications, Athens / 2014
4) «INORGANIC CHEMISTRY», G. Pneumatikakis, Ch. Mitsopoulou, K. Methenitis, A. STAMOULIS Publications, Athens / 2005 (in Greek)
5) «CHEMISTRY", Jones and Atkins, 4th Edition, W.H. FREEMAN AND COMPANY Publications, New York 2000
6) «BASIC INORGANIC CHEMISTRY», Nikolaos D. Klouras, KOSTARAKI Publications, Athens 1995 (in Greek)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _005**	**SEMESTER**	1rst
COURSE TITLE	**MATHEMATICS-STATISTICS**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS**
	Lectures, Laboratoty work	2L, 2LW	5
COURSE TYPE	Basic Background, General Knowledge, Field of Science, Skills Development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in english)		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

Learning outcomes
The aim of the course is to provide to the students of the Department of Geology all the necessary knowledge of Applied Mathematics and Statistics that are needed to their science in the areas of Differential and Integral Calculus of one variable and many variables, Differential Equations and Statistics. During the course students will get familiar with mathematical applications in Geology and Environmental Sciences. This knowledge is necessary for many subsequent specialty courses of the Department of Geology. At the end of the course the students have acquired the following skills: 1. To be able to effectively use Differential and Integral Calculus of one variable and many variables and basic notions of Statistics during their studies at the Department of Geology. 2. To be able to competent in mathematical modeling of problems in geology.
General Competences
Generally, by the end of this course the students have developed the following general abilities (from the list above): • Searching, analysis and synthesis of facts and information • Decision making • Adaptation to new situations • Production of new research ideas • Working in an interdisciplinary environment

SYLLABUS

1. **Differential Calculus of functions of one variable** (Limit, Continuity and Derivative function, Study of functions)
2. **Integral Calculus of functions of one variable** (Indefinite integrals, definite integrals, Improper Integrals)
3. **Sequences - Series**
4. **Differential Equations** (An Introduction to Differential Equations, First order Linear Differential Equations, Differential Equations of Separate Variables, Mathematic models)
5. **Linear Algebra** (Determinants, Matrices, Linear Systems)
6. **Elements of Statistics** (Combinatorics, Presentation of statistical data, Position and distribution measures, Linear regression)
6. **Applications in topics of Geology and Environmental Sciences**. **Mathematic modeling in issues of Geology.**

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY.	Lectures

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Support of learning proceedings and shedding of educational material through e_class.
TEACHING METHODS	

Activity	Semester workload
Lectures	26
Laboratory work	26
Study (non-guidance)	73
Total number of hours for the Course	**125 hours**

STUDENT PERFORMANCE EVALUATION	Language: Greek (English for erasmus) Written final examination after the end of the semester (100%): Including 2 questions on theory and 3 questions on applications of mathematics in Geology

ATTACHED BIBLIOGRAPHY

1. Dimitrios Georgiou, Stavros Iliadis and Athanasios Megaritis, Real Analysis, Tziolas 2017.

2. Vasilios Zafiropoulos, Mathematical Analysis and its applications, Patra 2012.

3. John Ferguson, Mathematics in Geology, Springer 1988.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_082**	**SEMESTER**	1rst
COURSE TITLE	**STUDIES IN THE DEPARTMENT OF GEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	2	

COURSE TYPE	General knowledge, Skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
This seminar course is compulsory and is considered a prerequisite for the student to be able to participate and attend safely the lab exercises and fieldtrips. The aim of the seminar is to enable the student: • To get acquainted with the different topics of Geology and especially those covered by the Department of Geology of Patras • To be aware of the activities, the organization and operation of the Department and all issues related to the educational process • To learn about the Erasmus program mobility actions • To learn about potential vocational training • To be informed about the safety and hazard rules in the premises of the Department

• To be informed about the Laboratories of the Department, their equipment and its safe use, the practical exercises, the instruments to be used (eg. Microscopes) and their proper and safe use, as well as the corresponding safety and hazard rules •To be informed about fieldtrips, an essential learning tool for the proper and complete training of a geologist, as well as to learn the respective safety and hazard rules
General Competences
Learn about the geology topics offered by the Department of Geology, as well as the activities, the organization and operation of the Department and all issues related to the educational process Understand and use safety and hazard when using laboratory units and during fieldtrips Working safely during practicals, using instruments and equipment as well as during fieldtrips

SYLLABUS

1. The scientific field of Geology
2. The different topics of Geology
3. The Department of Geology: actions, organization and operation
4. Laboratories, equipment and geology topics covered in our Department
5. Erasmus: Mobility Opportunities
6. Vocational training
7. Safety and hazard rules on the premises of the Department
8. Proper and safe use of instruments and equipment during practical exercises. Safety and hazard rules
9. Fieldtrips. Safety and hazard rules

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory practice face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (powerpoint) in teaching.
TEACHING METHODS	**Activity** / **Semester workload** Lectures: 10*2=20 Course total: **90**
STUDENT PERFORMANCE EVALUATION	There is no evaluation, but it is mandatory to attend the seminar

ATTACHED BIBLIOGRAPHY

- Suggested bibliography mainly in Greek:
Notes of lecturers in Greek.

GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol_006**	**SEMESTER OF STUDIES**	1rst
COURSE TITLE	**SCHOOL PSYCHOLOGY**		
INDEPENDENT TEACHING ACTIVITIES		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures, seminars and laboratory work		3 (lectures)	3
COURSE TYPE	Theoretical, General Knowledge		
PREREQUISITE COURSES:	---		
TEACHING AND ASSESSMENT LANGUAGE:	Greek. Teaching may be however performed in English in case foreign students (through the Erasmus+ programme) attend the course.		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBPAGE (URL)	http://eclass.upatras.gr/courses/PDE1310/		

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of the course, students are able to understand the activities of the division of School Psychology and the counselling and psychological services offered by school psychologists in the school community. In addition, because of the particularities of the Greek educational system (where school psychologists are not available in mainstream schools), students are able to understand the role of teachers in the provision of psychological and counselling services in the schools.
General Abilities
By the end of this course the students have developed the following skills (general abilities): 6. Ability to comprehend and respect the "different" and the multicultural. 7. Ability to adapt to new conditions 8. Ability to demonstrate social, professional and ethical responsibilities with regards to issues of gender.

COURSE CONTENT

The course consists of an introduction to the field of School Psychology and the work of school psychologists in the provision of psychological services in the schools following the mental community delivery model. In addition, the course presents the various facilities for the delivery of psychological and counselling services in the Greek educational system placing emphasis in the most recent Special Needs Education Laws. More, by recognizing the particularities of the Greek Educational system and the limited staffing of public schools (at all levels) with support personnel, the course also focuses on the role (roles) teachers are called upon to play daily in the schools (beyond their teaching duties), such as counselling of students, counselling for parents, educational assessment and implementation of educational interventions.

TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD	Lectures.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	**SYNTHETIC ORGANIC CHEMISTRY** Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. Additional information is available through the eclass system of the University.
TEACHING ORGANIZATION	

Δραστηριότητα	**Φόρτος Εργασίας Εξαμήνου**
Lectures (3 hours per week x 13 weeks)	39
Hours of private study by the student	36
Total number of hours for the Course (25 hours of work-load per ECTS credit)	**75 hours (total student work-load)**

STUDENT ASSESSEMNT	**SYNTHETIC ORGANIC CHEMISTRY (SOC)** Written examination after the end of the semester. Minimum passing grade: 5.

RECOMMENDED LITERATURE

Dowling, J., & Osborne, E. (Επιμ.) (2000). Η οικογένεια και το σχολείο: Μια συστημική προσέγγιση από κοινού σε παιδιά με προβλήματα (μτφ. Ι. Μπίμπου-Νάκου). Αθήνα: Gutenberg.

Μπίμπου-Νάκου, Ι. και Στογιαννίδου, Α. (2006). Πλαίσιο συνεργασίας ψυχολόγων και εκπαιδευτικών για την οικογένεια και το σχολείο. Αθήνα: Gutenberg.

Χατζηχρήστου, Χ. (2011). Εισαγωγή στη Σχολική Ψυχολογία. Αθήνα: Γ. Δαρδανός – Κ. Δαρδανός.

Χατζηχρήστου, Χ. (2011). Πρόγραμμα Κοινωνικής και Συναισθηματικής Αγωγής στο Σχολείο. Αθήνα: Γ. Δαρδανός – Κ. Δαρδανός

In addition, a selected list of articles from leading scientific journals is provided to Erasmus students attending the class

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _007**	**SEMESTER**	1rst
COURSE TITLE	**GEOLOGICAL TERMINOLOGY IN ENGLISH I**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, seminars and laboratory work	3Lect	3

COURSE TYPE	Scientific Area and Skills Development
PREREQUISITE COURSES:	There are no prerequisites for the course.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/GEO349/

LEARNING OUTCOMES

Learning outcomes
By the end of this course the students are able to: Students Improve English reading skills ,making feasible the reading of various text types related to their discipline, including textbook extracts, popularized articles and scientific articles. b) students develop a number of language and cognitive skills (most of which are transferable) necessary for participating in the academic discourse community, c) students develop further their language skills using the technology available in addition to classroom training. In other words they are prepared for autonomous learning.
General Competences
By the end of this course the students have developed the following skills (general abilities): At the end of the course students are able to comprehend advanced level related texts and determine the meaning of academic vocabulary in context. Students expand /enrich Geology English Terminology Improve all four language skills - reading ,listening ,speaking ,writing to a satisfactory level.

SYLLABUS

Geomorphology,Minerals , Rocks, The Rock cycle-weathering , Erosion, Fossils, Geology and the environment

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face to face (Lectures in class)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of Information and Communication Technologies (e.g. powerpoint) in teaching. The study material of the course for each chapter isuploaded on the internet, in the form of a series of ppt files, where from the students can freely download them using a password which is provided to them at the beginning of the course.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (3conduct hours per week x 13 weeks)	3X13 = 39
plenty of in-class activities	36
Total number of hours for the Course	**75 hours**

STUDENT PERFORMANCE EVALUATION	Final exam (90%) Attendance and participation (10%)

ATTACHED BIBLIOGRAPHY

A Dictionary of Earth Sciences (3rd ed.) (2008), OUP.
A Dictionary of Geology and Earth Sciences (4th ed), (2013) OUP.
The Penguin Dictionary of Geology by Philip Kearey.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_008**	**SEMESTER**	1rst
COURSE TITLE	**ELEMENTS OF ZOOLOGY AND BOTANY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures,	3	3

COURSE TYPE	BACKGROUND
PREREQUISITE COURSES:	Typically, there are not prerequisite course.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/BIO369/

LEARNING OUTCOMES

Learning outcomes
By the end of this course the students are able to: . Understand the basic principles and processes of the Science of Biology . Comprehend the cell functioning and to gain basic knowledge in Genetics and Biotechnology . Comprehend the plant and animal organisms functioning . Gain basic knowledge on evolution and life diversity . Gain basic knowledge on ecology, biological communities and ecosystems, the biosphere and the biodiversity at multiple scales. At the end of this course the students have further developed the following skills/ competences: 1. Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories of the Science of Biology 2. Ability to apply such knowledge and understanding to the solution of biological issues 3. Ability to interact with others on biological multidisciplinary problems 4. Study skills needed for continuing professional development
General Competences
Generally, by the end of this course the students have developed the following general abilities (from the list above): Adaptation to new situations Decision making Autonomous (Independent) work Group work Work in multidisciplinary conditions

SYLLABUS

An Introduction to the Science of Biology How are the cells functioning? Elements on Genetics and Biotechnology How are the plant organisms functioning? How are the animal organisms functioning? Elements on Evolution and Diversity of Life Populations, Communities and Ecosystems – An introduction to Ecology Biodiversity and Biosphere

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>Lectures, seminars (face to face).</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of Information and Communication Technologies (ICTs) (e.g. powerpoint, videos) in teaching.

The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of ppt files, where from the students can freely download them.</td></tr>
<tr><td>TEACHING METHODS</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>39</td></tr><tr><td>Autonomous study</td><td>50</td></tr><tr><td>Course total</td><td>89</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Written examination at the end of semester (100%)</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
STARR CECIE, EVERS CHRISTINE, STARR LISA (2014). Βιολογία Βασικές Έννοιες και Αρχές . Utopia Publishing.
CAMPBELL NEIL A., REECE JANE B. (2015). ΒΙΟΛΟΓΙΑ, ΤΟΜΟΣ Ι Η χημεία της ζωής - Το κύτταρο - Γενετική (μετάφραση: Κοκκορόγιαννης Θόδωρος, Βακάκη Βασιλική). Πανεπιστημιακές Εκδόσεις Κρήτης.
ΗΛΕΚΤΡΟΝΙΚΑ ΜΑΘΗΜΑΤΑ Η ΕΠΙΣΤΗΜΗ ΤΗΣ ΒΙΟΛΟΓΙΑΣ– (BIO-AY06, eclass.upatras.gr)
- Related academic journals:

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_009**	**SEMESTER**	2nd
COURSE TITLE	**MINERALOGY II**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, seminars and laboratory work	2 (lect.) 3 (lab&Tut.)	6

COURSE TYPE	Field of Science (Mineralogy)
PREREQUISITE COURSES:	Typically, there are not prerequisite course.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/GEO311

LEARNING OUTCOMES

Learning outcomes

By the end of this course the students are able to:

1. Know essential facts, concepts, principles and theories of mineralogy and use of minerals.

2. Recognise the minerals in thin sections.

3. Understand the dependence of the physical and optical properties of minerals, as well as their crystal habit from their chemistry

General Competences

At the end of the course the studenst have further developed the following skills/competences

1. Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to mineralogy
2. Ability to apply such knowledge and understanding to the solution of problems of an unfamiliar nature.
3. Ability to adopt and apply methodology to the solution of unfamiliar problems.
4. Study skills needed for continuing professional development.
5. Ability to interact with others on inter or multidisciplinary problems.

SYLLABUS

Formation of minerals in the Earth and the various environments-Uses of minerals
Binary phase systems
Classification of minerals
Framework silicates Part I
Framework silicates Part II
Sheet silicates
Chain silicates Part I
Chain silicates Part II
Nesosilicates

Cyclosilicates Sorosilicates Some non-silicate minerals (eg carbonates, oxides)

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Power Point, Laboratory exercises, you tube videos.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Laboratory work (3 conduct hours per week x 13 weeks)	2X13 = 26
Tutorial (1 conduct hour per week x 13 weeks)	1X13 = 13
Additional digital consolidation exercises	1X13 = 13
Hours for private study of the student and preparation of home-works.	72
Total number of hours for the Course	**150 hours**

STUDENT PERFORMANCE EVALUATION	Written final examination and problem solving. Exams on Petrographic Microscope and macroscopic mineral identification

ATTACHED BIBLIOGRAPHY

1. Δ. Παπούλης, Π. Λαμπροπούλου. Ορυκτολογία: Συστηματική Ταξινόμηση των Ορυκτών2016. 155σελ.
2. Perkins, D., Mineralogy. Prentice-Hall, Inc. New Jersey. 484p, 1998. Nesse, W.D., Introduction to Mineralogy. Oxford University Press. New York, Oxford, 442p. 2000.
3. Dyar, M.D., Gunter, M.E., Tasa, D. Mineralogy and Optical Mineralogy. Mineralogical Society of America, Chantilly, VA. 708p, 2008. 4. MacKenzie, W.S., Guilford, C., Atlas of the Rock-forming Minerals in Thin Section, Lonman, 98p, 1980.
4. MacKenzie, W.S., Guilford, C., Atlas of the Rock-forming Minerals in Thin Section, Lonman, 98p, 1980.
5. Lectures(Power Point) posted on eclass.

-Scientific Journals:

American Mineralogist, Mineralogical Magazine, Mineralogy and Petrology, Reviews in Mineralogy and Petrology, Elements, Mineral

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_010**	**SEMESTER**	2nd
COURSE TITLE	**EVOLUTION OF LIFE - PALAEONTOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work	2 (lect.), 2 (lab.)	5

COURSE TYPE	Basic and Skills Development
PREREQUISITE COURSES:	Typically, there are not prerequisite courses
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, teaching may be however offered in English in case foreign students attend the course.
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO326/ (in Greek)

LEARNING OUTCOMES

Learning outcomes

This module is a basic introduction in the field of Palaeontology. Students become acquainted with fossils, which consist the evidence of evolution, and their use in geological research. Also, during this module information concerning the main groups of organisms that are commonly found as fossils are provided.

Since the first moment that life appeared on earth 4 billion years ago, life on earth is under constant evolution. New species appear, while others disappear. Fossils are the unquestionable testimony of this evolution through the geological ages, thus due to their continuous change they allow us to record and understand the age of the rocks that they were found in, as well as the prevailing palaeoenvironmental conditions when they were still alive, or when they died and were deposited in the sediments.

Upon successful completion of this course the students are able to:

1. Identify fossils.
2. Understand, implement and discuss the basics of Palaeontology, what fossil and fossilisation is, how the fossilisation and preservation processes work and finally what taphonomy is.
3. Understand, implement and discuss information on the origin, development and evolution of life, what mass extinctions are, when they occur and what their impact is on the evolution of life.
4. Learn about the main groups of organisms that first appeared and prevailed during the Phanerozoic eon.
5. Understand that the earth is a changing world and these changes have a direct impact on the evolution and making of life on earth.
6. Become competent in identifying some of the most important and common groups of organisms that can be found as fossils.
7. Correlate organisms with certain environments which could be used to define the respective depositional environments.
8. Use these methods in order to contribute in the stratigraphic research and the understanding of the palaeoenvironment when stratigraphic methods such as biostratigraphy and chronostratigraphy are used.

General Competences

Generally, by the end of this course the students have developed the following general abilities:

1. Search, analyse and synthesize data and information, using the necessary technologies.
2. Working in a multidisciplinary environment
3. Working in an international environment.
4. Independent work.
5. Group work.
6. Generating new research ideas.
7. Respecting the environment.
8. Criticism and self-criticism.
9. Promoting free and creative thinking.
10. Respecting diversity and multiculturalism.

SYLLABUS

1. Fossils – Fossilisation – Categories of fossils – Ways of fossilisation
2. Species – Systematics – Phylogenesis – Determination of of species – Nomenclature.
3. Palaeoecology – Taphonomy.

4. What life is – Origin and evolution of life on earth – Mass extinctions.
5. Protists – Metazoans - Invertebrates - Chordates.
6. Bivalves, gastropods, cephalopods, brachiopods, echinoderms, trilobites, corals
7. Vertebrates, fishes, amphibians, reptiles, birds, mammals, hominids.
8. Palaeobotany

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory practice face to face. Observation and study of real fossils (hand specimens) during laboratory practice
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (powerpoint) in teaching. Supporting teaching and communication through e-class. The lectures content of the course for each chapter are uploaded on the e-class platform, in the form of a series of ppt files, from where the students can freely download them.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Laboratory work (2 conduct hours per week x 13 weeks)	2X13 = 26
Hours for the preparation of laboratory work reports (3h per week x 13 weeks)	3X13= 39
Hours for private study of the student (3h per week x 13 weeks))	39
Course total	**130 hours**

STUDENT PERFORMANCE EVALUATION	**I)** Oral final examination. The mark consists 50% of the final grade. The examination will include: - Short answered questions. - Short essays of combined approach. **II.** Written reports following the completion of each laboratory practical or two midterm exams. The mean mark of the reports consists the other 50% of the final grade. Minimum passing grade: 5. <u>Final Course Grade (FCG)</u> FCG = (Oral exam + practical reports or midterm exams) / 2 The language of assessment is in Greek. If foreign students attend the course, their assessment in English.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Prothero, R.D., 1998, Bringing fossils to life: An introduction to palaeobiology, WCB/McGraw-Hill
Clarkson, E., 1998, Invertebrate Palaeontology and evolution, Wiley-Blackwell
Armstrong, H.A., Brasier, M.D., 2005, Microfossils, Blackwell.
Benton M.J., 2005, Vertebrate Paleontology, Blackwell Science Ltd
Benton M. J., Harper D., A.T., 2009, Introduction to Paleobiology and the Fossil Record , Wiley-Blackwell, Chichester.
Levin, H.,2013, The Earth through time, Wiley
Notes of lecturers in English.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol_011**	**SEMESTER**	2nd
COURSE TITLE	**GEOMORPHOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work, Feldwork	2 (lect.) + 2 (lab.)	4

COURSE TYPE	Special background, Skill development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO365/

LEARNING OUTCOMES

Learning outcomes

This course is the introduction of the student to the discipline of Geomorphology.
Through the lectures, laboratory exercises and field exercises, the students could understand the endogenous and exogenous processes, which shape the Earth relief. This course is main background of Earth sciences and aims at the systematic study of the formation and evolution processes of the landforms during the geological time.
Upon successful completion of the course students will have the ability to:
• identify and describe the interactions of the lithosphere, hydrosphere and atmosphere in the landforms formation
• recognize and identify the different landforms that are created on the Earth's surface during the geological time
• understand, distinguish and interpret geomorphological processes, which affect the creation and evolution of landforms in different environments and different climatic zones
• apply methods of geomorphological analysis and research,
• examine and classify the geomorphological characteristics of the relief and
• calculate the morphological parameters of landforms
• collect, analyze, combine and compose geomorphological data and the related literature, in order to construct geomorphological maps or to assess the geomorphological hazards
• compare and evaluate data using geomorphological research methods in problems solving, such as spatial and temporal evolution of the relief, assessment of the environmental and morphological changes,
environmental impacts of human activities on the relief, and Natural Hazard Mitigation
• analyze, compose and present various geomorphological topics (individually or in groups)

General Competences

The skills that students should acquire are:
1. Retrieve, analyze and synthesize data and information, using the necessary technologies
2. Theoretical thinking and ability to turn theory into practice
3. Ability to apply knowledge in problem solving
4. Independent work
5. Working in team
6. Working in an interdisciplinary environment
7. Respect for the natural environment
8. Promoting of free, creative and inductive thinking

SYLLABUS

A. Lectures:

1. Earth relief
2. Endogenous - exogenous processes.
3. Landforms and factors that control them
4. Modern directions of geomorphology

5. Geomorphological maps - mapping
6. Hydrological cycle
7. Geomorphological processes
8. Soils
9. Geomorphic environments: a. Fluvial Geomorphology, b. Mass movements, c. Aeolian Geomorphology, d. Karst Geomorphology, e. Coastal Geomorphology, f. Glacial Geomorphology
10. Morphometry
11. Climatic Geomorphology
12. Tectonic Geomorphology
13. Geomorphological hazards
14. Geomorphology and Environment

B. Exercises (Laboratory)

The practical part of the course includes: a. exercises as well as crisis questions after each theoretical part, b. field exercises and/or field trips.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures, laboratory work (exercises) and field exercises face to face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Learning procedure support with the use of e-class platform. Multimedia use and PowerPoint presentations.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2×13=26
Laboratory work (2 conduct hours per week x 13 weeks)	2×13=26
Optional work	20
Fieldwork	20
Individual (private) study	43
Total number of hours for the Course	**135**

STUDENT PERFORMANCE EVALUATION	- Examinations in Greek (in English in case foreign students) - Final Exam or 2 Exculpatory Intermediate Examinations (written or oral) for Theoretical Part (Lectures) - 50% of grading - Final Exam (written or oral) for Practical Part (Laboratory) - 30% of grading, - 10% of grading with delivering of laboratory exercises - 10% of grading with delivering of fieldwork exercises.

ATTACHED BIBLIOGRAPHY

1.Lecture notes uploaded on E-Class (in Greek)
2.Evelpidou N. (2020): Geomorphology, p. 392 (in Greek).
3.Evelpidou N. (2018): Geomorphology, Laboratory Exercises, p. 258 (in Greek).
4.Karymbalis E. (2010): Coastal Geomorphology, p. 242 (in Greek).
5.Vouvalidis K. (2011): Physical Geography p. 158, (in Greek).
6.Pavlopoulos K. (2011): Geomorphology, Applications in Geosciences, p. 783 (in Greek).
7.Bathrellos G.D., Skilodimou H.D. (2021): Karst Geomorphology & Principles of Speleology, (in Greek).
8.Woods, K.M. (2009): "Physical Geology Laboratory Manual", p. 186, Kendall / Hunt Publishing Company.
9.Owen, C., Pirie, D., Draper, G. (2011): "Earth Lab, Exploring the Earth Sciences", p. 474, Cengage Learning
10. Strahler, A. (2011): "Introducing Physical Geography", p. 655, Wiley.
11. Busch, R.M. (2011): "Laboratory Manual in Physical Geology", p. 403, Prentice Hall.
12. Jasiewicz, J., Zwoliński, Z., Mitasova, H., Hengl, T. (2015): "Geomorphometry for Geosciences", p. 290.
13. Davidson-Arnott, R. (2010): "An Introduction to Coastal Processes and Geomorphology", p. 458, Cambridge University Press.
14. Huggett, R.J. (2017): "Fundamentals of Geomorphology", p. 578, Routledge.
15. Burbank, D.W., Anderson, R.S. (2012): "Tectonic Geomorphology", p. 474, Wiley.
16. Thornbush, M.J., Allen, C.D., Fitzpatrick, F.A. (2014): "Geomorphological Fieldwork", p. 272, Elsevier.
17. Morisawa, M.E. (1983): "Geomorphology Laboratory Manual", p. 253.
18. Goudie, A.S. (2008): "Encyclopedia of Geomorphology", p. 1202, Routledge.
19. Bird, E. (2008): "Coastal Geomorphology, An Introduction", p. 436, Wiley.
20. Charlton, R. (2008): "Fundamentals of Fluvial Geomorphology", p. 275, Routledge.
21. Leopold, L.B., Wolman, G.M., Miller, J.P. (1992): "Fluvial Processes in Geomorphology", p. 393, Dover Publications.

GENERAL

SCHOOL	NATURAL SCIENCE		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _012**	**SEMESTER**	2nd
COURSE TITLE	**GIS AND REMOTE SENSING IN APPLIED GEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory, Tutorial	2 (lect.) / 2 (lab.)/ 1T	5

COURSE TYPE	Field of Science (GIS & Remote Sensing)
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO307/

LEARNING OUTCOMES

Learning outcomes

The course aims at introducing students with Cartography and Geographic Information Systems technologies. By the end of this course the students are able to:

- recognize different types of maps and to interpret their contents.
- demonstrate knowledge and understanding of basic principles and concepts related to Cartography and GIS.
- define the geographical data as vectors and rasters and information as spatial and non- spatial.
- study maps of Greece and to recognize the projection systems.
- use geographic data in a GIS environment, to process it and to produce maps.
- generate DEM from digitized contour lines and to construct topographic and elevation profiles.
- value the significance of maps as tools of communication, information exchange and decision-making on a diachronic basis.

By the end of this course the students have developed the following skills:

- Locate his position in the field and on the map
- Georeference satellite remote sensing data, airphotos, maps and digitize data
- Import, save, process spatial and non spatial data in GIS environment
- Produce simple digital maps

General Competances

- Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
- Decision making
- Autonomous (Independent) work
- Work in an international enviroment
- Work in an interdisciplinary enviroment
- Work design and management
- Respect to natural environment

SYLLABUS

The course is organized in 4 teaching circles which are described below.

The course is organized in 3 teaching circles which are described below.

Circle A:

- Cartography – Typology and components of maps.
- History of Cartography.
- Basic principles of cartographic design – Scale – Spatial Resolution.
- Map Projection. Introductory concepts (geoid, spheroid, ellipsoid, geographic coordinates, datum, grid systems, types of projection, parameters).
- Hellenic Geodetic Reference Systems.

- Distortions, Mathematic models for geometric correction and resampling. Geometric correction of maps and satellite images.

Circle B:

- Theory of GIS, History, Structure.
- Spatial and non- spatial data, Digitization,
- Raster and vector data, structure of GIS system
- Transformation of vector data to raster data
- Thematic layer and thematic maps

Circle C:

- Topology
- Introduction to Spatial Analysis
- Introduction to Digital Elevation/ Surface Models
- Construction of topographic and elevation profiles.

Circle D:

- Case studies of the use of Geographic Information Systems in Geology.
- Global Navigation Satellite Systems or Global Positioning Systems.
- Combined use of GIS and GNSS

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures with the use of PowerPoint slideshow.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Laboratories with the use of specialized software for GIS (ESRI, ARCGIS) and Image Processing (ERDAS IMAGINE) in the departmental computer lab. Training in the use of GPS in the field.
TEACHING METHODS	

Activity	**Semester workload**
Lectures in Theory	2X13 = 26
Laboratory exercises in GIS and RS	2X13 = 23
Writing reports of the laboratory exercises	2X13= 26
1 day field practice in the use of GNSS	12
Hours for private study and bibliography analysis of the student	35
Total number of hours for the Course	**125**

STUDENT PERFORMANCE EVALUATION	Written examination after the end of the semester (G_{th}60%)or multiple choice exam online Written reports for each laboratory exercise (G_{lab}40%) Minimum passing grade: 5. Final Course Grade (FCG) FCG = (G_{th} + G_{lab}) / 2

ATTACHED BIBLIOGRAPHY

1. "Cartography and introduction to GIS)" K. Nikolakopoulos, 2018.University of Patras Editions (in Greek language)
2. Laboratory Notes: "Laboratory exercise of cartography and GIS", K. Nikolakopoulos, H Simoni, 2018.University of Patras Editions (in Greek language)
3. Laboratory Notes: "Laboratory exercise of digital processing of Remote Sensing data combined with GIS", D. Vaiopoulos G. Skianis K. Nikolakopoulos, Athens University Publ. 2006, p. 178. (in Greek language)

GENERAL

SCHOOL	**NATURAL SCIENCES**		
ACADEMIC UNIT	**GEOLOGY**		
LEVEL OF COURSE	**UNDERGRADUATE**		
COURSE CODE	**Geol_013**	**SEMESTER**	2nd
COURSE TITLE	**PHYSICS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures	4 THEORY	4

COURSE TYPE	Field of Science (Mechanics, Waves, Fluids, Thermodynamics, Electromagnetism and Optics)
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
➢ To gain the fundamental knowledge and understand the basic, known principles of Classical Mechanics, Waves, Fluids, Thermodynamics, as well as of Electromagnetism and Optics. ➢ -To develop synthetic thinking and get familiarized with solving more complex physics problems and interpreting physical phenomena, also related to the science of Geology.
General Competences
- Apply knowledge in practice - Retrieve, analyze and synthesize data and information, with the use of necessary technologies

SYLLABUS

Physics and Measurement. Vectors. Motion in one and two dimensions, Circular motion. The concept of force and the laws of motion. Energy and energy transfer. Conservative and nonconservative forces. Linear Momentum and Collisions. Rotation of a Rigid Object about a Fixed Axis. Angular Momentum. Fluid Mechanics. Oscillatory Motion. Wave Motion. Sound Waves. Superposition and Standing Waves. Temperature. Laws of thermodynamics.
Electric Field, Gauss' Law, Electric potential, Current and resistance, Electrical circuits (DC), Magnetic Field, Faraday's law, Magnetic properties of matter, Electromagnetic Waves, Nature of Light, Geometrical Optics.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face to face (Lectures in class)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY τητές	Use of ICT in teaching and communication with students

TEACHING METHODS

Activity	**Semester Workload**
Lectures	4×13=52
Tutorial exercises	9
Individual study	3×13=39
Total	**100**

STUDENT PERFORMANCE EVALUATION	Written Exams (Multiple choice, short answer questions, problem solving)

ATTACHED BIBLIOGRAPHY

- Physics for Scientists and Engineers, R. Serway, J. Jewett, Brooks Cole.

- Physics, Volume 1, 5th Edition, Resnick, Halliday, Krane, Wiley.
- University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson
- .Physics for Scientists and Engineers, R. Serway, J. Jewett, Brooks Cole.
- Fundamental of Physics, D. Halliday, R. Resnick, J. Walker, 10th Edition, Wiley.

GENERAL

SCHOOL	NATURAL SCIENCES

ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_014**	**SEMESTER**	2nd
COURSE TITLE	**FIELDWORK I**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Fieldwork – Field trips		4 +1 + 1 days	3
COURSE TYPE	General knowledge, Skills development		
RELATED COURSES:	Planet Earth, Geomorphology, Palaeontology		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/field-trips/Geol_014		

LEARNING OUTCOMES

Learning outcomes

For course Field work I the following fieldwork days are required: four (4) days for the course "Planet Earth", one (1) day for the course "Geomorphology" and one (1) day for the course "Paleontology".
The four daily field trips take place at:

1. Kalavrita, Aroanios River springs, Kastria caves (within the courses Planet Earth and Geomorphology)
2. Corinth channel, Sousaki volcano (within the courses Planet Earth and Paleontology)
3. Charadros River – Ortos hill (within the courses Planet Earth and Paleontology)
4. Outcrops at Proastio area in Patras (within the course Planet Earth)

The purpose of the above mentioned field-trips is to help the student to understand the topics of the studied courses, such as:

1. To understand the dynamics of surface earth processes
2. Introduction to the main minerals and sedimentary rocks
3. The water cycle, groundwater, surface water, streams and drainage systems
4. Glacial and periglacial geomorphology, Karstic geomorphology, fluvial geomorphology and morhotectonics
5. Volcanicity: Types of volcanic activity, Magma, Volcanoes and Igneous rocks. Types of volcanic vents, the example of Sousaki.
6. Main tectonic structures such as faults, and the respective extensional regimes that affect sedimentary basins. The example of the isthmus of Corinth
7. Earthquakes and their effect on humans
8. To distinguish and to identify fossils in the rocks
9. To understand that fossils consist clasts of the sedimentary rocks
10. To learn how to extract them from the sediments and collect them properly
11. To familiarize with some of the most important and common groups of organisms we encounter as fossils
12. To be able to associate organisms with specific living environments which can define the respective depositional environments

General Competences

Search for, analysis and synthesis of data and information, with the use of the necessary geological tools (maps, bibliography, reports etc.)
Introduce the students to the main topics of Geology

SYLLABUS

1. Kalavryta, Springs of Aroanios River, Cave of Kastria: Understanding the mechanisms of erosion, weathering and transport, gravitational movements and landslides. The surface water at the springs of Aroanios river, and the groundwater in the caves of Kastria, water. Glaciers and kartification phenomena
2. Corinth, Sousaki: Tectonism with the presence of extensional faults and how these affect the sedimentary basins of the Isthmus of Corinth, Marine fossils. Types of volcanic activity, produced products, texture and rock structure, Volcanic vents and their types, the example of Sousaki

3. Haradros River - Ortos: Sediments and sedimentary rocks, the bedding, the uncomformities, the different lithologies, the plant and animal fossils, the geological outcrops
4. Brick factory at Proastio, Patras: Lacustrine and lagoonal environments, coal horizons, fossils, uncomformities

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Six daily field-trips for three prerequisite courses aiming to the better understanding of teaching elements provided during lectures and practicals
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Support of Learning Process and Dissemination of educational material through the University of Patras e-class platform from where the respective guidebook for the field-trips can be downloaded.
TEACHING METHODS	

Activity	**Semester workload**
Lectures for field-trip preparation	6*2=12
Field-trips	6*8=48
Writing of the reports	6*5=30
Course total	**90**

STUDENT PERFORMANCE EVALUATION	Students must write for each filed-trip a report in order to prove that they understood in each field trip the demonstrated geological features. Marking Scale: 0-10. Minimum Passing Mark: 5.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography mainly in Greek:
1. Σημειώσεις Μαθήματος Θεωρίας και Εργαστηρίου που παρέχονται σε pdf μέσω e-class.
2. Γεωλογία Αρχές και Εφαρμογές, Θ. Δούτσος 421 σελ, Παρέχεται μέσω ΕΥΔΟΞΟΣ
3. Γεωλογία Η επιστήμη της Γης, Παπανικολάου και Σιδέρης 291 σελ Παρέχεται μέσω ΕΥΔΟΞΟΣ
4. Διερευνώντας τη Γη, Δερμιτζάκης και Λέκκας 593 σελ.
5. Physical Geology, Skimmer- Porter, John Wiley & Sons 1987
6. Earth Surface Processes Landforms and Sediment Deposits, Bridge and Demicco, Cambridge Univ. Press 2008
7. Γεωργιάδου-Δικαιούλια, Ε., Συμεωνίδης, Ν.Κ., Θεοδώρου, Γ.Ε., 2003, Παλαιοντολογία, ΜΕΡΟΣ Α. Εκδόσεις - Γραφικές Τέχνες ΓΚΕΛΜΠΕΣΗΣ ΑΝΤ. ΓΕΩΡΓΙΟΣ
8.Γεωργιάδου-Δικαιούλια, Ε., Συμεωνίδης, Ν.Κ., Θεοδώρου, Γ.Ε., 2003, Παλαιοντολογία, ΜΕΡΟΣ Β. Εκδόσεις - Γραφικές Τέχνες ΓΚΕΛΜΠΕΣΗΣ ΑΝΤ. ΓΕΩΡΓΙΟΣ

9.Γεωργιάδου-Δικαιούλια, Ε., Συμεωνίδης, Ν.Κ., Θεοδώρου, Γ.Ε.. 2003, Παλαιοντολογία, ΜΕΡΟΣ Γ. Εκδόσεις - Γραφικές Τέχνες ΓΚΕΛΜΠΕΣΗΣ ΑΝΤ. ΓΕΩΡΓΙΟΣ

10.Prothero, R.D., 1998, Bringing fossils to life: An introduction to palaeobiology, WCB/McGraw-Hill

11.Clarkson, E., 1998, Invertebrate Palaeontology and evolution, Wiley-Blackwell

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	CHEMISTRY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _015**	**SEMESTER**	2nd
COURSE TITLE	**SCHOOL COUNSELING**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures and laboratory work	3 (lect.)	3
COURSE TYPE	Field of Science (Counseling Psychology) and Skills Development (Counseling skills)		
PREREQUISITE COURSES:	Typically, there are not prerequisite course.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/PDE1359/		

LEARNING OUTCOMES

Learning outcomes
By the end of this course the students are able to: 1. Understand teacher's role as a counselor 2. Understand children and adolescents' psychosocial needs. 3. Understand how a counselling group is formed, carried out and evaluated. Also they will acquire an understanding of the therapeutic factors and group leader skills that make a group effective. 4. Present the principles of designing and conducting a psychoeducational group for children with various socioemotional difficulties 5. Apply group counseling skills 6. Apply the principles and the methods of evaluating a psychoeducational group for children and adolescents.
General Competences
By the end of this course the students have developed the following skills (general abilities): 1. Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to Group Counseling. 2. Ability to apply this knowledge and understanding to the management of social and emotional problems related to school environment. 3. Ability to adopt and apply methodology to the management of less familiar school problems regarding students. 4. Ability to prepare and carry out a psychoeducational group 5. Study skills needed for conducting a group for children and adolescents. 6. Ability to evaluate a psychoeducational group and make the necessary adjustments.

SYLLABUS

The importance of guidance and counselling programmes in schools today. Children's and adolescents' psychosocial characteristics and their counselling needs. The teacher's role as a counselor. Psychoeducational groups for children and adolescents. Planning for a psychoeducational group. Group leadership skills and group processes (therapeutic factors, group climate, group alliance). Evaluating psychoeducational groups.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures and practice through use of a counseling log.

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>The lectures content of the course for each chapter are uploaded on the internet (e-class), in the form of a series of ppt files, where from the students can freely download them.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (3 conduct hours per week x 13 weeks)</td><td>3×13=39</td></tr>
<tr><td>Counseling log (3 hour per week x 12 weeks) – counseling an individual or leading a psychoeducational group</td><td>36</td></tr>
<tr><td>Total number of hours for the Course</td><td>75 hours</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>1. Evaluation of the counseling log, which is handed to the course instructor 1 week before the exams (30%). The mark is given provided that the student has secured at least the grade 5 in written examinations.
2. Written examination after the end of the semester (70%)
Minimum passing grade: 5.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

1. Vassilopoulos, S. P., Brouzos, A., & Baourda, V. (2016). Psychoeducational group programs for children and adolescents. Athens: Gutenberg [in Greek]
2. Vassilopoulos, S. P., Koutsopoulou, I., & Regli, D. (2011). Psychoeducational groups for children. Athens: Grigoris [in Greek].

3. Brown, N. W. (2004). Psychoeducational groups: Process and practice. NY: Brunner-Routledge.
4. Corey, M. S. & Corey, G. (2006). Groups: process and practice. Belmont, CA: Thomson Brooks/Cole.

-journals:

1. Journal for specialists in group work. Routledge
2. European Journal of Counselling Psychology.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _016**	**SEMESTER**	2nd
COURSE TITLE	**GEOLOGICAL TERMINOLOGY IN ENGLISH II**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, seminars and laboratory work	3Lect	3

COURSE TYPE	Scientific Area and Skills Development
PREREQUISITE COURSES:	There are no prerequisites for the course.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO349/

LEARNING OUTCOMES

Leraning outcomes
By the end of this course the students are able to: Students who have already attended the first term comprehend different types of discourse -academic texts ,lectures Practise further all four skills, that is, speaking, listening, reading and writing.
General Competences
By the end of this course the students have developed the following skills (general abilities): At the end of the course students should be able to listen and understand lectures Students expand /enrich more advanced Geology English Terminology Improve speaking for communication in professional settings

SYLLABUS

Energy sources -Renewable sources of Energy, Seismology, Volcanology ,Petrol

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face to face (Lectures in class)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of Information and Communication Technologies (e.g. powerpoint) in teaching. The study material of the course for each chapter is uploaded on the internet, in the form of a series of ppt files, where from the students can freely download them using a password which is provided to them at the beginning of the course.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (3conduct hours per week x 13 weeks)	3×13=39
Plenty of in-class activities	36
Total number of hours for the Course	**75 hours**

STUDENT PERFORMANCE EVALUATION	Final exam (90%) Attendance and participation (10%)

ATTACHED BIBLIOGRAPHY

A Dictionary of Earth Sciences (3rd ed.) (2008), OUP.
A Dictionary of Geology and Earth Sciences (4th ed), (2013) OUP.
The Penguin Dictionary of Geology by Philip Kearey.

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_017**	**SEMESTER**	2nd
COURSE TITLE	**BASIC COMPUTER APPLICATIONS IN GEOLOGY**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work		1 (Lect.) +2 (lab.)	3
COURSE TYPE	Basic General knowledge		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)			

LEARNING OUTCOMES

The aim of the course is to acquire the basic knowledge on widely-used software, which are essential tools for studying geosciences.

General Competences

Generally, by the end of this course the students have developed the following general abilities:
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Working independently
Team work
Production of free, creative and inductive thinking

SYLLABUS

The course content includes the following chapters:
Spreadsheets of the MS-Office
Data entry
Basic functions and calculations
Complex functions and their graphs
Software for two-dimensional plots
Correlation of two geological parameters
Graphical representation of univariate geological data
Software for three-dimensional plots
Coordinate systems and data entry
Building of contour maps
Building simple digital elevation models
Map overlap
Software for the spatial variation of geological parameters
Basic principles of mapping
Boundaries of surface distributions
2D and 3D graphical representations
Examples of spatially-varying geological data

Software for processing XRD data
Introduction to the analysis of geomaterials and other materials with X-ray diffractometry. Basic principles of the phenomenon of X-ray diffraction.Software for processing mineralogical analyses with X-ray diffractometry. Detection and Evaluation of qualitative X-ray diffractometry analysis results using specialized software packages and relevant databases. Calculation and Evaluation of (semi) quantitative X-ray diffractometry analysis results using the height and area methods or the Rietveld method and using specialized software packages and relevant databases. Use of digital image processing software for the qualitative and quantitative processing of mineralogical characteristics of material and presentation of actinography with its relevant information.Measurement of average crystal size of (nano) minerals

Matlab software, basic applications

Matlab, basic principles, basic commands
Data files, loading and processing, diagrams in Matlab
Gridded data processing, contour maps

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face in the classroom. Lab exercises using the relevant software in the department's computer center.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of e-class platform including all the lectures and lab exercises in digital format. Seminars will be given in the department's computer center for the application of suitable software on lab exercise solution.. Additional practice by remote access on lab software exercises
TEACHING METHODS	**Activity** / **Semester workload** Lectures: 1 X 13 = 13 Laboratory practice: 2 X 13 = 26 Study: 13 X 3 = 39 Course total: **78**
STUDENT PERFORMANCE EVALUATION	**I. Theory** (50% of the final mark) Final Exam, written, of increasing difficulty, which may include multiple choice test, questions of brief answer, questions to develop a topic, judgment questions and exercise solving. Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams. Marking Scale: 0-10. Minimum Passing Mark: 5. **II. Laboratory**(50% of the final mark) Oral Examination. Students are obliged to attend all laboratory classes and to deliver the results of all exercises. Percentages are valid t only when the student secures the minimum mark of 5 in the final written examination Greek grading scale: 1 to 10. Minimum passing grade: 5. Grades <3 correspond to ECTS grade F. Grade 4 corresponds to ECTS grade FX. For the passing grades the following correspondence normally holds: 5 <-> E, 6 <-> D, 7 <-> C, 8 <-> B and >9 <-> A

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Lectures (Power Point) posted on eclass platform
Notes and software manuals

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _018**	**SEMESTER**	3rd
COURSE TITLE	**PETROGRAPHY OF IGNEOUS ROCKS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
LECTURES, LABORATORY EXERCISES, TUTORIAL	2TH+2LAB+2T	6

COURSE TYPE	Background, Field of Science and Skills Development
PREREQUISITE COURSES:	Physic, Chemistry, Introduction in Geology, Mineralogy I,II
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	-

LEARNING OUTCOMES

Learning outcomes
By the end of this course the students are able to: • Understanding of basic processes of magma which take place in the upper mantle and in the crust of Earth. • Consolidation of basic mineralopetrographic meanings. • Familiarization of students about different classification methods of igneous rocks. • Ability of macroscopic description and identification of Petrogenetic minerals. • Ability of microscopic description and identiufication of igneous rocks according to Streckeisen diagram. • Connection between theoretical knowledge with practical applications of rocks, for their use as industrial minerals and rocks. • Ability to present the knowledge of igneous rocks to scientific audience.
General Competences
Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Autonomous (Independent) work Group work

SYLLABUS

Structure and composition of the interior of the earth and moon- meteorites- characteristic features of rocks- methods of petrographic identification and study- petrographic identification and study- petrogenetic minerals- categories of rocks- igneous rocks- granitic rocks- syenitic rocks- dioritic and gabbroic rocks- ultramafic and ophiolites- rocks with feldspathoid- veins rocks and rare igneous rocks.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face to Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Lectures (power point), exercises, field exercises.

TEACHING METHODS

Activity	**Semester Workload**
Lectures	2×13=26
Laboratory exercises	2×13=26
Tutorial	2×13=26
Independent study	72
Total number of hours for the Course	**150**

STUDENT PERFORMANCE EVALUATION	**I. Theory** (50% of total rate) Final Examination: Written examination of graded difficulty (multiple choice, short growth questions, development questions, exercises) **II. Laboratory** (50% of total rate) *1)* Laboratory study of thin sections and rocks (25% of total rate) *2)* Oral examination : Macroscopical identification of minerals and rocks (25%)

ATTACHED BIBLIOGRAPHY

-Hatzipanagiotou,K.G. (1985):Petrography I.University of Patras.
Raymond,L.A. (1997): Petrology. The study of Igneous Sedimentary Metamorhic Rocks. The MCGraw-Hill Companies, Inc. 2460 Kerper Blvd. Dubuque, IA 52001.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _019**	**SEMESTER**	3rd
COURSE TITLE	**GEOCHEMISTRY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, seminars and practical assignments	2 (lect.), 3 (prac.)	5

COURSE TYPE	General Science/Scientific Discipline
PREREQUISITE COURSES:	Introductory Mineralogy courses constitute crucial background learning
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO349/

LEARNING OUTCOMES

Learning outcomes

The course is designed for undergraduate students with adequate background and comprehension of basic principles of Geology. The aim of this course is to offer advanced knowledge and skills on geochemical processes pertaining to (ι) the interactive geosphere-biosphere-hydrosphere-atmosphere system΄(ιι) the deeper parts of the lithosphere; (iii) the mobility of chemical elements across different subsystems of the solid Earth, and (iv) their significance and impact for global climate and humanity.

Through successful conclusion of this course, the student will be able to:

- Process, present and interpret geochemical data and their various intercorrelations,
- Assess the intrinsic links between mineralogy, mineral chemistry and whole-rock geochemistry,
- Classify rocks in the geological space and time, using their bulk geochemical characteristics,
- Understand and appreciate a plethora of petrogenetic processes using lithogeochemistry,
- Use geochemical data in the reconstruction of paleoenvironments and paleoclimate,
- Apply geochemical tools in the elucidation of fluid-rock interactions and associated alteration effects,
- To decipher and interpret the geochemical fingerprints of various biological processes, and
- To apply geochemical methodologies in the search and discovery of mineral resources.

General Competences

- Research, analyze, and synthesize data and information using appropriate technological tools,
- Work independently and as part of a group,
- Promotion of free, unconstrained, and critical thinking.

SYLLABUS

The course content can be broken down in the following first-order subsections:

- Introduction
- Lithogeochemistry of igneous processes
- Lithogeochemistry and sediments
- Applications of Rare Earth Element Geochemistry
- Stable isotope applications in lithogeochemistry
- Chemical Paleoceanography
- Lithogeochemistry and paleoclimate
- Biogeochemical cycles and processes
- The water cycle and its role in geochemical processes
- Lithogeochemistry and metasomatic alteration
- Lithogeochemistry in the search for mineral resources

TEACHING AND LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>In-person lectures, seminars and practical work</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Basic use of computer software (e.g. MS Powerpoint, MS Excel),
• Communication using an online platform (e-class).
• Availability of course materials in electronic form (mainly PDF files)
• Online access το literature through electronic library resources</td></tr>
<tr><td>TEACHING METHODS</td><td><table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>2×13 = 26</td></tr><tr><td>Practical exercises</td><td>3×13 =39</td></tr><tr><td>Bibliographic work</td><td>10</td></tr><tr><td>Independent work</td><td>25</td></tr><tr><td>Written assignments</td><td>30</td></tr><tr><td>Total</td><td>130</td></tr></table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Written examination on the theory component of the course at the end of the semester. 70% of final mark), and written assessment of practical competence (30% of final mark). The above include combinations of essay-type questions with emphasis on comprehension and critical thinking; short questions on key principles; and practical problem solving.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Lecturer’s notes and presentation slides (unpublished)
Misra K.C., 2017, Introduction to Geochemistry: Principles and Applications (1st Edition), Wiley-Blackwell, 576 pages
White, W.M., 2020, Geochemistry (2nd Edition), Wiley-Blackwell, 960 pages
Alexander P. 2021, Practical Geochemistry, Springer, 124 pages.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_020**	**SEMESTER**	3rd
COURSE TITLE	**STRATIGRAPHY – HISTORICAL GEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work, Fieldwork	2 (lect.), 3 (lab.)	5

COURSE TYPE	Basic and Skills Development
PREREQUISITE COURSES:	Typically, there are not prerequisite courses, however, for the better understanding of the course it would be considered appropriate students to have attended the following modules: Palaeontology, Planet Earth and GIS and Remote Sensing in Applied Geology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, teaching may be however offered in English in case foreign students attend the course.
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO325/ (in Greek)

LEARNING OUTCOMES

Learning outcomes

This is a basic module for the disciplines of Stratigraphy and Historical Geology, providing information on the use of the main stratigraphic methods and the evolution of earth through geological time.
Upon successful completion of this course the students are able to:

1. Understand, implement and discuss the principles of Stratigraphy.
2. Apply the principles of stratigraphy in geological studies.
3. Apply stratigraphic methods such as lithostratigraphy, biostratigraphy, chronostratigraphy etc. for the solution of stratigraphic problems.
4. Become familiar with the main stratigraphic units, used in the main stratigraphic methods and mainly the chronostratigraphic and geochronologic ones.
5. Obtain basic knowledge of depositional environments, lithofacies and biofacies.
6. Obtain basic knowledge on the main geological events that occurred and stigmatised the history of the earth from the Precambrian until today.

General Competences

Generally, by the end of this course the students have developed the following general abilities:

1. Search, analyze and synthesize data and information, using the necessary technologies.
2. Adapting to new situations.
3. Working in a multidisciplinary environment
4. Working in an international environment.
5. Independent work.
6. Group work.
7. Generating new research ideas.
8. Respecting the environment.
9. Criticism and self-criticism.
10. Promoting free and creative thinking.

SYLLABUS

1. Principles of Stratigraphy – Sedimentary rocks and bedding – Types of bedding – Discontinuities – Unconformities – Hiatuses – Stratigraphic sections
2. Stratigraphic methods – Lithostratigraphy – Biostratigraphy – Chronostratigraphy – Geochronology – Radiometric dating – Magnetostratigraphy – Chemostratigraphy

3. Facies Analyses – Depositional environments – Stratigraphic correlation
4. History of the earth from the Precambrian till the Quaternary - Stratigraphic distributions, rocks, organisms, extinctions, palaeogeography, palaeobiogeography, palaeoecology, palaeoclimatology, orogenies, with special reference to the respective formations of the Greek Penninsula.

TEACHING and LEARNING METHODS – EVALUATION

DELIVERY	Lectures and laboratory practice face to face. Solving Stratigraphical problems during laboratory practice
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (powerpoint) in teaching. Supporting teaching and communication through e-class. The lectures content of the course for each chapter are uploaded on the e-class platform, in the form of a series of ppt files, from where the students can freely download them.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Laboratory work (2 conduct hours per week x 13 weeks)	3X13 = 39
Hours for the preparation of laboratory work reports (3h per week x 13 weeks)	3X13= 39
Hours for private study of the student (3h per week x 13 weeks))	30
Course total	**134 hours**

STUDENT PERFORMANCE EVALUATION	**I)** Oral final examination. The mark consists 50% of the final grade. The examination include: - Short answered questions. - Short essays of combined approach. **II.** Written reports following the completion of each laboratory practical or two midterm exams. The mean mark of the reports consists the other 50% of the final grade. Minimum passing grade: 5. <u>Final Course Grade (FCG)</u> FCG = (Oral exam + practical reports or midterm exams) / 2 The language of assessment is in Greek. If foreign students attend the course, their assessment in English.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Miall, A.D., 2015, Stratigraphy: A Modern Synthesis, Springer
Brookfield, M.E., 2004, Principles of Stratigraphy, Willey
Levin, H., 2013, The Earth through time, Wiley
Wicander, R., Monroe, J.,S., 2010, Historical geology: evolution of earth and life through time, Brooks/Cole
Notes of lecturers in English.

- Related academic journals:

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_021**	**SEMESTER**	3rd
COURSE TITLE	**GEOPHYSICS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work, Field work	2 (lectures) 3 (laboratory)	6

COURSE TYPE	Basic, General Knowledge, Scientific area
PREREQUISITE COURSES:	Physics (electricity theory, gravity, magnetism, electromagnetics)
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek (in English for non-Greek speaking ERASMUS students)
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, (in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO343/

LEARNING OUTCOMES

Learning outcomes

This course is introductory to the concepts of geophysics and the fundamentals of geophysical exploration methods. Upon its completion, students are expected to:

- Understand the basic principles and terminology in geophysical sciences
- Have a good knowledge of the earth's interior composition and geophysical properties
- Have a good knowledge of the principles and application steps of the most commonly applied geophysical exploration methods (seismic, electrical, magnetic, gravity and electromagnetic)
- Be able to distinguish, among geophysical exploration methods, the most appropriate to solve specific problems of basic and applied research

General Competences

- Ability to search, analyze and integrate data and literature information toward solving specific problems
- Ability to integrate multidisciplinary data
- Ability to organize and implement field measurements
- Enhancement of team work spirit and ability

SYLLABUS

- Introduction to the science of Geophysics, basic principles, branches, importance and application fields
- The earth's interior: geophysical structure, properties and their variation
- Geodynamics, Plate tectonics theory
- Heat, heat flow in the earth's interior
- Gravitational field: intensity and potential, description and measurements, geoid, ellipsoid, isostasy, distribution of gravitational anomalies, tides
- Magnetic field: measures and variations, causes, measurements, tellouric current, paleomagnetism
- Basic principles of exploration geophysical methods: seismic, gravity, magnetic, electric and electromagnetic
- Planetary Geophysics

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures in class, laboratory exercises and field demonstrations
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) in teaching. Learning procedure to be supported through the e-class electronic platform. Communication between instructors and students both through e-class and by e-mails.
TEACHING METHODS	

Activity	**Semester workload**
Lectures	26

	Laboratory exercises with focus on understanding of basic principles	36	
	Study of additional exercises and literature	40	
	Hours for private study	48	
	Course total	**150**	
STUDENT PERFORMANCE EVALUATION	Written examination (70%), written reports on laboratory exercises (30%) The written examination takes place at the end of the semester and may include one or combination of the following: • Short answer theory-based questions • Essay answer questions • Assessment questions • Exercises solving		

ATTACHED BIBLIOGRAPHY

1. Papazachos, K. and B. Papazachos (2013). Introduction to Geophysics, Ziti Publications, Thessaloniki, pp. 624 (in Greek).
2. Tselentis, G.-A. and P. Paraskevopoulos (2013). Applied Geophysics, Liberal Books, Athens, pp. 600 (in Greek).
3. Lowrie, W. (2007). Fundamentals of Geophysics, Cambridge: Cambridge University Press, doi: 10.1017/CBO9780511807107

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_022**	**SEMESTER**	4th
COURSE TITLE	**FIELDWORK II**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Fieldwork – Field trips	3days	2

COURSE TYPE	General knowledge, Skills development
RELATED COURSES:	Mineralogy I, Mineralogy II, Geochemistry.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.upatras.gr/field-trips/Geol_014

LEARNING OUTCOMES

Learning outcomes

The three (3) days of field trip take place within the framework of the course "Petrography of igneous rocks" and "Petrography of sedimentary and Metamorphic rocks".

The aim of the field trip is students to better understand the subject of the referred courses:

1. Macroscopical recognition and classification of minerals and rocks as well as the geological description of their appearance-Sampling.
2. Structures and forms of appearance of rocks.
3. Mineralogical and petrographic properties in various rock types.
4. Description of carstic phenomena in selected areas.
5. Geological occurrences of ophiolite complexes as well as their tectonostratigaphical evolution in the area of East Mediterranean.
6. Recognition and description of ore concentrations in host rocks.
7. Systematic description and analysis of the geological structure of the Lavreotic peninsula and the relative skarns-possibility of identifying, describing and collecting of Petrogenetic and metallic minerals which are unique in a global scale.
8. The way and the rationale for the operation of ancient helical washers of ores.
9. Methods for extraction of mineral raw materials-visit in industrial facilities.
10. Environmental impact from the exploitation of mineral raw materials-examples.
11. Methana volcanoes-visit to the newest volcanic center of Argolic peninsula.

General Competences

Ability to recognize and describe minerals and rocks in the field,
Introduce the students to the main topics of Geology,
Search for, analysis and synthesis of data and information.

SYLLABUS

1. Wagon of the Mining Park of Fokida.
2. Ophiolite melange in the 15th km of Lamia-Domokos.
3. Manganese overlaps appearance in rocks of the ophiolite melange.
4. Pillow lavas appearance at the crossing for the Arnitsis monastery.
5. Agios Stephanos-chromite mine.
6. Aggregate materials quarry of TERNA SA
7. Domokos Prisons-Trinitarian volcanism.
8. Appearance of flysch in Domokos.
9. Visit in the mineralogical museum of Lavrio.

10. Area of appearance of minerals of Ni-Pb- Fe-Mn-Al ores in the mine of 3rd km of Lavrion-kamariza/Agios Konstantinos.
11. Visit in the passive Chaos dolin.
12. Visit to the unique ancient helical metal washers at Sinderina-Dimoliaki.
13. The appearance of metamorphic formations of the thrusted nap of Lavrio section.
14. Area of appearance of granodiorite-tonalite in Plaka area.
15. Impressions of skarn type keratite and mineralization.
16. Upper cretaceous thrust of limestones on the ophiolite suite in the area of Old Epidaurus.
17. Mountain Coni (central Argolis) - tectonic contact of Pantokratoras limestones with the ophiolite suite.
18. Route Ano fanari-Karatzas: typical geological section in the ophiolite melange.
19. Methana volcano: visit to the newest volcanic centre of the Argolic peninsula.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Three days field-trip for better understanding of teaching elements provided during lectures and laboratories of Mineralogy, Tectonic and Petrography.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Recognizing atlas of minerals and rocks as well as useful tools for the classification and collection of them.
TEACHING METHODS	

Activity	Semester workload
Lectures for field-trip preparation	6*2=12
Field-trips	3*8=24
Writing of the reports	3*8=24
Course total	**60**

STUDENT PERFORMANCE EVALUATION	Students must write for each filed-trip a report in order to prove that they understood in each field trip the demonstrated geological features.

ATTACHED BIBLIOGRAPHY

- Marinos, G., and Petrascheck, W.E., 1956, Laurium: I.G.M.E. Published Internal Essay, v. 4, p.1-247.
- Menzies, M. (1976). Geochimica et Cosmochimica Acta 40, 645-656.
- Baumgartner, P.O. (1985). Mémoires de la Société Helvétique des Sciences Naturelles, Birkhäuser, Basel, pp. 111.
- Katsikatsos, G., Migiros, G., Triantafyllis, M., & Mettos, A. 1986. Geological and Geophysical Research, Special Issue, 191-212.
- Hatzipanagiotou, K. (1990). Ofioliti 15, 61-77.
- Rassios, A. & Smith, A.G. (2000). Geol. Soc. Amer. Sp. Pap. 349, 473-483
- Bortolotti, V., Carras, N., Chiari, M., Fazzuoli, M., Marcucci, M., Photiades, A. & Principi, G. (2002). Ofloliti 27(1), 43-46.
- Barth, M.G., Mason, P.R.D., Davies, G.R., Dijkstra, A.H. & Drury, M.R. (2003). Journal Petrology 44, 1759–1785.
- Tsikouras, V., Pe-Piper, G., and Skarpelis, N., (2006). Abstracts, "International magmatism of the Central Aegean and adjacent areas: Petrology, tectonics, geodynamics, mineral resources and environment, Milos, p. 14.
- Bonsall A., Spry P, G., Voudouris P. C., Tombros S., St. Seymour K.St.and Melfos V. (2007).
- Baziotis I., Proyer A., Mposkos E. (2009). European Journal of Mineralogy, 21, 133-148.
- Liati A,. Skarpelis N., Pe-Piper G. (2009). Geological Magazine, 146, 732-742.
- Tsikouras, B. Karipi S., Rigopoulos I., Perraki M., Pomonis P. & Hatzipanagiotou K. (2009). Lithos, in press.
- Ioannis Baziotis, Maria Economou-Eliopoulos, Paul D. Asimow, Lithos, Volumes 288–289,2017, Pages 231-247.
- Hatzipanagiotou K., Tsikouras. B., Gaitanakis P. (1987-88), Annales Geologiques des pays Helleniques, 33, 475-492.
- Hatzipanagiotou K. (1985), 173 page, Patra, University of Patras.
- Hatzipanagiotou K. (1995), 234 page, Patra, University of Patras.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_023**	**SEMESTER**	3rd
COURSE TITLE	**GEOLOGICAL DATA ANALYSIS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work	1(lectures) 2 (laboratory)	4

COURSE TYPE	General background and Skills Development
PREREQUISITE COURSES:	Typically, there is no prerequisite course.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, in English
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO352/

LEARNING OUTCOMES

Learning outcomes
During this course the student acquires basic knowledge in geological data processing and presentation, using a computer, after successful completion the student are able to: Solve problems related to electronic geological data processing and presentation **Knowledge** This course aims to provide the basic knowledge of Matlab software for scientific data processing and presentation. **Skills** Geological data processing through computer codes, i.e. data diagrams, data maps, regressions, specialized graphs, etc Solve geological problems using Matlab i.e. create codes for automatic data handling **Abilities** Ability to solve geological problems, using a computer Ability to work in a team
General Competences
By the end of this course the students have developed the following skills (general abilities): Ability to apply acquired knowledge and understanding to the solution of problems related to geological data processing Ability to prepare and execute searching, analysis and synthesis of data and related information Ability to interact with others in problem solving

SYLLABUS

Introduction, computer assisted geological data analysis, Matlab (http://www.mathworks.com/products/matlab/), basic principles
Data files, loading and processing, diagrams in Matlab
Matlab functions, processing of large data volumes
Regression and data fitting
Statistical data processing, tendency, dispersion measures and statistical tests
Linear interpolation, gridded data processing, contour maps
Fourier analysis
Data smoothing
Application in real geological data, development of Matlab codes.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and computer laboratory training

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of Information and Communication Technologies (ICTs) in teaching. The lectures content of the course, for each chapter, are uploaded in the eclass platform. The same is done for laboratory exercises together with the appropriate solution. Interaction with students is done through eclass platform also.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>13</td></tr>
<tr><td>Laboratory exercises</td><td>26</td></tr>
<tr><td>Student personal practice in software use</td><td>25</td></tr>
<tr><td>Hours for private study of the student</td><td>36</td></tr>
<tr><td>Course total</td><td>100</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>The assessment is done in the following way:
Written examination after the end of the semester which includes (T1, max 5)
Theory based questions
Assessment questions
Problem solving questions
Problem solving in the computer laboratory (L1, max 5)

Minimum passing grade: 5. Final grade = T1+L1</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Lecture notes (eclass)
M. Trauth, E. Sillmann, R. Gebbers and N. Marwan, MATLAB Recipes for Earth Sciences, 2010.
http://www.mathworks.com/support/books/

- Related academic journals:

GENERAL

SCHOOL	NATURAL SCIENCE		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**GEOL_024**	**SEMESTER**	3rd
COURSE TITLE	**GEOGRAPHICAL INFORMATION SYSTEMS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory, Tutorial	1 (lect.) / 2 (lab.)/ 1T	4

COURSE TYPE	Field of Science (GIS & Remote Sensing)
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO307/

LEARNING OUTCOMES

Learning outcomes

The course aims at familiarizing students with geo spatial data and at introducing them in Geographic Information Systems and Remote Sensing technologies. By the end of this course the students are able to:

1. Distinguishing the concepts of analogue and digital image and calculate the digital image statistical parameters.
2. Distinguishing the geographical data as vectors and rasters and information as spatial and non- spatial.
3. Importing, storing, homogenizing, processing, and analyzing spatial and geological data
4. Developing and process spatial databases
5. Recognizing the most common satellite images and to digitally process them.
6. Using geographic and geological data in GIS environment, to process it and produce maps.

By the end of this course the students have developed the following skills:

1. Ability to demonstrate knowledge and understanding of basic concepts, about GIS and RS.
2. Enhancing the quality of images, creating colored composites and interpreting them.
3. Implementing geometric correction, georeferencing and digitization of satellite images.
4. Creation of DEM out of digitized contour lines and production of topographic and elevation profiles.
5. Creating maps with the combined use of Geographic Information Systems and Remote Sensing data.

General Competances

- Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
- Decision making
- Autonomous (Independent) work
- Work in an international enviroment
- Work in an interdisciplinary enviroment
- Work design and management
- Respect to natural environment

SYLLABUS

The course is organized in 4 teaching circles which are described below.

Circle A:

- Raster and vector data, Spatial and non spatial data
- Analogue and digital image, histogram and image statistical parameters
- Sensors and platforms, electromagnetic spectrum.
- Interactions of electromagnetic radiation with materials and atmosphere.

Circle B:

- Spatial analysis

- Spatial interpolation
- Digitization and correction of contours, Digital Elevation Models creation, Orthorectification and production of orthophotos

Circle C:
- Control and processing of spatial geodata
- Combined use of remote sensing and other geodata
- Development of Geodata base

Circle D:
- GIS and Web apllications, WebGIS
- Producing digital maps
- Case studies of the use of Geographic Information Systems and Remote Sensing in Applied Geology.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures with the use of PowerPoint slideshow.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Laboratories with the use of specialized software for GIS (ESRI, ARCGIS) and Image Processing (ERDAS IMAGINE) in the departmental computer lab. Training in the use of GPS in the field.
TEACHING METHODS	

Activity	**Semester workload**
Lectures in Theory	1X13 = 13
Laboratory exercises in GIS and RS	2X13 = 26
Writing reports of the laboratory exercises	1X13= 13
Hours for private study and bibliography analysis of the student	48
Total number of hours for the Course	**100**

STUDENT PERFORMANCE EVALUATION	Written examination after the end of the semester (G_{th}60%)or multiple choice exam online Written reports for each laboratory exercise (G_{lab}40%) Minimum passing grade: 5. Final Course Grade (FCG) FCG = (G_{th} + G_{lab}) / 2

ATTACHED BIBLIOGRAPHY

4. "Remote Sensing (Principles, Image processing,Applications)" G. Skianis K. Nikolakopoulos, D. Vaiopoulos, ION Publ. 2012. p.336. (in Greek language)
5. " Remote Sensing –Photointerpretation in Geo-scienses", Theodoros Astaras, Aivazi Publ. 2011, p. 484. (in Greek language)
6. Laboratory Notes: "Laboratory exercise of digital processing of Remote Sensing data combined with GIS", D. Vaiopoulos G. Skianis K. Nikolakopoulos, Athens University Publ. 2006, p. 178. (in Greek language)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**GEOL_025**	**SEMESTER**	3rd
COURSE TITLE	**METEOROLOGY - CLIMATOLOGY**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS**
Lectures, seminars and laboratory work		2 (lect.)/1 (lab.)	4
COURSE TYPE	Field of Science and Skills Development		
PREREQUISITE COURSES:	Recommended prerequisite knowledge: Students should have at least a basic knowledge of Fluid Mechanics, Thermodynamics, Electromagnetism and Calculus and also basic programming skills.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/PHY1923/		

LEARNING OUTCOMES

Learning outcomes

At the end of this course the students are able to:

- identify the basic characteristics of the atmospheric environment and the principal laws that apply to it
- apply these laws of physics in order to explain common weather and climatic phenomena and up-to-date issues in atmospheric physics, meteorology and climatology
- know and understand the basic theories and principles that are related with the atmosphere, its components and the phenomena that take place into it
- apply this knowledge for the quantitative and qualitative solutions of problems related with the contents of this course
- acquire the needed knowledge and experience to follow relevant courses that deal in depth with atmospheric physics, meteorology, climatology and atmospheric pollution
- interact with others on atmospheric physics and on inter or multidisciplinary problems

General Competences

- Search, analysis and synthesis, as well as a critical understanding of data and information using appropriate technologies
- Decision making
- Working in an interdisciplinary environment
- Autonomous work
- Teamwork
- Production of new research ideas
- Promotion of free, creative and inductive thinking

SYLLABUS

1 Earth's atmosphere

- General notions, magnitude of the atmosphere, composition of lower atmosphere
- Solar and terrestrial radiation, atmospheric temperature and pressure, geopotential, simple atmospheric models
- Water vapor in the atmosphere

2 Atmospheric Thermodynamics

- State equation, laws of thermodynamics, thermodynamic processes in the atmosphere

- Atmospheric Stability, Criteria of instability (Vertical temperature gradient, potential temperature, energy)

3 Cloud Physics

- Water vapor condensation, cloud classification, rain formation theory

4 Atmospheric Dynamics

- Forces defining the air motion, equations of motion, synoptic scale winds, air motion in the atmospheric boundary layer, thermal circulation
- General atmospheric circulation, planetary winds, troposhperic winds – Hadley cells, tropospheric long (Rossby) waves

5 Air Masses

- Air masses, fronts, low pressure centers, high pressure centers
- Cyclogenesis

6 Climate Dynamics

- Climate Classification, Climate Variability, Climate Equilibria, Sensitivity and Feedbacks
- Climate Change – climatic models

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Lectures using power-point presentations. Problem-solving seminars for the instructive solution of synthetic problems. Solving of critical questions by the students during the lecture time. Laboratory experiments. Digital content in the eClass platform.
TEACHING METHODS	

Activity	Semester workload
Lectures	26
Laboratory work	13
Solution of recommended exercises	26
Hours for private study of the student and preparation of home-work	32
Final examination	3
Total number of hours for the Course	**100**

STUDENT PERFORMANCE EVALUATION

Assessment Language: Greek
Assessment Language for Erasmus students: English

Assessment methods

- ✓ Written final examination (90% of the final mark) including:
  - Evaluation of elements from theory
  - Exercises and problem solving
- ✓ weekly short-answer tests of 10’ duration with comprehension questions (10% of the final mark)

Minimum passing grade: 5
Maximum passing grade: 10

ATTACHED BIBLIOGRAPHY

- **Μαθήματα Μετεωρολογίας και Κλιματολογίας**, Α. Α. Φλόκα, Εκδόσεις Ζήτη, Θεσσαλονίκη, 1994.
- **Μαθήματα Γενικής Μετεωρολογίας**, Τ. Ι. Μακρογιάννη, Χ. Σ. Σαχσαμάνογλου, Εκδόσεις Χαρις, Θεσσαλονίκη, 2004.
- **Γενική Μετεωρολογία**, Χ. Σ. Σαχσαμάνογλου, Τ. Ι. Μακρογιάννη, Εκδόσεις Ζήτη, Θεσσαλονίκη, 1998.
- **Εισαγωγή στη Φυσική της Ατμόσφαιρας και την Κλιματική Αλλαγή**, Π. Κατσαφάδος, Η. Μαυροματίδης, Εκδόσεις Κάλλιπος, 2015.
- **Atmospheric Science: An Introductory Survey**, J.M. Wallace, P.V. Hobbs, Academic Press, London, 2006.
- **Meteorology for Scientists and Engineers**, R. Stull, University of British Columbia, 2011.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**GEOL_083**	**SEMESTER**	3rd
COURSE TITLE	**SEMINAR-ENGLISH TERMINOLOGY FOR GEOLOGISTS**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, seminars and laboratory work		3L	3
COURSE TYPE	Scientific Area and Skills Development		
PREREQUISITE COURSES:	Good knowledge of English is recommended towards students' successful completion of the course (B1/B2 level). Attendance and participation is compulsory . Participants should have a good passing grade(over 7/10) in English for Geology 1 and 2 courses .		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO349/		

LEARNING OUTCOMES

Learning outcomes
By the end of this course the studentς are able to: • have practised and improved all four English language skills • have acquired the skills to approach texts in Geology(text comprehension, linguistic practice, vocabulary building, written speech production) Comprehend pertinent lectures, presentations, carried out in English
General Competences
Develop further all skills and micro-skills by making a power-point presentation based on a topic of their choice. This in addition equip them with the presentation skills and confidence required to make presentations in English in their postgraduate studies and in Erasmus courses abroad Deal effectively with interviews Write an impressive C.V

SYLLABUS

ACADEMIC ENGLISH - ENGLISH FOR SPECIFIC PURPOSES
INTERVIEW SKILLS
PRESENTATION SKILLS AND TECHNIQUES
HOW TO WRITE AN IMPRESSIVE C.V

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face to face (Lectures in class)	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of Information and Communication Technologies (e.g. powerpoint) in teaching. The study material of the course for each chapter isuploaded on the internet, in the form of a series of ppt files, where from the students can freely download them using a password which is provided to them at the beginning of the course.	
TEACHING METHODS	**Activity**	**Semester workload**
	Seminar (3 conduct hours per week x 13 weeks)	3×13=39
	Provide extensive exercise work to reinforce material comprehension, listening skills ,oral communication skills, writing skills. Provide a variety of exercise work to reinforce the unit terminology	36
	Total number of hours for the Course	**75 hours**

STUDENT PERFORMANCE EVALUATION	**Assessment** is based on final exam + class participation and Powerpoint presentation

ATTACHED BIBLIOGRAPHY

A Dictionary of Earth Sciences (3rd ed.) (2008), OUP.
A Dictionary of Geology and Earth Sciences (4th ed), (2013) OUP.
The Penguin Dictionary of Geology by Philip Kearey.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**GEOL_026**	**SEMESTER**	4rth
COURSE STUDY	**PETROGRAPHY OF SEDIMENTARY AND METAMORPHIC ROCKS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
LECTURES, LABORATORY EXERCISES+TUTORIAL	2TH+2LAB+1T	6

COURSE TYPE	Background, Field of Science and Skills Development
PREREQUISITE COURSES:	Physic, Chemistry, Introduction in Geology, Mineralogy I,II, Petrography I.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	-

LEARNING OUTCOMES

Learning Outcomes

By the end of this course the students are able to:

- Macroscopical and microscopical identification of sedimentary and metamorphic rocks.
- Classification of sedimentary and metamorphic rocks according to international standards.
- Use of sedimentary and metamorphic rocks in various industrial and environmental applications.
- Acquisition of basic knowledge, necessary for the attendance of the course: Petrology of igneous and metamorphic rocks.

General Competances

Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
Autonomous (Independent) work
Group work

SYLLABUS

Sedimentary rocks (weathering stages, physical, chemical, biochemical factors, stage of transport, deposit and diagenesis)- characteristic features of sedimentary rocks- systematic classification and description (clastic, chemical and biochemical sediments, structure of limestones and basic principles of coal petrography).
Metamorhic rocks (types of metamorphism, categories of met. Rocks-factors-degrees and phases of metamorphism- structure of met. Rocks- systematic classification and descriptuion of met. Rocks)

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Face to Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Lectures (power point), exercises, field exercises.

TEACHING METHODS

Activity	**Semester workload**
Lectures	2×13=26
Laboratory exercises	2×13=26
Tutorial	1×13=13
Independent study	85
Total number of hours for the Course	**150**

STUDENT PERFORMANCE EVALUATION

I. Theory (50% of total rate)
Final Examination: Written examination of graded difficulty (multiple choice, short growth questions, development questions, exercises)
II. Laboratory (50% of total rate)
1) Laboratory study of thin sections and rocks (25% of total rate)
2) Oral examination : Macroscopical identification of minerals and rocks (25%)

ATTACHED BIBLIOGRAPHY

- Hatzipanagiotou,K.G. (2005):Petrography II.University of Patras.
-Raymond,L.A. (1997): Petrology. The study of Igneous Sedimentary Metamorhic Rocks. The MCGraw-Hill Companies, Inc. 2460 Kerper Blvd. Dubuque, IA 52001.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_027**	**SEMESTER**	4rth
COURSE TITLE	**SEDIMENTOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	2(L), 2(LW)	5

COURSE TYPE	Special background, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO337/

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of this course , the students are able to: Define, explain and summarize the basic sedimentary processes and depositional environments Understand the formation processes and the main types of sediments and sedimentary rocks. Describe and analyze the main sedimentary structures as well as grain size and particle morphology of clastic sedimentary rocks
General Competences
Search for, analysis and synthesis of data and information with the use of the necessary technology, working independently

SYLLABUS

Theory

Introduction to Sedimentology and stratigraphy
Clastic and Non- Clastic (chemical and biochemical sedimentation) sedimentary rocks, sandstone, claystone siltstone, conglomarates – Carbonates, evaporites etc
Processes of transport and sedimentary structures
Sedimentary depositional environments (alluvial fans, river, deltas ,lakes and lagoons, marine)
Sedimentary facies and depositional environments analysis
Borehole stratigraphy and sedimentology

Laboratory

Grain size distribution and statistical parameters, ternary diagrams
Palaeocurrents indices and their interpretation (rose diagrams)
Roundness, spherisity and shape characteristics of grains
Borehole sedimentology – Log profile (SedLog software)
Data analysis and Statistical analysis
Packing proximity
Facies correlation (fence diagrams, facies maps etc)

TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>In classroom theory (face-to-face) using power point presentations.
Laboratory exercises in groups of 30-35 students
Tutorial support for the non directed study and the better understanding of laboratory exercises.
Seminar lessons using geo software for the laboratory exercises.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Use of Information and Communication Technologies (ICTs) (power point) in teaching
Support of Learning Process and Dissemination of educational material through the University of Patras e_class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (2 conduct hours per week x 13 weeks)</td><td>13*2=26</td></tr>
<tr><td>Laboratory work (2 conduct hours per week x 13 weeks)</td><td>13*2=26</td></tr>
<tr><td>Interpretation and writing of the exercises</td><td>13*3=26</td></tr>
<tr><td>Tutorial</td><td>13*1=13</td></tr>
<tr><td>Project preparation</td><td>4*7=28</td></tr>
<tr><td>Seminar</td><td>3*3=9</td></tr>
<tr><td>Non-directed study</td><td>22</td></tr>
<tr><td>Course total</td><td>150</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Final Exam written compulsory, intermediate exams written optional, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving (80% theory and 20% exercises from laboratory).
Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams.
Marking Scale: 0-10.
Minimum Passing Mark: 5.
Students are obliged to attend all laboratory class and to deliver the results of all exercises.
Maximum number of non delivered laboratory exercises: 2</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography mainly in Greek:
1. Σημειώσεις Μαθήματος Θεωρίας και Εργαστηρίου που παρέχονται σε pdf μέσω e-class.
2. Ιζηματολογία, Ψιλοβίκος Εκδόσεις Τζιόλα 358 σελ, Παρέχεται μέσω ΕΥΔΟΞΟΣ
3. Sedimentology and Stratigraphy, G. Nichols, 355 σελ. Blackwell publ.
- Related academic journals:
Sedimentology
Basin Research
Quaternary International

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _028**	**SEMESTER**	4rth
COURSE TITLE	**STRUCTURAL GEOLOGY**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work		3 (Lect.) +2 (lab.)	6
COURSE TYPE	Basic General knowledge / Field of Science		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO315/		

LEARNING OUTCOMES

Learning outcomes
The course is addressed to undergraduate students who know and understand the basic principles of Geology. The aim of the course is for students to acquire advanced knowledges and skills on themes related with the tectonic structures as well as with the processes, movements and forces that produce the structures. By the end of this course the students are able to: Know and describe the most common deformation structures in rocks Understand and discriminate deformation structures which have been developed under different stress regimes Understand and discriminate deformation structures which have been developed in different crustal levels Classify the deformation structures in terms of their geometry and kinematics Combine various orientation data of deformation structures and calculate various geometric elements of them Present the 3D geometry of deformation structures using simple azimuthal projections
General Competences
Generally, by the end of this course the students have developed the following general abilities (from the list above): Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

The course content includes the following chapters: Basic concepts Mechanical properties of rocks Stress and rocks Deformation mechanisms Introduction to tectonic faults Normal faults Thrust faults Strike-slip faults Joints Shear zones Basic concepts on folds Fold generation mechanisms Cleavage

Azimuthal projections in Structural Geology

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face in the classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	
TEACHING METHODS	**Activity** / **Semester workload** Lectures: 3 X 13 = 39 Laboratory practice: 2 X 13 = 26 Study and analysis of bibliography: 25 Study (non-directed): 45 Written report: 20 **Course total: 155**
STUDENT PERFORMANCE EVALUATION	Written examination after the end of the semester. The examinations includes essay, short-answer and problem solving questions.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Davis G., Reynolds S. 1996. Structural Geology of rock and regions. John Wiley & Sons, Inc.
Fossen H. 2010. Structural Geology. Cambridge University Press.
Koukouvelas I. 1998. Structural Geology. Leader Books Publ., Athens.
van der Pluijm B., Marshak S. 2004. Earth Structure. W. W. Norton & Company, Inc.
Xypolias P. 2009. Azimuthal projections in Structural Geology. Symmetria Publ., Athens.

- Related academic journals:

Journal of Structural Geology
Tectonics
Tectonophysics

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_029**	**SEMESTER**	4rth
COURSE TITLE	**SEISMOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work	2 (lectures) 2 (laboratory)	6

COURSE TYPE nt	Basic, Skills Development, Science field
PREREQUISITE COURSES:	Basic knowledge of Phycics related subjects e.g. waves, oscillations etc
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, in English
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO351/

LEARNING OUTCOMES

Learning outcomes
During this course the student acquires basic knowledge in Seismology, after successful completion the student: Know the basic principles of Seismology Solve, simple problems related to Seismology, e.g. earthquake location, travel times, earthquake magnitude etc **Knowledge** The course aims to provide knowledge related to the structure of the Earth, the generation and propagation of seismic waves, the characteristics of seismicity in time and space, the seismic source, the seismic instruments and the seismotectonics of Greece. **Abilities** Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to earthquake generation, wave propagation, source properties, seismotectonics Ability to apply such knowledge and understanding to the solution of qualitative and quantitative problems Ability to adopt and apply methodology to the solution of unfamiliar problems. Ability to apply basic seismological principles in problems related with this subject Ability to solve simple seismological problems, using seismological software Ability to work in a team
General Abilities
By the end of this course the students have developed the following skills (general abilities): Ability to apply acquired knowledge and understanding to the solution of problems Ability to interact with others in problem solving as a team

SYLLABUS

Introduction, history and general overview of seismology Principles of elasticity, stress strain, elastic moduli. Basic principles of wave propagation theory. Theory of oscillations, wave equation Stress and Strain Seismic waves, types, wave propagation and the structure of the Earth Seismometry, types of seismometers, modern seismographs, analog digital conversion, seismic networks Causes, occurrence and properties of earthquakes. Earthquake location and magnitude, seismic scales. Seismology of Greece, seismotectonics of Greece and adjacent areas Seismic moment, focal mechanism, rupture models Earthquake prediction, seismic sequences Seismographs and interpretation of earthquake records

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and computer laboratory training using seismological software
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) in teaching. The lectures content of the course, for each chapter, are uploaded in the eclass platform. Students are trained in seismological software use in the Department's computer lab. Interaction with students is done through eclass platform also.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	The assessment is done in the following way: Written examination after the end of the semester which includes Theory based questions Assessment questions Problem solving questions Minimum passing grade: 5

Activity	Semester workload
Lectures	26
Laboratory exercises	26
Hours for private study of the student	72
Course total	**124**

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Lecture notes (eclass)
Tselentis Akis, Modern Seismology, Pub. Papasotiriou, 1997.
Papazachos B, Karakaisis G., Chatzidimitriou P., Introduction to Seismology, Pub. Ziti, 2005
Stein, Seth, Wysession, Michael, An Introduction to Seismology, Earthquakes and Earth Structure 1st edition, Blackwell, 2002
Shearer M. Peter, Introduction to Seismology, Cambridge Univ. Press

- Related academic journals:
Bulletin of the Seismological Society of America
Journal of Seismology
Geophysical Journal International
Journal of Geophysical Research

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _030**	**SEMESTER**	5rth
COURSE TITLE	**FIELDWORK III**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Field work	6days	3

COURSE TYPE	Basic General knowledge / Skills development
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
The course is addressed to undergraduate students who sufficiently know and understand the principles of Sedimentology, Sedimentary Petrography and Structural Geology. By the end of this course the students are able to: To recognize and describe the basic sedimentary and tectonic structures in the field. To use diagnostic criteria to identify in the field sedimentary depositional environments (e.g. deltaic deposits and alluvial fan) and underline the tectonic regime Mapping the structures and the stratigraphy of sedimentary rock, as well as to construct stratigraphic columns and geological cross-secti from the field observation. Identify the relative age of rocks and tectonic structures based on the basic geological principles of superposition, original horizontality lateral continuity Identify the orientation of sedimentary and tectonic structures using the geological compass Be able to evaluate and interpret field data taking into account the geological model and the evolution of the study area.
General Competences
Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Working independently Team work Respect for the natural environment Production of free, creative and inductive thinking

SYLLABUS

The course focuses on the student's training in the field, training them in the identification and understanding of the formation of tectonic and sedimentary structures as well as sedimentary depositional environments.
•Sedimentary rocks and field recognition
•Sedimentation and depositional processes
• Principles of identification and interpretation of tectonic and sedimentary structures
• Tectonic structures in sedimentary and crystalline rocks
• Tectonic structures in extensional and compressional regime
• Methods of collecting data in the field and data processing
• Statistical processing of field data using appropriate geo-software
• Palaeogeographical and tectonic interpretation of the study areas
• Construction of geological profiles from field data using appropriate software
• Methods of presentation and visualization of collected tectonicl and sedimentary data

TEACHING and LEARNING METHODS – EVALUATION

<table>
<tr><td>DELIVERY</td><td>Face-to-face in the field</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td></td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Fieldwork</td><td>6days X 8 = 48</td></tr>
<tr><td>Study (non-directed)</td><td>10</td></tr>
<tr><td>Written report (using data collected during fieldwork)</td><td>30</td></tr>
<tr><td>Course total</td><td>88</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>The student assessment is based on the score of the submitted report as well as on oral examination</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Coe, A.L., Arges, T.W. Rothery, D.A., Spicer, R. A. 2010. Geological Field Techniques. Wiley-Blackwell publ. pp. 337
Ξυπολιάς Π. 2009. Αζιμουθιακές προβολές στην Τεκτονική Γεωλογία. Εκδόσεις ΣΥΜΜΕΤΡΙΑ, Αθήνα, σελ. 197.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_031**	**SEMESTER**	4rth
COURSE TITLE	**CLAY MINERALS AND ENVIRONMENTAL APPLICATIONS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, seminars and laboratory work	2 (lect.) 1 (lab.)	3

COURSE TYPE	Field of Science (Clay Minerals)
PREREQUISITE COURSES:	Typically, there are not prerequisite course. Essentially, the students should possess: knowledge of Mineralogy I, Mineralogy II, Petrography I, Petrography II
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	

LEARNING OUTCOMES

Learning outcomes

By the end of this course the students are able to:

At the end of this course the student learn :

1. The introduction to clays science
2. The inter-scientific character and Environmental applications of clay science
3. The most important methods for identification and characterization of clay minerals.

General Competences

At the end of the course the students have developed the following skills/competences

1. Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to clay science
2. Ability to apply such knowledge and understanding to the solution of problems of an unfamiliar nature.
3. Ability to adopt and apply methodology to the solution of unfamiliar problems.
4. Study skills needed for continuing professional development.
5. Ability to interact with others on inter or multidisciplinary problems.

SYLLABUS

1. Introduction to clays and Clay Minerals
2. Clay Minerals formation Part 1 : Weathering
3. Clay Minerals formation Part 2: Hydrothermal
4. Clay Minerals formation Part 3: Sedimentary
5. Clay Minerals formation Part 3: Diagenesis
6. Crystal structure of clay minerals

7. Chemical composition of clay minerals
8. Physical and chemical properties of clay minerals
9. Geological and industrial applications of clays and clay minerals
10. The most important environmental applications
11. The most recent environmental applications
12. Methods of clay minerals identification
13. Clay Minerals characterization (XRD, SEM, DTA-TG, FT-Raman, Raman, FTIR, NMR).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Power Point, Laboratory exercises, examples.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Laboratory work (1 conduct hour per week x 13 weeks)	1X13 = 13
Hours for private study of the student and preparation of home-works	36
Total number of hours for the Course	**75 hours**

STUDENT PERFORMANCE EVALUATION	Written final examination and problem solving

ATTACHED BIBLIOGRAPHY

1. Π.Τσώλη-Καταγά. Άργιλοι -Ιδιότητες και εφαρμογές,1990. 85p.,
2. Bergaya, F., Theng, B.K.G. and Lagaly, G. Handbook of Clay Science, 2006. 1224 p.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _032**	**SEMESTER**	4th
COURSE TITLE	**EARTHQUAKE GEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures, laboratory work and tutorial	2L+1sem+1 Tutor	5

COURSE TYPE	Field of Science
PREREQUISITE COURSES:	There are no prerequisite courses. However, students knowing basic principles provided through the previously taught theoretical courses on "Structural Geology" and "Seismology" are strongly benefited in understanding the issues of the course.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS HE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO344/

LEARNING OUTCOMES

Learning Outcomes
The course is aimed at undergraduate students who understand basic principles of Geology. The aim of the course is to acquire advanced knowledge and skills in topics related to deformation of active faults as they are imprinted on the Earth's landscape. In particular, the educational objectives of the course will include recognition of the landscape changes that accompany different types of active faults in deformed geotectonic environments. Identification of active faults will be based on landscapes close to the fault trace, on the fluvial geomorphology and on the drainage pattern. Furthermore, in order the students to understand the concepts and the key landscapes attesting to the active deformation a series of examples from active faults in Greece and key slides from active faults worldwide are presented. Furthermore, we use examples of ground failures during recent earthquakes of Greece. The analysis and implementation of the concepts to be learned will also be done within the workshop with calculations and classifications of geomorphological indices. The composition and assessment of the knowledge in the course will result in students being able to recognize active faults and their capability in hosting strong earthquakes.
General Competences
By the end of this course the students have developed the following skills (general abilities) Search; analyze key observations regarding active faults. Synthesize geological data and information using the necessary technologies, Autonomous work, Teamwork, Promote free, creative and inductive thinking

SYLLABUS

The content of the course includes the following chapters: Introductory concepts Quotation of Earthquake Geology Methodologies for analysis of Active Structures Joints and Faults Rocks within Fault Zones The role of active faults and the Earthquake Processes Geomorphological expression of active faults Palaeoseismology Tectonic Geomorphology Morphotectonics

Secondary effects of earthquakes Seismic hazard and geology of earthquakes

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures, laboratory work and fieldwork face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of pdf files. The students can freely download them using a password which is provided to them at the beginning of the course.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Seminars (1 conduct hour per week X13 weeks)	1X13 = 13
Tutorial	
Student Report based on the data collected during the fieldwork.	11 (1X8 fieldwork) = 8
Hours for private study of the student and preparation of homework (4 per semester). One report dealing with a recent earthquake sequence. One report from the fieldwork and two reports on the Laboratory exercises.	54
Total of the course	**112**

STUDENT PERFORMANCE EVALUATION	1. Optionally, preparation of four in total homework from groups of two students each. 20% of the mean mark of the homework is added to the grade obtained in the final written examination, provided that the student has secured at least grade 4. 2. Written examination after the end of the semester - final grade (GSOC), unless the student participated in the preparation of homework during the semester. In that case, 20% of the mean mark of the homework is added to the final examination mark. Minimum passing grade: 5.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Κουκουβέλας Ι., Κοκκάλας Σ., Ζυγούρη Β. 2020. Γεωλογία & Σεισμοί, Εκδόσεις Δίσιγμα, Θεσσαλονίκη, σελ. 443.
Κουκουβέλας Ι. 1998. Τεκτονική Γεωλογία. Εκδόσεις Leader Books, Αθήνα.
Yeats R., Sieh K., Allen C. 1997. The Geology of Earthquakes, Oxford University Press, pp. 568
Keller E., Pinter N. 1996. Active Tectonics, Prentice Hall.

-Related Scientific Journals:
Journal of Structural Geology
Tectonics
Tectonophysics
Journal of Geodynamics

GENERAL

SCHOOL	NATURAL SCIENCE		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _033**	**SEMESTER**	4rth
COURSE TITLE	**DIGITAL REMOTE SENSING**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory, tutorial		1 (lect.) / 2 (lab.) /	4
COURSE TYPE	Field of Science (GIS, Remote Sensing, Photogrammetry)		
PREREQUISITE COURSES:	GIS (optional, 3rd semester)		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in English)		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO307/		

LEARNING OUTCOMES

Learning outcomes

The course aims at training students in creation and management of databases and at familiarizing them with advanced digital image processing techniques. Furthermore the course introduces students to spatial data analysis,spatial queries formulation and decision making. By the end of this course the students are able to:

1. Distinguish RS data based on the wavelength.
2. Use airphoto or satellite stereopairs to create Digital Surface Models.
3. Process thermal, hyperspectral, as well as radar data in a Geographical Information Systems environment and produce maps.+
4. Recognize the most common satellite images and to digitally process them.
5. Recognize and process UAV data and Laser Scanner data

By the end of this course the students have developed the following skills:

1. Ability to demonstrate knowledge and understanding of basic concepts, about GIS and RS.
2. Importing, storing, processing, managing thermal and hyperspectral satellite data with the use of specialized software.
3. Importing, storing, processing, managing radar satellite data with the use of specialized software.
4. Creating Digital Surface Models using photogrammetric methods from both aerial and satellite stereo images.
5. Creating maps with the combined use of Geographic Information Systems and Remote Sensing data.

General Competences

- Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
- Decision making
- Autonomous (Independent) work
- Work in an international enviroment
- Work in an interdisciplinary enviroment
- Work design and management
- Respect to natural environment

SYLLABUS

The course is organized in 4 teaching circles which are described below.

Circle A:

- Digital Image pre-processing
- Change Detection Mapping Using Satellite Images and GIS, (Change Detection Theory, Change Detection Techniques, Using Geographic Information Systems to map changes).
- Spectral band ratios for the detection of minerals and rocks.

Circle B:

- Vegetation indexes
- Multispectral classification

- Principal Component Analysis method
- Data fusion theory, major data fusion techniques, examples of fusing high resolution panchromatic data with multi-spectral data.
- Spatial autocorrelation of digital remote sensing data. Autocorrelation function and semi-bar graph function, Applications in satellite imagery, The bar chart surface.

Circle C:
- Radar imaging theory, radar imaging geometry, antenna types, radar image characteristics, polarization, dielectric constant, roughness, depth of penetration, radar image deformation, interferometry, radar-application systems in geology, filters used in radar images.
- Thermal Remote Sensing data,
- Hyperspectral remote sensing data

Circle D:
- UAVs data and structure from motion photogrammetry
- Laser scanners
- Photogrammetry, Introduction to Basic Concepts of photogrammetry, Creation of Three-Dimensional maps, Digitization in 3D Environment
- Examples of complex applications of Remote Sensing data and GIS data in Mapping, Seismology, Geophysics, Geomorphometry, Hydrogeology and geotechnical works.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures with the use of PowerPoint slideshow.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. Lab exercises using specialized GIS (ESRI ArcGIS) and digital image processing software (ERDAS IMAGINE) in the Computer Center of the Department. Student training in GPS in the field.
TEACHING METHODS	

Activity	**Semester workload**
Lectures in Theory	1X13 = 13
Laboratory exercises in GIS and RS	2X13 = 26
Writing reports of the laboratory exercises	1X13= 13
Hours for private study and bibliography analysis of the student	48
Total number of hours for the Course	**100**

STUDENT PERFORMANCE EVALUATION	Written examination after the end of the semester (G_{th}60%)or multiple choice exam online Written reports for each laboratory exercise (G_{lab}40%) Minimum passing grade: 5. Final Course Grade (FCG) FCG = (G_{th} + G_{lab}) / 2

ATTACHED BIBLIOGRAPHY

1. "Remote Sensing (Principles, Image processing,Applications)" G. Skianis K. Nikolakopoulos, D. Vaiopoulos, ION Publ. 2012. p.336. (in Greek language)
2. " Remote Sensing –Photointerpretation in Geo-scienses", Theodoros Astaras, Aivazi Publ. 2011, p. 484. (in Greek language)
3. Laboratory Notes: "Laboratory exercise of digital processing of Remote Sensing data combined with GIS", D. Vaiopoulos G. Skianis K. Nikolakopoulos, Athens University Publ. 2006, p. 178. (in Greek language)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _034**	**SEMESTER**	5th
COURSE TITLE	**GEOLOGICAL MAPPING OF SEDIMENTARY ROCKS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	1(L), 2(LW)	4

COURSE TYPE	Special background, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The course is addressed to undergraduate students who sufficiently know and understand the principles of Geology. The aim of the course is for students to acquire knowledge and skills on the geological mapping of sedimentary rocks.

Upon successful completion of this course, the students will be able to:
Understand and recognize the geological data of a map, such as geological formations, sedimentary rocks and main tectonic structures
Know and understand the methods of geological mapping of sedimentary rocks
Calculate geometrically the orientation and thickness of geological units and formations
Compile and design structural maps in areas of sedimentary rocks
Compose and design simple geological maps and geological cross sections
Design geological cross sections in areas with stratigraphic unconformities
Design geological cross sections in areas with weakly folded sedimentary sequences
Design geological sections in areas with faulted sequences
Interpret the stratigraphy of a region based on the geological map and the geological cross sections

General Competences

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):
Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Working independently
Team work
Respect for the natural environment
Production of free, creative and inductive thinking

SYLLABUS

The course content includes the following chapters:

Application of geological mapping.
Basic concepts of thematic mapping
Geographical location, orientation and navigation techniques using a topographic map and a compass.
Basic concepts in the mapping of sedimentary rocks
Methods of mapping sedimentary rocks
Geometric calculations in three dimensions (determine stratigraphic succession, thickness of sedimentary rocks, construct a stratigraphical column)
Projection of the geological elements of the sedimentary rocks in the geological map

Structural maps Geological analysis and interpretation of maps with simple, unidirectional inclined stratigraphic successions Geological analysis and interpretation in areas with unconformities Geological analysis and interpretation in areas with weakly folded stratigraphic successions Geological analysis and interpretation in areas with weakly faulted stratigraphic successions

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	In classroom theory (face-to-face) using power point presentations. Laboratory exercises in groups of 30-35 students Tutorial support for the non directed study and the better understanding of laboratory exercises. Seminar lessons using geo software for the laboratory exercises.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (power point) in teaching Support of Learning Process and Dissemination of educational material through the University of Patras e_class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures (1 conduct hours per week x 13 weeks)	1*13=13
Laboratory work (2 conduct hours per week x 13 weeks)	2*13=26
Interpretation and writing of the exercises	3*13=39
Non-directed study	30
Course total	**108**

STUDENT PERFORMANCE EVALUATION	Final Exam written compulsory, intermediate exams written optional, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving (20% theory and 80% exercises from laboratory).

ATTACHED BIBLIOGRAPHY

- Suggested bibliography mainly in Greek:
Σημειώσεις Μαθήματος Θεωρίας και Εργαστηρίου που παρέχονται σε pdf μέσω e-class.
Ξυπολιάς Π. 2009. Αζιμουθιακές προβολές στην Τεκτονική Γεωλογία. Εκδόσεις ΣΥΜΜΕΤΡΙΑ, σελ. 197.
Barnes, J. W., Lisle, R. 2004. Basic Geological Mapping. John Wiley & Sons publ., pp. 184.
Bennison, G.M. 1990. An Introduction to Geological Structures and Maps. Chapman & Hall, Inc, pp. 76.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _035**	**SEMESTER**	5th
COURSE TITLE	**IGNEOUS AND METAMORPHIC PETROLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, tutorials and laboratory work	2 (lect.), 1 (tut.), 2 (lab.)	6

COURSE TYPE	General Background, Field of Science (Petrology) and Skills Development (microscopic characterization)
PREREQUISITE COURSES:	Geochemistry "Petrography I" and "Petrography II"
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO308/

LEARNING OUTCOMES

Learning outcomes

By the end of this course the student are able to:

1. Identify minerals and textures of igneous and metamorphic rocks
2. Apply the thermodynamic rules and evaluate the thermodynamic equilibrium in igneous and metamorphic chemical systems.
3. Use binary and ternary systems for the interpretation of igneous rock systems (granites, basalts, etc.)
4. Use compositional diagrams and petrogenetic grids to infer the P-T-t paths of metamorphic rocks.

By the end of the course the student have further developed the following skills:

1. Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to rock formation
2. Ability to construct and use geochemical diagrams for petrological interpretation
3. Develop skills needed for the identification and interpretation of critical textures and assemblages.
4. Ability to apply such knowledge and understanding for the interpretation of processes that produce chemical / mineralogical diversity of igneous and metamorphic rocks.
5. Ability to place petrogenetic processes in the frame of the theory of the lithospheric plates.

General Competences

By the end of this course the student have furthermore developed the following general comptence:

1. Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to Petrology of Igneous and Metamorphic Systems.
2. Ability to apply this knowledge and understanding to the solution of problems related to Petrology of Igneous and Metamorphic Systems of non familiar nature.
3. Ability to adopt and apply methodology to the solution of non familiar problems of Petrology of Igneous and Metamorphic Systems.
4. Study skills needed for continuing professional development.
5. Ability to interact with others in petrological issues.

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):
Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
Autonomous (Independent) work
Group work

SYLLABUS

Part A: Igneous Petrology

Origin of the elements and minerals in the universe. Fundamental petrological concepts. Study of the Earth mantle. Classification of igneous rocks. Fundamental thermodynamic concepts. Unary, binary and ternary phase diagrams, the phase rule. Liquid-crystal equilibria

in magmatic systems. Processes of magma production and evolution. Basalts, Granites. Geochemical processes in the igneous rocks. Magmatic evolution models. Mantle metasomatism. Magmatic environments.
Laboratorial exercises:
Each student is assigned a thin section suite to work out exercise assignments on identifying and interpreting rock textures and mineral assemblages:
LAB A1: Igneous textures and rock classification: a review.
LAB A2: Fundaments thermodynamic concepts. Study of binary phase diagrams.
LABS A3: Study of binary phase diagrams with incongruent melting.
LABS A4: Study of ternary phase diagrams.
LABS A5-6: Geochemical processes in the igneous systems, Processes of magma production

Part B: Metamorphic Petrology
Physical and chemical processes of metamorphism. Metamorphic zones, isograds and facies. Metamorphism and plate tectonics. Chemographic projection of mineral assemblages. Composition diagrams, reactions and petrogenetic grids of metamorphic rocks of high, intermediate and low pressure facies series. Geothermobarometry and P–T- t paths of metamorphic rocks.
Laboratory Exercises:
Each student is requested to answer in specific problems emerging through the study of thin sections of metamorphic rocks at the end of each laboratory exercise.
LAB B1: Microtextural characteristics of metamorphic rocks.
LAB B2: Characteristic parageneses of metamorphic zones and facies.
LAB B3: Construction and use of ACF, AKF and AFM diagrams.
LAB B4: Determination of the metamorphic grade of various rock types from areas subjected to very low grade of metamorphism and contact metamorphism.
LAB B5: Determination of the metamorphic grade of various rock types from areas subjected to metamorphism intermediate pressure (barrovian type).
LAB B6: Determination of the metamorphic grade of various rock types from areas subjected to metamorphism of high pressure.
LAB B7 The use of proper reactions for the determination of the equilibrium P-T conditions of rocks.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face. Open courses (all lectrures and laboratories are freely accessible and freely available to everyone over the Internet as videos).
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of ppt files, where from the students can freely download them using a password which is provided to them at the beginning of the course. Teleconferencing software packages (skype, google hangouts) are ordinarily used throughout the semester for online continuing training of the students.

TEACHING METHODS

Activity	Semester workload
Lectures (2 conduct hours per week x 13 weeks)	2x13=26
Laboratory work (2 conduct hours per week x 13 weeks) – thin section analysis under the polarizing microscope and use of phase diagrams for the study of petrological systems	2x13=26
Seminars (1 conduct hour per week x 13 weeks) - solving of representative problems through the use binary and ternary phase diagrams	1x13=13
Tutorials (1 conduct hour per week x 13 weeks) – Study of phase diagrams and microscopic observation of thin sections	1x13=13
Hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory; use of OPEN COURSES)	4x13=52
Weekend hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory; use of OPEN COURSES)	23x13=26
Hours for private study of the student during the week available for exam preparation and two weeks of holidays	4x3=12
Course total	**168**

STUDENT PERFORMANCE EVALUATION

Language of evaluation: Greek

I. Theory (50% of the total evaluation): Two alternative options are foreseen as stated bellow:

Ia. Midterm exam

- 1st Part (25% of the total evaluation): Written examination, of variable levels that can comprise multiple choice tests, questions of short answers, short essay composition, problems, exercises.
- 2nd Part (25% of the total evaluation): Written examination, of variable levels that can comprise multiple choice tests, questions of short answers, short essay composition, problems, exercises.

Ib. Final Exam

- Written examination (50% of the total evaluation): of variable levels that can comprise multiple choice tests, questions of short answers, short essay composition, problems, exercises.

II. Laboratory (30% of the total evaluation). Three alternative options are foreseen as stated bellow:

IIa. Midterm exam

- 1st Laboratory Study of thin sections of igneous rocks (15% of the total evaluation)
- 2nd Laboratory Study of thin sections of metamorphic rocks (15% of the total evaluation)

IIb. Final Exam

- Laboratory Study of thin sections of igneous and metamorphic rocks (30% of the total evaluation)

	IIc. Written laboratory reports • Written laboratory reports for each laboratory exercises are submitted in intermediate deadlines. At least 90% of the performed laboratory exercises should be submitted (30% of the total evaluation) **III. Oral examination** (20% of the total evaluation). Undertaken exclusively during the final examination period • Oral interview on selected thin sections of igneous and metamorphic rocks by means of polarizing microscopy Percentages are valid t only when the student secures the minimum mark of 5 in either the theoretical and the laboratory part of the examination. All three levels of examination (I, II and III) are mandatory for every student. Greek grading scale: 1 to 10. Minimum passing grade: 5. Grades <3 correspond to ECTS grade F. Grade 4 corresponds to ECTS grade FX. For the passing grades the following correspondence normally holds: 5 <-» E, 6 <-> D, 7 <-> C, 8 <-> B and >9 <-> A

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1) «Πετρολογία Μεταμορφωμένων», Καταγάς, Χ., 2017, Πανεπιστημιακές Σημειώσεις, Πανεπιστήμιο Πατρών.
2) «Μαγματική Πετρολογία», Κοτοπούλη, Κ.Ν. 2009, Πανεπιστημιακές Σημειώσεις, Πανεπιστήμιο Πατρών.
3) «Igneous and Metamorphic Petrology», M. Best, 2003, Blackwell Publishing.
4) «An introduction to Igneous and Metamorphic Petrology», J.D. Winter, 2001, Pentice Hall.
5) An Introduction to Metamorphic Petrology, Second Edition, B.W.D. Yardley and C. Warren, 2021, Cambridge University Press. Pp. 344
6) «Igneous and Metamorphic Rocks Under the Microscope: Classification, Textures, Microstructures and Mineral Preferred Orientation», D. Shelley, 1992, Springer.

- Related academic journals:

1) Journal of Petrology
2) Metamorphic Geology University of Patras Publications Centre, Patras, 2005.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _036**	**SEMESTER**	5th
COURSE TITLE	**REMOTE SENSING IN THE MARINE ENVIRONMENT**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work and Field Work	1(L), 1(LW) , 1DAY	5

COURSE TYPE	General knowledge, Scientific Area
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO346/

LEARNING OUTCOMES

Learning outcomes

Upon successful completion of this course , the students will be able to:

- Define, explain and summarize the basic principles of marine remote sensing techniques
- Analyze and evaluate scientific data to create a conclusion about mapping of the seafloor
- Discriminate possible marine geohazards
- Evaluate the dynamics of the seafloor
- Adapt new marine sensing techniques

General Competences

- Data retrieval, analysis and synthesis of data and information through the use of new information technologies
- Adapting to new situations.
- Decision making.
- Individual work
- Team work
- Work in a multidisciplinary environment
- Respect for the natural environment.
- Promotion of free, creative and inductive way of thinking

SYLLABUS

Theory & Laboratory

- Navigation and Positioning of a research vessel
- Techniques for the mapping of the seafloor relief: Echo Sounders (single and multibeam)
- Techniques for the mapping of seafloor morphology: Side Scan Sonars
- Techniques for the mapping of seafloor stratigraphy: Subbottom Profilers
- Echo types, Seismostratigrphic maps
- Marine Geohazrds
- Applications of remote sensing techniques on underwater structures
- Applications of remote sensing techniques on marine cultural heritage sites
- Applications of remote sensing techniques on the management of marine resources.

Field work

Marine geophysical survey so the students will be able to practice on the acquisition of marine remote sensing data sets

TEACHING AND LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY</td><td>In classroom and in laboratory (face-to-face)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>• Use of Information and Communication Technologies (ICTs) (power point) in teaching
• Support of Learning Process and Dissemination of educational material through the e_class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester Work Load</th></tr>
<tr><td>2Lectures (1 conduct hours per week x 13 weeks)</td><td>2X13 = 26 (hours)</td></tr>
<tr><td>Laboratory work (1conduct hours per week x 13 weeks)</td><td>2X13 =26 (hours)</td></tr>
<tr><td>Field work</td><td>1X8 =8 (hours)</td></tr>
<tr><td>Individual study</td><td>6X8 =48 (hours)</td></tr>
<tr><td>Total contact hours and training</td><td>108</td></tr>
</table></td></tr>
<tr><td>STUDENTS PERFORMANCE EVALUATION</td><td>I. Theory
Final Exam, written, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving.
Students are obliged to attend all scheduled laboratory classes and to prepare and present laboratory exercises during the semester.
Marking Scale: 0-10.
Minimum Passing Mark: 5.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Books :
Notes and lectures within the framework of the academic project: “open courses”
Relative scientific journals:
Marine Geology, Geo-Marine letters

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_037**	**SEMESTER**	5th
COURSE TITLE	**APPLIED HYDROGEOLOGY**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures and laboratory work	2 (lect.), 3 (lab.)	5
COURSE TYPE	Field of Science (Hydrogeology)		
PREREQUISITE COURSES:	Basic knowledge of geology, chemistry, physics and mathematics		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in French and English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	The name of the Hydrogeology laboratory Website is http://www.hydrolab.gr		

LEARNING OUTCOMES

Learning outcomes

APPLIED HYDROGEOLOGY

The course entitled "Applied Hydrogeology" is designed as an application of the geological knowledge to the exploitation of groundwater in order to meet the water needs, for example of a city or an agricultural or a tourist activity etc. This is a course of specialization which, in conjunction with the other relevant courses that are taught in the Department of Geology, aims to provide students with the necessary knowledge of:

1. The understanding of the hydrological cycle and water budget.
2. The utility and use of devices that measure the parameters associated with the surface and groundwater.
3. The water hosted in geological formations and the presence of aquifers.
4. The understanding of the movement of groundwater.
5. Addressing hydrogeological and environmental problems, by compiling data, with the ultimate view of professional self-reliance and successful job positioning in the professional arena.

General Competences

Analysis and synthesis of data and information using the necessary technologies. Project design and management.

SYLLABUS

- Subject of Hydrogeology, Origin of water. Hydrogeology in relation to natural sciences. The hydrological budget of the planet. Estimation of water needs for drinking water supply, irrigation and the water supply to industrial and tourist facilities.
- Introduction to the hydrological cycle and hydrological budget. Statistical processing of precipitation and construction of rainfall maps. Potential and actual evapotranspiration and methods for their calculation. Measurement of runoff, statistical processing of runoff measurements, unit hydrograph and its use.
- Groundwater movement in porous media, Darcy's law and its validity criteria, porosity and permeability, transmissivity and storativity, empirical ways of estimating water permeability with tracer tests and grain size analysis, flow networks and their applications.
- Groundwater Hydraulics.

Groundwater mitigation works. Vertical, horizontal and mixed mitigation works. Borehole construction: various techniques, advantages and disadvantages of each one. Boreholes construction stages and the role of the geologist. Selection of technical hydrogeological characteristics of a borehole according to the intended abstraction volume. Borehole protection, cost estimation, pumping assemblies.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS	With the use of power point, and instrument samples demonstration

TECHNOLOGY		
TEACHING METHODS	**Activity**	**Semester workload**
	The teaching process includes 26 hours of lectures, and 26 hours of lab courses. Lectures are powered by PowerPoint slides, while educational videos are also projected. Other materials are also used in the classroom, e.g. water level meters, or borehole casing samples. During the lab courses, students are divided into groups of two to three people, working independently, and under the supervision of the teachers, to complete the exercises they are given each time. The course also includes a field trip, during which students have the opportunity to see hydrogeological structures in the field and discuss about specific hydrogeological subjects.	
	Lectures	2X13 = 26
	Lab courses- exercises	3X13 = 39
	Writing of laboratory exercises	2X13= 26
	Daily Study	39
	Preparation of examinations	30
	Course total	**160 hours (total student work-load)**
STUDENT PERFORMANCE EVALUATION	The examination of the course is in writing. Students are given eight to ten questions of different difficulty level, including questions that require judgment, and exercises with a specific score for each of them. The lab exercises are corrected and graded. Intermediate scheduled tests are often carried out in order to consolidate the content of the course and to bring students closer to its most important subjects. The intermediate tests are positively taken into consideration in the overall assessment of the students.	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. N. Lambrakis, K. Νικολακόπουλος, K. Κατσάνου, 2016. Hydrology with the use of GIS tools and Remote sensing data. Kallipos, pp, 227, ISBN 978-960-603-106-9
2. N. Lambrakis, Applied and Environmental Hydrogeology, Patra's University Editions, 130pp
3. N. Lambrakis, Lessons in Applied and Environmental Hydrology, To appeared, 450pp
4. G. Kallergis, 1999. Applied – Environmental Hydrogeology. Technical chamber Editions, Volumes A,B,C.
5. G. Soulios, 1996. General Hydrogeology. University Studio Press. First, Second and third Volume

- Related academic journals:

1. Hydrogeology Journal, Springer
2. Journal of Hydrology, Elsevier

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _038**	**SEMESTER**	5th
COURSE TITLE	**FIELDWORK IV**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Field work	6 days	3

COURSE TYPE	Basic General knowledge / Skills development
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
The course is addressed to undergraduate students who sufficiently know and understand the basic principles of Geology. The aim of the course is for students to acquire advanced knowledge and skills in order to construct a geologic map. By the end of this course the student will be able to: Recognize and group lithologies in exposures sedimentary rocks in the field Know and understand the methods for geological data collection in the field Recognize and record the basic sedimentary structures from rocks in the field Recognize and record the main structural features that deform the rocks Construct and draw geological maps in areas of low difficulty Analyze and describe the orientation of sedimentary and structural features, Construct geological cross-sections and the stratigraphic columns of the study areausing data from the geological map that is drawn. Prepare and submit a professional geological mapping report.
General Competences
Generally, by the end of this course the student will, furthermore, have develop the following general abilities: Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Working independently Team work Respect for the natural environment Production of free, creative and inductive thinking

SYLLABUS

The course content includes the following: Use of geological field equipment in the field Identify and group different lithologies based on the map scale Field measurements of bedding and structural features with the geological compass Mapping of geological contacts in the field Sketching and analysis of mesoscopic rock sections Lithostratigraphic synthesis of the study area Conduct a geological mapping report

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face in the field

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	The overall student performance evaluation is based on the submitted written report with the data collected in the field as well as on oral examination on their field interpretations.

Activity	Semester workload
Fieldwork	6days X 8 = 48
Study (non-directed)	10
Written report (using data collected in the field)	30
Course total	**88**

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Koukouvelas I., Kokkalas S., Zygouri V. 2010. Geology & Earthquakes. Disigma Publ. Thessaloniki. (in Greek)

Collinson, J.D., Thompson, D.B., 1989. Sedimentary structures, Unwin Hyman Publ., London.

Stow, D., 2005. Sedimentary rocks in the field. Manson Publishing Ltd., UK.

Lisle R., Brabham P., Barnes J. 2011. Basic geological mapping. John Wiley & Sons, Ltd.

Xypolias P. 2009. Azimuthal projections in Structural Geology. Symmetria Publ., Athens. (in Greek)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_039**	**SEMESTER**	6th
COURSE TITLE	**FIELDWORK V**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Fieldwork	3 days	2

COURSE TYPE	General Background
RELATED ROCKCOURSES:	Igneous and Metamorphic Petrology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek / Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO386/

LEARNING OUTCOMES

Learning outcomes

Three days fieldwork under the framework of the course entitled: "Igneous and Metamorphic Petrology"
The Fieldwork aims to provide the students all the necessary knowledge for better understanding the main issues of the prerequisite course.
:

1. Students will be trained in recognizing the various igneous and metamorphic rock types in the field and identify all the rock characteristics which will enchance them decipher about:

a) the geotectonic position of the various geological formations and their relation to the over- and under-lying ones
b) the metamorphic conditions which are responsible for the various mineralogical transformations of the parent materials
c) the igneous processes through which the magmatic rock were formed

This learning outcome will be better achieved through the parallel observation of thin sections of respective material, that the students had already study during their laboratory training. The in situ observation of the thin sections and the identification of the mineralogical assemblages and the parageneses is facilitated by the use of a portable polarizing microscope

2. Moreover, students are introduced to specific advanced issues which further highlight the multidisciplinarity of the various aspects of the geological sciences. In this respect, several visits of various locations with special geological characteristics are taking place, among which:

a) the karstic cave of Kastania
b) the fossilized forest of Agia Marina and the homonymous Geopark
c) the old abandoned mine of hematite in Agios Elisseos area

3. Finally the submission of written reports and the preparation of blogs in groups of two students has a twofold aim:

a) to acquire the necessary experience in writing scientific reports through which all the data collected in the field are presented and synthesized according to scientific standards and by using of the available literature and their knowledge
b) to be trained in collaborating with their colleagues and further enhance the final outcome.

General Competences

By the end of this course the student will, furthermore, have developed the following general competences):
Search for, analysis and synthesis of data and information, with the use of the necessary geological tools (geological maps, literature sources, technical reports)
Be introduced to the principal issues of the geological sciences

SYLLABUS

Three days fieldwork in SE Peloponnese (Taygetous – Parnon – Neapolis, Laconia)

1. Limestone outcrops of the Tripolis zone
2. Limestone outcrops of the Pindos zone

3. Phyllite – Quartzite series
4. Plattenkalk series
5. Tyros beds
6. Karstic cave of Kastanias
7. Geopark of Agia Marina
8. Hematime mine in Agios Elisseos

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	The fieldwork comprises three days of outdoor training for the better understanding of the theory and laboratories of the prerequisite course.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	All of the relative material and the fieldwork guide are uploaded on Asynchronous eLearning Services (eclass).
TEACHING METHODS	

Activity	**Semester workload**
Lectures and fieldwork preparation	2x3=6
Laboratory work with representative hand specimens and thin section of petrological material from the visiting areas	2x3=6
Fieldwork	3x8=24
Preparation and submission of a fieldwork essay	4x6=24
Course total	**168**

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

The fieldwork guide

- Related research papers:

Baltatzis and Katagas, 1984. The pumpellyite-actinolite and contiguous facies in part of the Phyllite-Quartzite series, central northern peloponnesus, greece. Journal of Metamorphic Geology, 2(4), 349-363. doi:10.1111/j.1525-1314.1984.tb00595.x

Brauer, R., Ittner, R. & Kowalczyk, G. 1980. Ergebnisse aus der 'Phyllit-Serie' SE-Lakoniens (Peloponnes. Griechenland). Neues Jahrbuch fur Geologie und Paldontologie Monatshefte, 1980, 129-132.

Doutsos, T., Koukouvelas, I., Poulimenos, G., Kokkalas, S., Xypolias, P., & Skourlis, K. (2000). An exhumation model of the south peloponnesus, greece. International Journal of Earth Sciences, 89(2), 350-365. Retrieved from www.scopus.com

Gerolymatos, 1994 Gerolymatos, I., 1994. Metamorphose und Tektonik der Phyllit- Quartzit-Serie und der Tyros Formation auf dem Peloponnes und Kythira, Berliner Geowiss. Abh., 164-161.

Pe-Piper, G., Panagos, A.G., Piper, D.J.W. and Kotopouli, K.N., 1982: The (?)Mid-Triassic volcanic rocks of Lakonia, Greece. Geol. Mag., 119, 77-85

Pe-Piper, G. and Kotopouli, K.N., 1981: Very low grade metamorphism of (?)Triassic volcanics west Hellenic Nappes, Southern Peloponnese, Greece. Bull. Geol. Soc. Am., 92, 1762-1806.

Theye, T., & Seidel, E. (1991). Petrology of low-grade high-pressure metapelites from the external hellenides (crete, peloponnese): A case study with attention to sodic minerals. European Journal of Mineralogy, 3(2), 343-366. doi:10.1127/ejm/3/2/0343

Theye, T., Seidel, E., & Vidal, O. (1992). Carpholite, sudoite, and chloritoid in low-grade high-pressure metapelites from crete and the peloponnese, greece. European Journal of Mineralogy, 4(3), 487-507.

Ι.Γ.Μ.Ε., 1990 Γεωλογικός χάρτης Ελλάδος. Φύλλο "Σπάρτη", κλίμακας 1:50.000.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_040**	**SEMESTER**	5th
COURSE TITLE	**INDUSTRIAL MINERALS AND THEIR CONTRIBUTION TO THE ECONOMY**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, tutorials and laboratory work		2 (lect.) 1 (lab.)	4
COURSE TYPE	Field of Science (Mineralogy-Petrology) and Skills Development (determination of physical and chemical properties through the use of analytical instruments)		
PREREQUISITE COURSES:	Typically, there are not prerequisite course. Essentially, the students should possess: (a) knowledge provided through the previously taught theoretical courses: ''Physics", "Chemistry", "Earth Materials I", "Earth Materials II", "Petrography I" and "Petrography". (b) laboratory skills obtained through the previously attended laboratories included in the courses outlined above.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO312/		

LEARNING OUTCOMES

Learning outcomes
By the end of this course the student will be able to: understand the fundamentals of the application of mineralogy to technology via the use of the non-metallic minerals and rocks for the development of mineral based materials, new products and new uses according to their physical and chemical properties. will be familiarized with the analytical methods of research to identify and evaluate the industrial minerals, by applying all of their geological knowledge they have acquired during their studies. understand the possibilities offered by the exploitation of the industrial mineral resource in national economic development, as well as their importance in the global economy.
General Competences
By the end of this course the student will, furthermore, have developed the following skills (general abilities): Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to Industrial Minerals. Ability to apply this knowledge and understanding to the solution of problems related to Industrial Minerals and their uses. Ability to adopt and apply methodology to the solution of non familiar problems of Industrial Minerals Study skills needed for continuing professional development. Ability to interact with others in issues concerning indedification, exploitation and use of industrial mineral resources. Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above): Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Autonomous (Independent) work Group work

SYLLABUS

Lectures
Analysis of common and special industrial minerals and rocks and their uses (mineralogy, mineral chemistry, formation environment, classification schemes, properties and industrial uses) Description of production of industrial minerals for their use in industry: consturction materials, insulating materials, glass industry, ceramic manufacture, molding sands, fillers, aggregates, filters, fertilizers, cement, concrete, mortars. Outcrops of Industrial minerals in Greece. Case studies of Melos and Yalli islands

Contribution of Industrial Minerals and Rocks in the national economy and the opportunities of financial and sustainable development they offer.
Contribution of Industrial Minerals and Rocks in the global economy.
Competitive products

Laboratory work

Industrial minerals in our everyday life.
Industrial minerals in the construction industry.
Gemstones
Identification and recognition of geological outcrops suitable for industrial uses
Constraints of open front exploitation of industrial minerals and rocks. Feasibility parameters.
Semester laboratory report

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face. Lectures: using slides for overhead projector and/or power-point presentations. Open eClass - Asynchronous eLearning Platform: storage and presentation of teaching material. Laboratories: Students are assigned a couple of commercially available industrial materials (eg. Pharmaceuticals, foods, cosmetics, detergent s, modeling clays, cat litters, personal hygiene products, etc.) to be analysed using a variety of analytical techniques in order to identify uses of various industrial minerals. Alternatively, a common raw material can be chosen from which they are asked to produce specific products. A final essay will include their result as well as other possible industrial uses and application of their research materials.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of ppt files, where from the students can freely download them using a password which is provided to them at the beginning of the course. Use of specialized software packages (DIFFRACplus EVA software Bruker-AXS, USA, based on the ICDD Powder Diffraction File 2006 version) for the qualitative and quantitative characterization of industrial minerals.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2x13=26
Laboratory work (1 conduct hour per week x 13 weeks) – identification of potential industrial mineral resources using geological maps, identification of mineral uses in various commercial products, characterization of industrial minerals by means of analytical techniques)	1x13=13
Fieldtrip (visit to a local cement factory and to its quarry). Preparation of a written report.	1x12=12
Hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory)	3x13=39
Weekend hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory)	1x13=13
Hours for private study of the student during the week available for exam preparation and two weeks of holidays	4x3=12

	Course total	**115**
STUDENT PERFORMANCE EVALUATION	Written examination (60% of the final mark) An essay comprising the outcome of the exercise assignments on the commercial products analysed and a report on various additional uses of the industrial uses recognized therein (40% of the final mark). Percentages are valid t only when the student secures the minimum mark of 5 in the final written examination Greek grading scale: 1 to 10. Minimum passing grade: 5. Grades <3 correspond to ECTS grade F. Grade 4 corresponds to ECTS grade FX. For the passing grades the following correspondence normally holds: 5 <-» E, 6 <-> D, 7 <-> C, 8 <-> B and >9 <-> A	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1)"Βιομηχανικές ορυκτές πρώτες ύλες", Ν. Καντηράρης, Ν. Κούκουζας, Π. Λαμπροπούλου, Δ. Παπούλης, Μ. Περράκη Έκδοση: 1/2023, Κωδικός στον Εύδοξο: 122093122 23, ISBN: 9786185560256, ΓΚΟΤΣΗΣ ΚΩΝ/ΝΟΣ &ΣΙΑ Ε.Ε.
2) "Applied Petrology – Industrial Minerals", A. Katerinopoulos & M. Stamatakis, 2005, Univ. Athens [A textbook in Greek language)
3)"Mineral Wealth of Greece", A. Tsirambidis, 2005, Giahoudis Publications, Thessaloniki.
4)"Industrial Minerals and their uses", P.A. Ciullo, 1996, Elsevier
5)"Introduction to industrial minerals", D.A.C. Manning, 1995, Chapman & Hall, 1995

- Related academic journals:

1) Minerals
2) Industrial minerals

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_041**	**SEMESTER**	5th
COURSE TITLE	**ENVIRONENMENTAL SEDIMENTOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	2(L), 2(LW)	5

COURSE TYPE	Special background, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	NEW

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of this course , the students will be able to: Describe and interpret sedimentary processes (physical and chemical) occurring in transitional depositional environments (coastal sand dunes, marshes and lagoons) as well as in inland waters (lakes) 2. Identify the different types of geomorphological features in the coastal zone. 3. Use geochemical indices in order to interpret and identify the sedimentation and geochemical processes. 4. Interpret and recognize changes in sea level. Recognize climate change events by interpreting the temporal and spatial variation of sedimentation conditions and geochemical proxies. 5. Be aware and trained of sampling and drilling techniques in lagoon and lagoon systems. 6. Analyze and evaluate environmental geochemical parameters using the toxicity and environmental geochemical indices.
General Competences
Search for, analysis and synthesis of data and information with the use of the necessary technology , working independently

SYLLABUS

1. Sedimentary and hydrochemical characteristics of water systems (lakes and transitional waters)
2. Coastal sedimentation environments (Delta, marshes, lagoons, dunes etc.)
3. Limestone sedimentation environments
4. Sedimentary and geomorphological processes in coastal environments.
5. Classification of transitional systems
6. Measures for the protection and management of environmental problems in transitional depositional environments and protected areas (Natura).
7. Sedimentary and geomorphological processes in lakes
8. Classification of lakes
9. Sediments geochemistry (TOC, TN, TS and TP determination) and inorganic geochemical indices
10. Sediments geochemical characteristics and toxicity limits
11. Techniques and methods of sampling sediment and water

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	In classroom theory (face-to-face) using power point presentations. Laboratory exercises in groups of 15-20 students Tutorial support for the non directed study and the better understanding of laboratory exercises. Seminar lessons using geo software for the laboratory exercises.
USE OF INFORMATION AND COMMUNICATIONS	Use of Information and Communication Technologies (ICTs) (power point) in teaching

<table>
<tr><td>TECHNOLOGY</td><td>Support of Learning Process and Dissemination of educational material through the University of Patras e_class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (2 conduct hours per week x 13 weeks)</td><td>13*2=26</td></tr>
<tr><td>Laboratory work (2 conduct hours per week x 13 weeks)</td><td>13*2=26</td></tr>
<tr><td>Interpretation and writing of the exercises</td><td>13*3=26</td></tr>
<tr><td>Field Trip</td><td>2*7=14</td></tr>
<tr><td>Project preparation</td><td>2*6=12</td></tr>
<tr><td>Non-directed study</td><td>15</td></tr>
<tr><td>Course total</td><td>119</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>Final Exam written compulsory, intermediate exams written optional, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving (80% theory and 20% exercises from laboratory).
Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams.
Marking Scale: 0-10.
Minimum Passing Mark: 5.
Students are obliged to attend all laboratory class and to deliver the results of all exercises.
Maximum number of non delivered laboratory exercises: 2</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Suggested bibliography mainly in Greek:
1. Σημειώσεις Μαθήματος Θεωρίας και Εργαστηρίου που παρέχονται σε pdf μέσω e-class.
2. Ιζηματολογία, Ψιλοβίκος Εκδόσεις Τζιόλα 358 σελ, Παρέχεται μέσω ΕΥΔΟΞΟΣ
3. Coastal Geomorphology, Bird, Wiley
4. Environmenta Sedimentology, Perry and Taylor, Blackwell
Environmental Earth Sciences
Holocene
Quaternary International

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _042**	**SEMESTER**	6th
COURSE TITLE	**PHOTOGEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work	1 (Lect.) +2 (lab.)	4

COURSE TYPE	Basic General knowledge / Skills development
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
The course is addressed to undergraduate students who sufficiently know and understand the principles of Geology. The aim of the course is for students to acquire advanced knowledge and skills on the geological data collection via the analysis of aerial-photographs. By the end of this course the student will be able to: Know the basic principles of photogeology Know and understand the usage of aerial-photographs in geological research Know and understand the usage of photogeological analysis Carry out photogeological mapping in areas of medium difficulty Compile simple geological cross-sections using photogeological data Carry out geometrical calculations in photogeological maps
General Competences
Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above): Search for, analysis and synthesis of data and information, with the use of the necessary technology Working independently Team work Production of free, creative and inductive thinking

SYLLABUS

The course content includes the following chapters:
Introduction to photogeological analysis
Photogeological analysis and mapping of rock units and unconformities
Photogeological analysis and structural mapping in faulted areas
Photogeological analysis and structural mapping in folded areas
Photogeological mapping in complex areas
Interpretation of photogeological maps
Geometric calculations in photogeological maps

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY		
TEACHING METHODS	**Activity**	**Semester workload**

	Lectures	1 X 13 = 13
	Laboratory practice	2 X 13 = 26
	Study and analysis of bibliography	16
	Written report	20
	Study (non-directed)	30
	Course total	**105**
STUDENT PERFORMANCE EVALUATION	Written examination after the end of the semester. The examinations includes computational questions as well as short answer questions	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Maltman A. 1990. Geological Maps - An Introduction. Open University Press
Miller V. C. and Miller C. F.: Photogeology- McGraw-Hill Books

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_043**	**SEMESTER**	6th
COURSE TITLE	**ENGINEERING SEISMOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work	2 (lectures) 1 (laboratory)	4

COURSE TYPE	Science field, Skills Development
PREREQUISITE COURSES:	Basic knowledge of Seismology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, in English
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO342/

LEARNING OUTCOMES

Learning outcomes
During this course the student acquires basic knowledge in Engineering Seismology and especially in subjects like seismic hazard, seismic risk and soil response, after successful completion the student will: Know the basic principles of Engineering Seismology Solve, simple problems related to Engineering Seismology **Knowledge** The course aims to provide knowledge related to the methods and principles used by Engineering Seismology in seismic risk mitigation. Through the class the students will become familiar with modern methodologies in Engineering Seismology and how these can be applied to antiseismic construction. **Abilities** Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relating to earthquake hazard, wave propagation in soil layers, earthquake statistics Ability to apply such knowledge and understanding to the solution of qualitative and quantitative problems Ability to solve simple engineering seismology problems, using related seismological software Ability to work in a team
General Competences
By the end of this course the student will, furthermore, have developed the following skills (general abilities): Ability to apply acquired knowledge and understanding, to the solution of problems Ability to interact with others in problem solving as a team

SYLLABUS

Introduction, Engineering Seismology history, advances due to major quakes.
Seismic Intensity, Intensity scales.
Accelerometers, processing of accelerometer records.
Statistical analysis of seismicity, application to seismic hazard
Earthquake Hazard - Risk assessment, Probabilistic and Deterministic methodologies
Acceleration spectrum, response spectrum, Fourier spectrum of strong motion records
Ground motion prediction equations, Synthesis of strong ground motions
Design spectra and Building codes
Microzonation studies, geophysical techniques, ground response analysis
Microtremor analysis, methods, relation to ground response.
Seismic landslides

Laboratory exercises in Engineering Seismology subjects: earthquake statistics, processing of strong ground motion records, seismic hazard, microzonation methods etc

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and computer laboratory training using specific seismological software
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) in teaching. The lectures content of the course, for each chapter, are uploaded in the eclass platform. Students are trained in seismological software use in the Department's computer lab. Interaction with students is done through eclass
TEACHING METHODS	

Activity	**Semester workload**
Lectures	26
Laboratory exercises	13
Preparation of laboratory exercises	13
Hours for private study of the student	46
Course total	**98**

STUDENT PERFORMANCE EVALUATION	The assessment is done in the following way: Written examination after the end of the semester which includes Theory based questions Assessment questions Problem solving questions Minimum passing grade: 5

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Lecture notes (eclass)

2. Tselentis Akis, Modern Seismology, Pub. Papasotiriou, 1997.

3. Papazachos B, Karakaisis G., Chatzidimitriou P., Introduction to Seismology, Pub. Ziti, 2005

4. Kramer, S.L. Geotechnical Earthquake Engineering, Prentice Hall, 1996.

- Related academic journals:

1. Bulletin of the Seismological Society of America
2. Journal of Seismology
3. Soil Dynamics and Earthquake Engineering

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _044**	**SEMESTER**	6th
COURSE TITLE	**GEOLOGICAL MAPPING OF CRYSTALLINE ROCKS**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work		2 (Lect.) +2 (lab.)	5
COURSE TYPE	Basic General knowledge / Skills development		
PREREQUISITE COURSES:	NO		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO324/		

LEARNING OUTCOMES

Learning outcomes
The course is addressed to undergraduate students who sufficiently know and understand the principles of Structural Geology and Petrography of Crystalline Rocks. The aim of the course is for students to acquire advanced knowledge and skills in the interpretation and analysis of geological maps. By the end of this course the student will be able to: Recognize and understand the methods of geological mapping in areas with crystalline rocks Recognize and understand the methods of structural mapping in areas with crystalline rocks Present the fabric elements of crystalline rocks on the geological map Compose geological maps and cross-sections in areas with simple metamorphic sequences Compose geological maps and cross-sections in areas with folded metamorphic sequences Compose geological maps and cross-sections in areas with complexes of metamorphic and magmatic rocks Compose geological maps and cross-sections in areas with polydeformed complexes of crystalline rocls Compose the tectonostratigraphy of areas with crystalline rocks
General Competences
Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above): Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Working independently Team work Respect for the natural environment Production of free, creative and inductive thinking

SYLLABUS

The course content includes the following chapters:

Basic concepts in geological mapping of crystalline rocks;
Method for mapping geological contacts and major structures
Presentation of fabric elements of crystalline rocks on the geological map
Analysis s in areas with simple metamorphic sequences
Analysis in areas with folded metamorphic sequences
Analysis in areas with complexes of metamorphic and magmatic rocks
Analysis in areas with poly-deformed complexes of crystalline rocks

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face in the classroom
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Written examination after the end of the semester. The examinations include both problems solving and short-answer questions.

Activity	Semester workload
Lectures	2 X 13 = 26
Laboratory practice	2 X 13 = 26
Study of bibliography	10
Study (non-directed)	30
Written report	40
Course total	**132**

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Hollocher K. 2014. A pictorial guide to metamorphic rocks in the field. CRC Press/Balkema.
Koukouvelas I., Kokkalas S., Zygouri V. 2020. Earthquake Geology. Disigma Publ. Thessaloniki. p. 443 (in Greek)
Lisle R., Brabham P., Barnes J. 2011. Basic geological mapping. John Wiley & Sons, Ltd.
Xypolias P. 2009. Azimuthal projections in Structural Geology. Symmetria Publ., Athens. (in Greek)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _045**	**SEMESTER**	6th
COURSE TITLE	**ENERGY SOURCES AND ENERGY RAW MATERIALS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work	2 (lect.) + 2 (lab.)	5

COURSE TYPE	Field of Science and Skills Development
PREREQUISITE COURSES:	Typically, there are not prerequisite courses. Essentially, the students should possess knowledge provided through the theoretical courses Mineralogy, Petrography, Geochemistry, Tectonics.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, in English
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO379/

LEARNING OUTCOMES

Learning outcomes

By the end of this course the student will
Have a spherical view of all the primary energy sources available today.
Be acquainted with the geological principles controlling the deposit formation of the energy raw materials and their exploitation.
Be aware of the non-electrical uses of the energy raw materials.
Be able to assess the potential environmental impacts from the use of the energy raw materials.

By the end of this course the student will have developed the following skills:
Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to the energy sources.
Ability to apply this knowledge and understanding to the solution of problems related to energy sources.
Ability to adopt and apply new methodologies/techniques to solve problems dealing with the peat/coal exploration.
Study skills needed for continuing professional development.
Ability to interact with others in geological or interdisciplinary problems.
In addition students with the help of the tutor they act successively as teachers and as students as well, facing teaching problems.

General Competences

Generally, by the end of this course the student will have developed the following general abilities:
Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
Adaptation to new situations
Decision making
Autonomous (Independent) work
Group work
Exercise of criticism and self-criticism
Promotion of free, creative and inductive thinking
Respect to natural environment
Work design and management

SYLLABUS

Man and Energy
Coal (origin, types and chemical composition, coalification, exploration, mining, uses, world and domestic reserves, environmental impacts from mining and exploitation).
Oil and Gas (origin, deposits and chemical composition, exploration, mining, uses, world and domestic reserves, environmental impacts from mining and exploitation).
Other hydrocarbons (bituminous rocks, coal-bed methane, hydrates).
Radioactive ores/Nuclear fuels (Uranium and Thorium: geochemistry, minerals, deposits, exploration, mining, uses other than power generation, domestic uranium and thorium deposits, environmental impacts from mining and exploitation).
Renewable Energy Sources (hydro, geothermal, solar and wind power, biomass, ocean energy, nuclear fusion).
Students teaching a selection of courses in front of an audience. Expanding students' knowledge, developing their skills and forming positive attitudes in relation to the use and pedagogical utilisation of Technology, Informatics and Communication tools. Using a questionnaire, with closed and open type questions, where the views of students that participated in the interdisciplinary exercises as teachers and as students have been recorded.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (e.g. power point presentations) in teaching. The lectures content of the course for each chapter are uploaded on the e-class webpage of the University, in the form of a series of pdf files; the students can freely download them using a password.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2×13=26
Laboratory work (2 conduct hours per week x 13 weeks)	2×13=26
Field work (2 days)	2×8=16
Hours for private study of the student and preparation of home-works	82
Course total	**150**

STUDENT PERFORMANCE EVALUATION	**Exercises** During the semester the students have to do homework; the exercises have to be given to the teaching staff on time. This is the basic prerequisite for allowing participation in the final examination. **Written Examination,** including questions of short and extended replies, diagramme interpretation etc. The mark of the written examination constitutes 100% of the final mark. Minimum passing grade: 5.

ATTACHED BIBLIOGRAPHY

1. Chatterjee, K.K., 2006. Uses of energy minerals and changing techniques. New Age International (P) Ltd, New Delhi.
2. Christanis, K., 1998. Energy Sources and Energy Raw Materials. Textbook, University of Patras.
3. Dahlkamp, F.J., 2010. Uranium Deposits of the World. Springer-Verlag, Berlin.
4. Buchla, D.M., Kissell, T.E., Floyd, T.L., 2014. Renewable Energy: Sources, Processes, and Systems. Pearson Publ.

Journals
As the subject of the course is very wide, there are a lot of Journals dealing with the Energy Sources

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_046**	**SEMESTER**	6th
COURSE TITLE	**GEODYNAMICS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory	2 (lect.) + 2 (lab.)	5

COURSE TYPE	Field of Science
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek /Greek. Teaching may be however performed in English in case foreign students attending the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO387/

LEARNING OUTCOMES

Learning outcomes
The course is addressed to undergraduate students who know and understand the basic principles of Geology and Structural Geology. The aim of the course is to give to the students the advanced knowledge and skills on themes related to lithospheric plate motion, the forces and mechanism involved in these movements, as well as the processes acting on the lithosphere (e.g., deformation, magmatism, metamorphism) that are associated with the different plate boundaries. By the end of this course the student will be able to: Know and understand the interior of the earth. Know and understand the structure and the different types of the earth's crust. Know and understand the forces and the driving mechanisms that control the plate motions. Know and understand the processes, such as deformation, magmatism and metamorphism, which are related with the divergence, convergence and collision of the lithospheric plates. Distinguish regions of the earth's crust, based on their structure and geological evolution, that have been formed and deforming at plate boundaries from regions located at the stable platform or craton. Understand the anatomy and the different types of orogenic belts.
General Competences
Generally, by the end of this course the student will, furthermore, develop the following general abilities: Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Autonomous (Independent) work Team work Promotion of free, creative and inductive thinking

SYLLABUS

The course content includes the following chapters: Historical development of theories about the orogenesis Structure of the interior of the earth The main tectonic features of the lithosphere Lithospheric plate motion Divergent and conservative plate margins Convergent plate margins-subduction zones Collision of lithospheric plates and orogeny Anatomy of orogenic belts-orogenic deformation.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures with power-point presentations in class. Problem solution laboratories (thirteen problems.

	In the case of available budget for field work, the course will include a 2-day field trip in areas of central Greece in order to understand better the deformation and the structural features at the margins of microplates.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of e-class platform with all lectures and lab problems available in digital format.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Student assessment is based on: (a) written examination after the end of the semester, which mainly includes essay questions (30% of the final grade) (b) four written quizzes in total, each one per thematic course area (30% of the total grade) (c) written short report and presentation of specific course contents suggested by the instructor (20% of the final grade) and (d) lab exercises in-class (20% of the total grade).

Activity	**Semester workload**
Lectures	2 X 13 = 26
Laboratory work	2 X 13 = 26
Lab exercise solution	2 X 13 = 26
Report preparation and presentation	5 X 7 = 35
Literature review	2 X 6 = 12
Course total	**125 hours**

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Kokkalas, S. 2012. Geodynamics. Univ. Patras Publ.(in Greek)
D. Turcotte and G. Schubert, 2002. Geodynamics (2nd Edition), Cambridge University Press.
P. Kearey, K. Klepeis, F. Vine, 2009. Global tectonics, 3rd Edition, Wiley-Blackwell.
- Related academic journals: Journal of Geodynamics, Tectonophysics, Tectonics

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_047**	**SEMESTER**	6th
COURSE TITLE	**ENGINEERING GEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work, Field Work	2(L), 2(LW), 1FW)	6

COURSE TYPE	Field of Science (Geology) and Skills Development (Engineering)
PREREQUISITE COURSES:	Typically, there are not prerequisite course.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO345/

LEARNING OUTCOMES

Learning outcomes
The course gives the theoretical and objective knowledge related to the identification and determination of the physical and mechanical behavior of the geological formations, in the context of the design and study - construction of the technical works. By the end of this course the student will possess cognitive and practical skills and has the ability to: Utilization of know - how to assess the physical - mechanical parameters of soil formations through laboratory and on - site methodologies and simulations (use of appropriate methods, materials and instruments) Application of knowledge and creative thinking to solve problems related to the particular and unpredictable geological conditions that will be encountered in the design of the technical project (e.g. suitable in-depth drilling and ground sampling, potential rock mass failures, etc.) Also, the student in the working environment has the ability to respond: With competence in interdisciplinary required by technical works (study - construction) With responsibility and reliability in the case of autonomous employment
General Competences
Retrieve, analyze and synthesize data and information, using the necessary technologies Decision making Working in an interdisciplinary environment

SYLLABUS

Soil Mechanics: origin, composition – structure, physical parameters, classification parameters (grading, consistency, activity), swelling, description - classification system (AUSCS), engineering behavior (shear strength - failure criteria, deformability - consolidation).
Rock Mechanics: composition – structure, classification, physical parameters, mechanical strength, failure criteria, deformability, rock material classification
Rock mass Discontinuities: engineering description (orientation, spacing, persistence, wall strength, roughness, and aperture), borehole measurements (CR, RQD).
Exploratory boreholes for geotechnical purposes: aim, drilling, depth, location, sampling diameter, boring equipment, machinery, sampling methods for soil and rock formations, packing and storage, observation and description, core recovery indices and RQD, borehole logging.
In situ geotechnical testing : standard penetration test (SPT), cone penetration test (CPT), pressuremeter test (MPM), cross hole test, permeability testes (Maag, Lefranc, Lugeon)
Laboratory work in: (a) laboratory soil testing (Soil Mechanics) according to ASTM, BS and E105-86 standards, (b) evaluation of in-situ testing results according to ASTM, BS and E106-86 standards
Field work in geotechnical in-situ testing for the study and construction of transport technical works and delivery of essay

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory work face to face

<table>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>• Use of Information and Communication Technologies (ICTs) (power point) in teaching.
• Uploading of all Laboratory exercises to the e_class platform for processing by the students
• Support of Learning Process and Dissemination of educational material through the e_class platform</td></tr>
<tr><td>TEACHING METHODS</td><td><table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (2 conduct hours per week x 13 weeks)</td><td>2×13=26</td></tr>
<tr><td>Laboratory work (2 conduct hours per week x 13 weeks) including practice in testing procedure and apparatuses as regards (a) soil mechanics and (b) geotechnical in-situ testing</td><td>2×13=26</td></tr>
<tr><td>Field work in geotechnical in-situ testing for the study and construction of transport technical works and delivery of essay</td><td>13</td></tr>
<tr><td>Autonomous study</td><td>110</td></tr>
<tr><td>Course Total</td><td>175 hours</td></tr>
</table></td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>I) Laboratory evaluation (50%):
(a) Lab exercises. Each lab exercise is resolved and delivered the next week after its educational process. After it is corrected, marked and returned to the student.
The average mark of all lab exercises is calculated.
(b) Written examination on laboratory exercises.
Final Lab Work Grade (50%) =(a)*20% + (b)*30%

II) Final Written Course Exams (50%):
Ten (10) questions of short answer related to lectures</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

- Text books:
Τεχνική Γεωλογία (2002). Γ. Κούκης, Ν. Σαμπατακάκης Εκδόσεις Παπασωτηρίου, σελ. 514
Engineering Geology. Principle and practice (2009). D.G. Price, Springer.
Engineering Geology (2007). F.G. Bell. Second edition. B.H.
- Scientific International Journals:
Bulletin of Engineering Geology and the Environment. Springer
Engineering Geology. Elsevier.
Geotechnical and Geological Engineering. Springer

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_048**	**SEMESTER**	6th
COURSE TITLE	**FIELDWORK VI**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Field work	7days	3

COURSE TYPE	Basic General knowledge / Skills development
PREREQUISITE COURSES:	NO
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes
The course is addressed to undergraduate students who sufficiently know and understand the principles of Structural Geology and Petrography. The aim of the course is for students to acquire advanced knowledge and skills on geological mapping. By the end of this course the student will be able to: Recognize and group lithologies in exposures of crystalline rocks in the field Recognize and understand the fabric elements of crystalline rocks in the field Carry out measurements of the orientation of fabric elements of crystalline rocks in the field Map and characterize the geological contacts in the field Map deformation structures in the field Construct and compose geological maps in areas of medium difficulty Compose geological cross-sections as well as the tectonostratigraphy using data from the geological map which she/he produced Prepare a professional report for the geological map which she/he produced
General Competences
Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above): Search for, analysis and synthesis of data and information, with the use of the necessary technology Adapting to new situations Working independently Team work Respect for the natural environment Production of free, creative and inductive thinking

SYLLABUS

The course content includes the following chapters:

Grouping of lithologies based on the map scale
Recognition of fabric elements of crystalline rocks
Field orientation measurements with the geological compass
Sketching and analysis of mesoscopic rock section
Mapping and characterization of geological contacts
Structural mapping

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face in the field

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	
TEACHING METHODS	**Activity** / **Semester workload** Fieldwork: 7days X 8 = 56 Written report (using data collected in the field): 36 **Course total**: **90**
STUDENT PERFORMANCE EVALUATION	The student assessment is based on the score of the submitted report as well as on oral examination

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Hollocher K. 2014. A pictorial guide to metamorphic rocks in the field. CRC Press/Balkema
Koukouvelas I., Kokkalas S., Zygouri V. 2020. Geology & Earthquakes. Disigma Publ. Thessaloniki. p.443 (in Greek)
Lisle R., Brabham P., Barnes J. 2011. Basic geological mapping. John Wiley & Sons, Ltd.
Xypolias P. 2009. Azimuthal projections in Structural Geology. Symmetria Publ., Athens. (in Greek)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _049**	**SEMESTER**	6th
COURSE TITLE	**MARBLES AND AGGREGATE MATERIALS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
LECTURES, LABORATORY EXERCISES	2th+1lab	4

COURSE TYPE	Scientific field
PREREQUISITE COURSES:	Petrography I,II, Sedimentology.
LANGUAGE INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	-

LEARNING OUTCOMES

Learning outcomes
By the end of this course the student will be able to: • Use and exploitation of aggregate materials. • Ability of drawing up mineralopetrographic and physicomechanical study of rocks. • Management of dangerous quarry wastes and delimination of new possible areas. • Maintenance and restoration of ancient monuments.
General Competences
Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Autonomous (Independent) work Group work Respect of the physical environement

SYLLABUS

Marbles and ornamental rocks- physical features, physicomechanical properties of marbles- allocation and varieties of marbles- applications of rocks- the marble in ancienty and in nowdays- databases.
Aggregate materials and rocks- mineralopetrographic examination, laboratory tests and classification of aggregates for their different uses. – existing legislative framework and environmental restoration.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face to Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Lectures (power point), exercises, field exercises.
TEACHING ORGANIZATION	

Activity	**Workload for semester**
Lectures	2×13=26
Laboratory exercises	1×13=13
Independent study	61
Total number of hours for the Course	**100**

STUDENT PERFORMANCE EVALUATION	A. Writing examination(20%) which includes short growth questions. B. Oral examination (80%) which includes the writing and the presentation of scientific thesis.

ATTACHED BIBLIOGRAPHY

- . Hatzipanagiotou,K.G. (1985):Petrography I.University of Patras.
-. Hatzipanagiotou,K.G. (2005):Petrography I.University of Patras.

-Tsirampidis, A.E. (2005):The mineral richness of Greece..Yiachoudi, Thessaloniki.,

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _050**	**SEMESTER**	6th
COURSE TITLE	**ANALYTICAL METHODS AND DIGITAL IMAGING TECHNIQUES OF MINERAL RAW MATERIALS RESEARCH**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures and laboratory work	2 (lect.), 1 (lab.)	4
COURSE TYPE	Field of Science and Skills Development (theoretical background and use of the main analytical techniques used in the study of earth materials)		
PREREQUISITE COURSES:	Typically, there are not prerequisite course. Essentially, the students should possess: (a) knowledge provided through the previously taught theoretical courses of "Earth Materials I", "Earth Materials I", "Chemistry" and "Physics". (b) laboratory skills obtained through the previously attended laboratories included in the courses outlined above.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO317/		

LEARNING OUTCOMES

Learning outcomes

By the end of this course the student will be able to:

Decide the proper method for mineral or rock analys (including organic sediments) is according to the demands of a specific application, having acquired knowledge on the principles of some of the most common qualitative and quantitative methods used for mineralogical and geochemical analysis.

Use and know how to prepare samples to be analysed by each method

By the end of the course the student will have further developed the following skills /competences:

Ability to interpret the data obtained by each of the methods using dedicated software.

Ability to manage analytical data.

General Competences

By the end of this course the student will, furthermore, have developed the following skills (general abilities):

Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications of the main analytical techniques employed during the study of earth materials

Ability to apply this knowledge and understanding to the solution of problems related to material analysis

Ability to adopt and apply the appropriate analytical methodology for studying materials non familiar with

Study skills needed for continuing professional development.

Ability to interact with others in issues concerning analytical techniques and their application in earth materials analysis.

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):

Searching, analysis and synthesis of facts and information, as well as using the necessary technologies

Autonomous (Independent) work

Group work

SYLLABUS

Lectures

Principles and uses of X-ray powder diffraction, X-ray fluorescence spectrometry, Scanning Electron Microscopy, Electron microprobe analysis, Infrared, Raman and Mössbauer spectroscopy, ICP-AES and ICP-MS, differential thermal analysis, optical cathodoluminescence

Laboratory work

Interpretation of the results obtained through each method by the dedicated software packages and the accompanying databases.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face. Lectures: using slides for overhead projector and/or power-point presentations. Open eClass - Asynchronous eLearning Platform: storage and presentation of teaching material. Laboratories: Students are assigned a thin section suite to work out an essay on the metamorphic conditions and processes of a specific study area.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of ppt files, where from the students can freely download them using a password which is provided to them at the beginning of the course.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2x13=26
Laboratory work (1 conduct hour per week x 13 weeks) – analyzing a suite of materials (mainly petrological and archaeological) by means of various analytical methodologies and evaluation of the results obtained	1x13=13
Writing of scientific reports for communicating the analytical results obtained through the laboratory exercises	1x13=13
Sample preparation for their study in the laboratory	1x6=6
Hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory)	3x13=39
Weekend hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory)	1x13=13
Hours for private study of the student during the week available for exam preparation and two weeks of holidays	2x3=6
Course total	**116**

STUDENT PERFORMANCE EVALUATION	Written examination (75% of the final mark) An essay comprising the outcome of the exercise assignments on the analyzed materials (25% of the final mark). Percentages are valid t only when the student secures the minimum mark of 5 in the final written examination Greek grading scale: 1 to 10. Minimum passing grade: 5. Grades <3 correspond to ECTS grade F. Grade 4 corresponds to ECTS grade FX. For the passing grades the following correspondence normally holds: 5 <-> E, 6 <-> D, 7 <-> C, 8 <-> B and >9 <-> A

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1)Notes of lecturers in Greek.
2)Various relevant scientific papers
3) Sections of the user manuals of the various analytical instruments and their dedicated software packages
4)Lectures (Power Point) posted on eclass platform

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _051**	**SEMESTER**	6th
COURSE TITLE	**PALAEOCEANOGRAPHY, PALAEOCLIMATOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	2(L), 1(LW)	4

COURSE TYPE	General knowledge, Scientific Area, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO370/

LEARNING OUTCOMES

Learning outcomes

Upon successful completion of this course , the students will be able to:

- Clarify the causes of the past climatic changes and the impact of them in the environment and human.
- Link the climatic variability and the evolution of the planet earth and the civilization in the past
- Analyze and evaluate scientific data to create a conclusion about the modern and past environment
- Combine multithematic paleoenvironmental data sets.

General Competances

- Data retrieval, analysis and synthesis of data and information through the use of new information technologies
- Adapting to new situations.
- Decision making.
- Individual work
- Team work
- Production of new research ideas.
- Respect for the natural environment.
- Promotion of free, creative and inductive way of thinking

SYLLABUS

Theory

- Mechanisms and causes of the past climatic variability
- Research methods in the palaeoclimatology and paleoenvironmentology
- Introduction to the application of stable isotopes techniques
- Introduction to the application of radio isotopes techniques
- Foraminifera as indexes of paleoenvironmental evaluation and evolution
- Introduction to the application of palynology
- Impacts and effects of the paleoclimatic variability

Laboratory

- Methods and practices of sampling for paleoclimatic and paleoenvironmental studies
- Micropalaeontological (foraminifera) analyses
- Analysis and interpretation of multithematic paleoenvironmental data sets

TEACHING AND LEARNING METHODS – EVALUATION

DELIVERY	In classroom and in laboratory (face-to-face)
USE OF INFORMATION AND COMMUNICATION	• Use of Information and Communication Technologies (ICTs) (power point) in teaching

<table>
<tr><td>TECHNOLOGY</td><td>• Support of Learning Process and Dissemination of educational material through the e_class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (2 conduct hours per week x 13 weeks)</td><td>2X13 = 26 (hours)</td></tr>
<tr><td>Laboratory work (1 conduct hours per week x 13 weeks)</td><td>1X13 =13(hours)</td></tr>
<tr><td>Individual Study (Interpretation and writing of the exercises)</td><td>61 (hours)</td></tr>
<tr><td>Total contact hours and training</td><td>100</td></tr>
</table>
</td></tr>
<tr><td>STUDENTS PERFORMANCE EVALUATION</td><td>I. Theory
Final Exam, written, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving.
Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams.
Marking Scale: 0-8.
II. Laboratory
Students are obliged to attend all laboratory classe and to deliver the results of all exercises.
Maximum number of non delivered laboratory exercises: 3
Marking Scale: 0-2
The final Course mark is the summary of the marks on Theory and Lab
Minimum Passing Mark: 5.</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Books :

«Το κλίμα τα τελευταία 40000 χρόνιαΑναφορά στην Ανατολική Μεσόγειο», Γεραγά Μαρία, Εκδόσεις Πανεπιστημίου Πατρών, ISBN: 978-960-530-125-5.,

Relative scientific journals:

Paleoclimatology Paleoecology Paleogeography
Quaternary Research
Palaeoceanography
Quaternary International

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _051**	**SEMESTER**	6th
COURSE TITLE	**PALAEOCEANOGRAPHY, PALAEOCLIMATOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	2(L), 1(LW)	4

COURSE TYPE	General knowledge, Scientific Area, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO445/

LEARNING OUTCOMES

Learning outcomes

Upon successful completion of this course , the students will be able to:

- Clarify the causes of the past climatic changes and the impact of them in the environment and human.
- Link the climatic variability and the evolution of the planet earth and the civilization in the past
- Analyze and evaluate scientific data to create a conclusion about the modern and past environment
- Combine multithematic paleoenvironmental data sets.

General Competances

- Data retrieval, analysis and synthesis of data and information through the use of new information technologies
- Adapting to new situations.
- Decision making.
- Individual work
- Team work
- Production of new research ideas.
- Respect for the natural environment.
- Promotion of free, creative and inductive way of thinking

SYLLABUS

Theory

- Mechanisms and causes of the past climatic variability
- Research methods in the palaeoclimatology and paleoenvironmentology
- Introduction to the application of stable isotopes techniques
- Introduction to the application of radio isotopes techniques
- Foraminifera as indexes of paleoenvironmental evaluation and evolution
- Introduction to the application of palynology
- Impacts and effects of the paleoclimatic variability

Laboratory

- Methods and practices of sampling for paleoclimatic and paleoenvironmental studies
- Micropalaeontological (foraminifera) analyses
- Analysis and interpretation of multithematic paleoenvironmental data sets

TEACHING AND LEARNING METHODS – EVALUATION

DELIVERY	In classroom and in laboratory (face-to-face)
USE OF INFORMATION AND COMMUNICATION	• Use of Information and Communication Technologies (ICTs) (power point) in teaching

TECHNOLOGY	• Support of Learning Process and Dissemination of educational material through the e_class platform.
TEACHING METHODS	

Activity	Semester workload
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26 (hours)
Laboratory work (1 conduct hours per week x 13 weeks)	1X13 =13(hours)
Individual Study (Interpretation and writing of the exercises)	61 (hours)
Total contact hours and training	**100**

STUDENTS PERFORMANCE EVALUATION	**I. Theory** Final Exam, written, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving. Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams. Marking Scale: 0-8. **II. Laboratory** Students are obliged to attend all laboratory classes and to deliver the results of all exercises. Maximum number of non delivered laboratory exercises: 3 Marking Scale: 0-2 **The final Course mark** is the summary of the marks on Theory and Lab Minimum Passing Mark: 5.

ATTACHED BIBLIOGRAPHY

Books :

«Το κλίμα τα τελευταία 40000 χρόνιαΑναφορά στην Ανατολική Μεσόγειο», Γεραγά Μαρία, Εκδόσεις Πανεπιστημίου Πατρών, ISBN: 978-960-530-125-5.,

Relative scientific journals:

Paleoclimatology Paleoecology Paleogeography
Quaternary Research
Palaeoceanography
Quaternary International

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _052**	**SEMESTER**	6th
COURSE TITLE	**HYDROCHEMISTRY**		

INDEPENDENT TEACHING ACTIVITIES	TEACHING HOURS	ECTS CREDITS

	PER WEEK	
Lectures, seminars and laboratory work	2 (L), 1 (LAB)	4
COURSE TYPE	Field of Science and Skills Development	
PREREQUISITE COURSES:	Typically, there are not prerequisite course. For a better understanding of the course, it would be advisable for students to have attended first the course of Applied Hydrogeology	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.	
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes	
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO360/	

LEARNING OUTCOMES

Learning Outcomes

By the end of this course the student will be able to:

- Understand the natural chemical composition of water
- Understand the hydro-geo -chemical processes that form the natural chemical composition of the groundwater as well as the water – rock interaction
- Identify the effect of pollution on the chemical composition of water.
- Be aware of the ways and methodologies for analyzing water samples in the Laboratory.
- Evaluate the results of laboratory analyzes
- Use these results in practice.
- Learn the standards of drinking water according to EU directives.

General Competences

By the end of this course the student will, furthermore, have developed the following skills (general abilities):

1. Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to groundwater quality.
2. Ability to apply this knowledge and understanding to the solution of problems related to groundwater quality

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):
Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
Adaptation to new situations
Decision making
Autonomous (Independent) work
Group work
Exercise of criticism and self-criticism
Promotion of free, creative and inductive thinking
Respect to natural environment
Work design and management

SYLLABUS

- Natural chemical composition of groundwater
- Introduction to thermodynamic systems - activity
- Mineral Dissolution (Minerals and Water)
- Reduction – Oxidation Processes
- Ion exchange
- Carbonates and carbon dioxide
- Physicochemical Parameters of Water (pH, electrical conductivity, redox potential, alkalinity, hardness, saturation indexes)
- Presentation of hydrochemical data (Hydrochemical diagrams - Hydrochemical maps)
- Classification of waters
- Geochemistry of groundwater
- Standards of drinking water

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, hydrochemical exercises and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, e-class platform, in the form of a series of ppt files, where from the students can freely download them.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13=26
Laboratory exercises of hydrochemistry and work at the Laboratory (2 conduct hours per week x 13 weeks)	1X13=13
Writing reports on laboratory exercises	3X13=39
Hours for private study of the student, preparation of home-works and preparation of the final exams	3X13=39
Total number of hours for the Course	**117 hours**

STUDENT PERFORMANCE EVALUATION	1. Written examination during the examination period and 2. Written reports for each laboratory exercise. The average of the grades is 10% of the final grade.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Lambrakis, N., 2015. Introduction to Hydrochemistry, University of Patras

2. Apello and Postma, 2006. Geochemistry, groundwater and pollution, Balkema Publishers.

- Related academic journals:

Environmental Earth Sciences, Springer Publishers; Environmental Monitoring and Assessment, Springer Publishers

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _053**	**SEMESTER**	**7th**
COURSE TITLE	**ORE GEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures of Theory, Tutorial and Lab exercises,	2 (Lect.), 2 (Lab), 1 Tut.	6

COURSE TYPE	Scientific area and skills development
PREREQUISITE COURSES:	Attedance of Mineralogy, Petrography, Geochemistry, Petrology, Tectonics, Geodynamics, Historical Geology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes in English
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO347/

LEARNING OUTCOMES

Learning outcomes

The course is a basic introductory course in Ore Geology subjects, dealing with the most common deposits of ore-minerals. Partly comprises also Economic Geology in introductory level.
The learning goals include:

- Knowledge of the geological characteristics of ore-minerals deposits and understanding of the "descriptive or empirical model" of each type of deposit.
- Analysis of the "descriptive mode" by combining macropetrographical, petrological, tectonical and geochemical aspects, including microscopical observations. Application of this analysis to categorize the style of the deposits according to their "metallogenic model".
- Ability in evaluating and interpreting exploration results and data, ability to compare the outcome to "known metallogenic models" and to synthesize all the available data towards discovering new deposits.

General Competences

Search, analyze and synthesize data and information, using the necessary technologies
Independent work.
Group work
Work in international environment
Work in multidisciplinary environment
Generating new research ideas
Exercise of criticism and self-criticism
Promote free, creative and inductive thinking

SYLLABUS

Ore Geology and its themes
The different styles of mineralizations and their formation
Deposits in Greece and Internationally
Macro- and microcharacteristics of main metallic minerals

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Direct face to face lecturing in classroom, in Lab of Microscopic observations and field.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of IT (power point, pdf) και blackboard. Support through e-class platform.
TEACHING METHODS	

Activity	Semester workload
Theory Lectures	2×13=26
Tutorial lectures and exercises	1×13=13
Lab macroscopical identification of ores and microscopical examination of polished blocks pf metallic minerals,	2×13=26
Group paper-report	25
Autonomous study	60
Total number of hours for the Course	**150**

STUDENT PERFORMANCE EVALUATION

.

A. Written final exam test (60%) that includes:
i. Multiple choice questions
ii. Questions of short answers
iii. Synthesis of short essays
iv. Understanding and interpreting metallogenic maps and sections
v. Sketching metallogenic maps and sections
vi. Solving problems related to geochemical and economical geology data.
B. Oral exam (10%) that includes:
i. Ore identification
ii. Description of an ore genetical model in relation to the texture and fabric of ore specimens
iii. Interpretation of geological maps – Correlated to field work activities.
Γ. Lab exam (30%) that includes:
i. Identification of metallic minerals under the microscope
ii. Identification of metallic minerals textures under the microscope

	Evaluation criteria: During the semester two simulations of the lab exams are conducted. Students have the opportunity of self-evaluation with material provided to them through eclass.

ATTACHED BIBLIOGRAPHY

Greek
Melidonis, N., 1992. General ore-geology (Γενική Κοιτασματολογία). University of Patras, 516p.
Skarpelis, N., 2006. Introduction to ore-geology (Εισαγωγή στην Κοιτασματολογία). University of Athens 268p.

Ξενόγλωσση
Robb, L., 2004. Introduction to ore-forming processes. ISBN: 978-0-632-06378-9, Wiley-Blackwell, 384 p.

Journals
Economic Geology Journal **http://www.segweb.org/**

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_054**	**SEMESTER**	7th
COURSE TITLE	**GEOLOGY OF TECHNICAL WORKS AND ROCK MECHANICS**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work		2(L), 3(LW)	6
COURSE TYPE	Field of Science (Geology) and Skills Development (Technical Works and Environment)		
PREREQUISITE COURSES:	Typically, there are not prerequisite course. It is however recommended that students should have at least a basic knowledge of Engineering Geology		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO349/		

LEARNING OUTCOMES

Learning outcomes
The course gives the theoretical and objective knowledge related to the identification and description of the engineering geological conditions that prevail on technical works design and their environmental impacts. Particular emphasis is given to selecting and identifying the most "critical" geological parameters that will affect technical work construction and their safe operation. By the end of this course the student will possess cognitive and practical skills and has the ability to: Utilization of know - how to assess the physical - mechanical parameters of rock formations (rock material and rock mass) through laboratory and on - site methodologies and simulations (use of appropriate methods, materials and instruments) Application of knowledge and creative thinking to solve problems related to the particular and unpredictable geological conditions that will be encountered in the design of the technical project (slope protection, tunnel supporting, dam grouting, etc.) Also the student in the working environment has the ability to respond:

With competence in interdisciplinary required by technical works (study - construction) With responsibility and reliability in the case of autonomous employment
General Competences
Retrieve, analyze and synthesize data and information, using the necessary technologies Decision making Adapt to new situations Working in an interdisciplinary environment

SYLLABUS

Engineering behavior of rock mass: rock mass classification systems RMR, Q and Geological Strength Index (GSI). Applications on the design and construction of tunnels, slopes and foundations.
Landslides: terminology and classification, causal and triggering factors, remedial measures
Design and construction of dams: classification of dams, design criteria, engineering geological requirements, dam and reservoir waterproofing, monitoring techniques.
Design and construction of tunnels: geological conditions during construction, rock mass deformation and failure mechanism, construction methods (NATM, TBM), supporting techniques.
Laboratory work in: (a) laboratory rock testing (Rock Mechanics) and (b) evaluation of in situ testing results according to ASTM, BS, ISRM and E103-84 standards
Applied exercises on rock mass classification schemes for (a) the construction of sub-surface and open-surface works, (b) landslide remediation, (c) geotechnical design in dam foundation and (d) tunneling

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory work face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	• Use of Information and Communication Technologies (ICTs) (power point) in teaching. • Uploading of all Laboratory exercises to the e_class platform for processing by the students • Support of Learning Process and Dissemination of educational material through the e_class platform
TEACHING METHODS	

Activity	Semester workload
Lectures (2 conduct hours per week x 13 weeks)	2×13=26
Laboratory work (2 conduct hours per week x 13 weeks) including practice in testing procedure and apparatuses as regards (a) Rock Mechanics and (b) in situ rock mass measurements	2×13=26
Applied exercises on rock mass classification schemes for (a) the construction of sub-surface and open-surface works, (b) landslide remediation, (c) geotechnical design in dam foundation and (d) tunneling	13
Autonomous study	85
Course Total	**150 hours**

STUDENT PERFORMANCE EVALUATION	I) Laboratory and field work evaluation (50%): (a) Each lab exercise is resolved and delivered the next week after its educational process. After it is corrected, marked and returned to the student. Field Work is immediately delivered just after the completion of the training process. The average mark of both lab and filed work exercise is calculated (b) Written examination on laboratory exercises. Final Lab Work Grade (50%) =(a)*20% + (b)*30% II) Final Written Course Exams (50%): Ten (10) questions of short answer related to lectures

ATTACHED BIBLIOGRAPHY

- Text Books:
1) Γεωλογία Τεχνικών Έργων (2007). Γ. Κούκης, Ν. Σαμπατακάκης Εκδόσεις Παπασωτηρίου, σελ. 575
2) Engineering Geology. Principle and practice (2009). D.G. Price, Springer.
3) Engineering Geology (2007). F.G. Bell. Second edition. B.H.
-Scientific International Journals:

1)	Bulletin of Engineering Geology and the Environment. Springer
2)	Engineering Geology. Elsevier.
3)	Geotechnical and Geological Engineering. Springer

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_055**	**SEMESTER**	7th
COURSE TITLE	**FIELDWORK VII (HYDROGEOLOGY-ENGINEERING GEOLOGY AND INFRASTRUCTURE WORKS)**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Field Work	2(FW)	2
COURSE TYPE	Skills Development in Field Work Practice		
RELATED COURSES:	Engineering Geology, Geology of Technical Works and Environment, Applied and Environmental Hydrogeology		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO454/		

LEARNING OUTCOMES

Learning outcomes
The course provides the practical knowledge related to the identification and description of the engineering geological and geotechnical conditions that determine the design of infrastructure works and their adaptation to the environment. The course familiarizes the students with the basic concepts and methods of Engineering Geology and Geology of Technical Works that are applied in the design and construction of infrastructure works and presents some of the basic construction methods in tunneling, retaining structures, dewatering, grouting, etc. The course also provides the practical knowledge related to the presence of karst aquifers in carbonate rocks, the differences between porous-media and karst aquifers, and the importance of springs in the hydrogeological systems. In addition, the importance of dams in the management of surface water resources is thoroughly explained. The course familiarizes the students with the basic concepts and methods of Hydrogeology that are applied in the implementation of hydrogeological, environmental and management studies. By the end of this course the student will possess cognitive and practical skills and has the ability to: Application of knowledge and creative thinking to solve problems related to the implementation of technical solutions in critical infrastructure issues during study and construction (slope protection, tunnel supporting, dam grouting, etc.) Identification of the best solution in construction problems with technical and financial criteria. Application of knowledge and creative thinking to solve problems related to the implementation of hydrogeological and environmental problems as well as problems related to the management of surface water resources Also the student in the working environment has the ability to respond: With competence in interdisciplinary required by technical works (study - construction) With competence in interdisciplinary required by hydrogeological, environmental and management studies With responsibility and reliability in the case of autonomous employment
General Competences
Retrieve, analyze and synthesize data and information, using the necessary technologies Decision making

Adapt to new situations
Working in an interdisciplinary environment

SYLLABUS

The course contains field work practice in the subjects of "Engineering Geology and infrastructure works" and "Applied and Environmental Hydrogeology". It contains two preliminary lectures for students, four days of field work practice (two for each of the referred subjects) and a written technical essay from each of the students, that is evaluated and marked.

The two (2) days of field work practice in the subject of "Engineering Geology and infrastructure works" improve the understanding of students in the technical applications of Engineering Geology and Geology of Technical Works. The two (2) days of field work practice in the subject of "Applied and Environmental Hydrogeology" improve the understanding of students in Hydrogeology.

The two (2) days of field work practice in the subject of "Engineering Geology and infrastructure" include:

1) Description of the foundation of the "Rio-Antirio" cable-stayed bridge
2) Analysis of the design of rock interception and landslide mitigation works along the national road of "Antirio-Ioannina".
3) Description of the construction of the large clayey-core earth-dams "Stratos and Kastraki" in the Acheloos river basin and "Pournari" in the Arachthos river basin
4) Description of the construction of important infrastructure works in the highly weathered and poor quality geological formations that exist in the thrust area of Pindos and Ionian zone: Dam and underground complex works along the Metsovitiko river (tunnels, shafts and underground openings)
5) Description of the construction of important infrastructure works along the Egnatia highway (bridges, reinforced embankments, etc).
6) Description of the design of landslide mitigation and slope restoration works along the Egnatia highway.

The two (2) days of field work practice in the subject of "Applied and Environmental Hydrogeology" include:

1) Description of the formation and operation of karst systems in Western Greece (Louros karst system)
2) Description of the importance of dams in the management of surface-waters in Western Greece
3) Description of the Pheneos polge and the karst systems in North Peloponnese (Ziria-Kefalari karst systems)
4) Description of the formation and operation of the karst springs and water management in the Stymfalia area
5) Description and presentation of water sampling techniques from springs and boreholes
6) Description of the aquifer layers of the Argolis basin and their pollution problems

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Four (4) days of field work practice for the better understanding of Engineering Geology, Geology of Technical Works and Environment and Hydrogeology
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Support of Learning Process and Dissemination of educational material through the e_class platform
TEACHING METHODS	

Activity	**Semester workload**
Preliminary Lectures for field work practice	2×2=4
Field Work Practice	4×8=32
Technical essay	2×8=16
Course Total	**52 hours**

STUDENT PERFORMANCE EVALUATION	Every student at the end of the educational process delivers a technical essay which gets evaluated and marked

ATTACHED BIBLIOGRAPHY

- Text Books:

1) Γεωλογία Τεχνικών Έργων (2007). Γ. Κούκης, Ν. Σαμπατακάκης Εκδόσεις Παπασωτηρίου, σελ. 575.
2) Τεχνική Γεωλογία (2002). Γ. Κούκης, Ν. Σαμπατακάκης Εκδόσεις Παπασωτηρίου, σελ. 514.
3) Εφαρμογές της Τεχνικής Γεωλογίας και Γεωτεχνικής στα Τεχνικά Έργα (2015). Ν. Σαμπατακάκης, Γ. Κούκης, Ν. Δεπούντης. Εκδόσεις Πανεπιστημίου Πατρών, σελ. 131
4) Engineering Geology. Principle and practice (2009). D.G. Price, Springer.
5) Engineering Geology (2007). F.G. Bell. Second edition. B.H.
6) Geotechnical and Geological Engineering. Springer
7) Γ. Καλλέργης, 1999. Εφαρμοσμένη – Περιβαλλοντική Υδρογεωλογία. Έκδοση Τεχνικού Επιμελητηρίου Ελλάδος, Τόμος Α, Τόμος Β και Τόμος Γ.
8) Γ. Σούλιος, 1996. Γενική Υδρογεωλογία. University Studio Press,Τόμοι Πρώτος, Δεύτερος και Τρίτος
9) Γ. Σούλιος (2011). Γενική Υδρογεωλογία - Τόμος Ε΄ - Καρστική υδρογεωλογία, Ισοτοπική υδρολογία - ιχνηθετήσεις, Γεωφυσικές διασκοπήσεις - τηλεπισκόπηση, Υδρογεωλογικά μοντέλα, Η υδρογεωλογία στα φράγματα, University Studio Press

-Scientific International Journals:

1) Bulletin of Engineering Geology and the Environment. Springer

2)	Engineering Geology. Elsevier.
3)	Geotechnical and Geological Engineering. Springer
4)	Environmental Earth Sciences, Springer Publishers;
5)	Environmental Monitoring and Assessment, Springer Publishers

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _057**	**SEMESTER**	7th
COURSE TITLE	**PETROGENESIS OF OPHIOLITE COMPLEXES**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
LECTURES, LABORATORY EXERCISES,		2TH+1LAB	4
COURSE TYPE	Background, Field of Science and Skills Development		
PREREQUISITE COURSES:	Petrography I,II, Tectonic geology, Petrology of igneous and metamorphic rocks.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBPAGE (URL)	-		

LEARNING OUTCOMES

Learning outcomes
By the end of this course the student will be able to: Understanding of processes of genesis and evolution of ophiolite complexes- theory of lithospheric plates- identification geotectonic environments by using geochemical data- use of ophiolite rocks as strong aggregate materials- detection of PGM according to modern methods- asbestos.
General Competences
Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Autonomous (Independent) work Group work

SYLLABUS

Ophiolite complexes- theory of lithospheric plates and ophiolites- description of Petrogenetic processes for the formation of a complete ophiolite complex- identification of geotectonic models for the formation of ophiolite complexes- description of basic ophiolite complexes from Greece and all over the world.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face to Face	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Lectures (power point), laboratory tests.	
TEACHING METHODS	**Activity**	**Semester Workload**

	Lectures	2×13=26
	Laboratory exercises	1×13=13
	Group paper-report	19
	Autonomous study	42
	Total number of hours for the Course	**100**
STUDENT PERFORMANCE EVALUATION	A. Writing examination (20%) which includes short growth questions. B. Oral examination (80%) which includes: Writing and presentation of scientific thesis to audience.	

ATTACHED BIBLIOGRAPHY

-Hatzipanagiotou,K.G. (1985):Petrography I.University of Patras.
- Hatzipanagiotou,K.G. (2005)):Petrography II.University of Patras.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_058**	**SEMESTER**	7th
COURSE TITLE	**NANOGEOSCIENCE**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, tutorials and laboratory work		2 (lect.), 1 (lab.)	4
COURSE TYPE	Field of Science (Nanogeoscience)		
PREREQUISITE COURSES:	Typically, there are not prerequisite course. Essentially, the students should possess: knowledge provided through the previously taught courses : 'Mineralogy I, Mineralogy II, Petrography I, Petrography II		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBPAGE (URL)			

LEARNING OUTCOMES

Learning outcomes
At the end of this course the student should have knowledge of : 1. The introduction to Nanogeoscience. 2. The interdisciplinary character of the most important environmental applications of nanogeoscience. 3. The most significant determination and characterization methods of nanocomposites
General Competences

At the end of the course the student will have further developed the following skills/competences

1. Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories nanogeoscience
2. Ability to apply such knowledge and understanding to the solution of problems of an unfamiliar nature.
3. Ability to adopt and apply methodology to the solution of unfamiliar problems.
4. Study skills needed for continuing professional development.
5. Ability to interact with others on inter or multidisciplinary problems.

SYLLABUS

1. Introduction to nanogeoscience
2. Occurrence and distribution of nanominerals and mineral nanoparticles in oceans
3. Occurrence and distribution of nanominerals and mineral nanoparticles in surface waters
4. Occurrence and distribution of nanominerals and mineral nanoparticles in soils
5. Structure, Chemistry and properties of mineral nanoparticles
6. Naturally occurring amorphous nanomaterials
7. Nanoparticles in the atmosphere and their effects on climate and human health
8. Nanoparticles in soils and rocks
9. The effect of organic nanoparticles and microorganisms on weathering
10. Nanomaterials beyond earth
11. The interdisciplinary character of nanogeoscience
12. The most important environmental applications of nanoparticles
13. Identification and characterization methods in Nanogeoscience (XRD, SEM, DTA-TG, FT-Raman, Raman, FTIR, NMR).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Power Point, Laboratory exercises, examples.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Laboratory work (1 conduct hour per week x 13 weeks)	1X13 = 13
Tutorial	1X13 = 13
Hours for private study of the student and preparation of home-works	73
Total number of hours for the Course	**125 hours**

STUDENT PERFORMANCE EVALUATION	Written final examination and problem solving

ATTACHED BIBLIOGRAPHY

1. Peter Baláž: Mechanochemistry in Nanoscience and Minerals Engineering, 2008. 413 p.

Scientific Journals:

1. Nature Geoscience,
2. Nature Nanotechnology,
3. ACS Nano,
4. ACS Applied Materials and Interfaces,
5. Environmental Science-Nano,
6. Applied Catalysis B: Environmental,
7. Applied Clay Science

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _059**	**SEMESTER**	7th
COURSE TITLE	**MAGMATISM IN THE HELLENIC REGION**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work		2 (lect.), 1 (lab.)	4
COURSE TYPE	Field of Science (Petrology) and Skills Development (characterization of the magmatism in a specific area and identification of the magma emplacement processes		
PREREQUISITE COURSES:	Typically, there are not prerequisite course. Essentially, the students should possess: (a) knowledge provided through the previously taught theoretical course of ''Petrology of Igneous and Metamorphic Rocks". (b) laboratory skills obtained through the previously attended laboratories included in the course of ''Petrology of Igneous and Metamorphic Rocks"		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO388/		

LEARNING OUTCOMES

Learning outcomes
By the end of this course the student will be able to: Understand the distribution and petrogenesis of igneous rocks within the Hellenide orogen Develop skills for writing a scientific report on magmatism and the igneous rocks of an area **By the end of the course the student will have further developed the following skills/competences:** Capability of using the polarizing microscope for recognizing the igneous processes through the study of thin sections of igneous rocks. Develop skills needed for the interpretation of igneous processes within the Hellenide orogen and its relations with adjacent regions and their geotectonic regime.
General Competences
By the end of this course the student will, furthermore, have developed the following skills (general abilities): Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to the processes of magma emplacement at a specific area. Ability to apply this knowledge and understanding to the solution of problems related to the igneous processes in the Hellenic region. Ability to adopt and apply methodology to the solution of non familiar problems of other igneous provinces Study skills needed for continuing professional development. Ability to interact with others in issues concerning the igneous processes in an area and its relation to the wider geotectonic regime. Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above): Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Autonomous (Independent) work Group work

SYLLABUS

Lectures
Geological and igneous evolution of the Eastern Meditteranean area
Triassic magmatism
Genesis of the Neotythean crust
Subduction and arc volcanism
Collision tectonics
Tertiarry nappe tectonism of the Hellenides
Neotectonic phases
Aegean Volcanic arc

Laboratory work
Igneous petrological characterization study of sets of thin sections from the main igneous provinces of the Hellenides

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face. Lectures: using slides for overhead projector and/or power-point presentations. Open eClass - Asynchronous eLearning Platform: storage and presentation of teaching material. Laboratories: Students are assigned a thin section suite to work out an essay on the metamorphic conditions and processes of a specific study area.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of ppt files, where from the students can freely download them using a password which is provided to them at the beginning of the course. Use of polarizing microscope employed with a digital camera for capturing and analyzing representative images through the use of specialized software packages (ProgRes CapturePro 2.9.0.1 by JENOPTIC)
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2x13=26
Laboratory work (1conduct hour per week x 13 weeks) – recognizing the igneous processes through the study of thin sections of igneous rocks by means of polarizing microscopy	1x13=13
Bibliographic research	1x13=13
Sample preparation for their study in the laboratory	1x6=6
Hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory)	3x13=39
Weekend hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory	1x13=13
Hours for private study of the student during the week available for exam preparation and two weeks of holidays	2x3=6
Course total	**116**

STUDENT PERFORMANCE EVALUATION	Written examination (50% of the final mark) An essay comprising the outcome of the exercise assignments on the igneous conditions of a specific study area (50% of the final mark). Percentages are valid t only when the student secures the minimum mark of 5 in the final written examination Greek grading scale: 1 to 10. Minimum passing grade: 5. Grades <3 correspond to ECTS grade F.

	Grade 4 corresponds to ECTS grade FX. For the passing grades the following correspondence normally holds: 5 <-> E, 6 <-> D, 7 <-> C, 8 <-> B and >9 <-> A

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
1) Notes of lecturers in Greek.
2) Various relevant scientific papers

- Related academic journals:
1) Journal of Petrology
2) Bulletin of the Geological Society of Greece

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _060**	**SEMESTER**	7th
COURSE TITLE	**COAL GEOLOGY**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Lectures, laboratory work	**2 (lect.) + 2 (lab.)**	**4**
COURSE TYPE	Field of Science and Skills Development		
PREREQUISITE COURSES:	Typically, there are not prerequisite courses. Essentially, the students should possess knowledge provided through the theoretical courses Mineralogy, Petrology, Geochemistry, Tectonics, Sedimentology.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, in English		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO374/		

LEARNING OUTCOMES

Learning outcomes
By the end of this course the student will Have a spherical view of the geology of peat and coal deposits and the factors controlling their formation. Be acquainted with the methods and techniques applied in the exploration and the exploitation of peatlands and coal deposits. Be aware of the major world and domestic peatlands and coal deposits. Be able to assess the potential environmental impacts from the use of peat and coal. By the end of this course the student will, furthermore, have developed the following skills: Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to peat/coal formation. Ability to apply this knowledge and understanding to the solution of problems related to peatlands and coal deposits. Ability to adopt and apply new methodologies/techniques to solve problems dealing with the peat/coal exploration. Study skills needed for continuing professional development.

Ability to interact with others in geological or interdisciplinary problems.
General Competences
Generally, by the end of this course the student will have developed the following general abilities: Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Adaptation to new situations Decision making Autonomous (Independent) work Group work Exercise of criticism and self-criticism Promotion of free, creative and inductive thinking Respect to natural environment Work design and management

SYLLABUS

Origin of coal. Peat-forming controls. Coalification. Types and components of coal. The coal deposit. Coal exploration Exploitation, reserves, production, utilisation Coal deposits in Greece Environmental Impacts

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (e.g. power point presentations) in teaching. The lectures content of the course for each chapter are uploaded on the e-class webpage of the University, in the form of a series of pdf files; the students can freely download them using a password.
TEACHING METHODS	**Activity** / **Semester workload** Lectures (2 conduct hours per week x 13 weeks) — 2X13 = 26 Laboratory work (2 conduct hour per week x 13 weeks) — 2X13 = 26 Hours for private study of the student and preparation of home-works — 48 **Course total** — **100**
STUDENT PERFORMANCE EVALUATION	**Exercises** During the semester the students have to do homework; the exercises have to be given to the teaching staff on time. This is the basic prerequisite for allowing participation in the final examination. **Final Examination, including** **Written examination** after the semester end, including questions of short and extended replies, diagramme interpretation etc. The mark of the written examination constitutes 50% of the final mark **Oral examination** on the microscope including Determination of macerals. Questions on the origin of the certain macerals. The mark of the oral examination constitutes 50% of the final mark. Minimum passing grade: 5.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Christanis K., 1998. Coal Geology. Textbook, University of Patras.

Diessel C.F.K., 1995. Coal-bearing Depositional Systems. Springer Verlag, Berlin.

Taylor, G.H., Teichmüller, M., Davis, A., Diessel, C.F.K., Littke, R., Robert, P., 1998. Organic Petrology. Gebrüder Borntraeger, Berlin.

Thomas, L., 2012. Coal Geology. 2nd Edition, Wiley-Blackwell.

- Related academic journals:
International Journal of Coal Geology (https://www.journals.elsevier.com/international-journal-of-coal-geology)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _ 061**	**SEMESTER**	7th
COURSE TITLE	**APPLIED GEOMORPHOLOGY - NATURAL HAZARDS & DISASTERS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work	2 (Lec.) + 1 (Lab.)	5

COURSE TYPE	Special background, Skill development, Specialty
PREREQUISITE COURSES:	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO366/

LEARNING OUTCOMES

Learning outcomes

The course focuses on the Applications of Geomorphology and on more specific topics, such as:

- urbanization and changes in the geomorphological environment due to human interventions,
- anthropogenic (man-made) landscape-relief
- land use changes
- irrigation works (reservoirs, channelization)
- assessment of geomorphological hazards
- management of geomorphological disasters
- floods
- erosion
- mass movements (falls, slips, creeps, subsidence, collapses)
- relief effect on constructions
- establishment of safe areas for development of human activity

Upon successful completion of the course students will have the ability to:

- recognize, identify and describe the principles of applied geomorphology in hydrological studies, in coastal zone studies and land use studies

- understand, distinguish and interpret the effects of urbanization and human interventions on changes in the geomorphological environment, on the relief, and their effects on the occurrence of natural disasters, such as floods, landslides, falls, subsidence, erosion, etc
- calculate physical parameters for the design of technical projects, such as torrent arrangements, dams, roads, settlements as well as factors that affect the occurrence of land movements, floods, erosion, etc.
- apply methods of applied geomorphology in the design of technical projects and in the assessment of geomorphological hazards
- collect and analyze the primary data as well as to combine and compose examples of national and international studies
- explain, collect, compare and evaluate data in problem solving on urban sediments, soil, and geological background, on surface water management, on natural hazard assessment, and on development, design and urban management

General Competences

The skills that students should acquire are:

1. Theoretical thinking and ability to turn theory into practice
2. Ability to apply knowledge in problem solving
3. Retrieve, analyze and synthesize data and information, using the necessary technologies
4. Decision making
5. Independent work.
6. Working in team.
7. Working in an interdisciplinary environment
8. Respect for the natural environment
9. Promoting of free, creative and inductive thinking.

SYLLABUS

A. Lectures:

1. Differences between Theoretical and Applied Geomorphology.
2. Past Climatic changes (Quaternary)
3. Applications of Geomorphology (surface water & groundwater, terrestrial relief, hydrographic networks, deltaic areas, sea level changes)
4. Geomorphology & Land Uses
5. Urbanization & changes in the Geomorphological environment
6. Natural Hazards & Disasters (mass movements, floods, erosion, etc)
7. Technical and environmental issues of urban areas [eg soils & bedrock, surface water management, hazard assessment (floods, landslides, falls, subsidence, erosion), planning & management of urban areas]

B. Exercises (Laboratory)

The practical part of the course includes: a. exercises as well as crisis questions after each theoretical part, b. field exercises and/or field trips.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures, laboratory work (exercises) and field exercises face to face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Learning procedure support with the use of e-class platform. Multimedia use and PowerPoint presentations
TEACHING METHODS	

Activity	Semester workload
Lectures (2 conduct hours per week x 13 weeks)	2×13=26
Laboratory work (1 hour per week x 13 weeks)	1×13=13
Group work and presentation	1×13=13
Field exercises.	14
Individual (private) study	54
Total number of hours for the Course	**120**

STUDENT PERFORMANCE EVALUATION	- Evaluation process in Greek A. Theoretical Part (Lectures) - 60% of grading - preparation & presentation of a work (from a list of topics) by students, - questions during the presentation B. Practical Part (Laboratory) - 40% of grading - delivery of personal exercises via e-class

ATTACHED BIBLIOGRAPHY

1.Lecture notes uploaded on E-Class (in Greek)
2.Bathrellos G.D., Skilodimou H.D. (2021): Karst Geomorphology & Principles of Speleology (in Greek).
3.Lekkas E.L. (2010): Natural & Technological Disasters Technological Disasters, (in Greek).
4.Oya, M. (2001): Applied Geomorphology for Mitigation of Natural Hazards, p. 182, Springer.
5.Julien, P.Y. (2002): River mechanics, p. 456, Cambridge University Press.
6.Boon, P.J., Raven, P.J. (2012): River Conservation and Management, p. 411, Wiley.
7.Anbazhagan, S., Subramanian, S.K., Yang, X. (2011): Geoinformat i cs in Applied Geomorphology, p. 387, CRC Press.
8.Allison, R.J. (2002): Applied Geomorphology, p. 480, Wiley.
9.Slaymaker, O. (2000): Geomorphology, Human Activity and Global Environmental Change, p. 334, Wiley.
10. Fookes, P.G., Lee, E.M., Griffiths, J.S. (2007):Engineering Geomorphology, Theory and Practice, p. 307, CRC Press.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_062**	**SEMESTER**	7th
COURSE TITLE	**SEDIMENTARY BASIN ANALYSIS**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work, two days field work	2 (lect.) 1 (lab), 2 days field	4

COURSE TYPE	Scientific area and the development of skills in understanding the evolution of a sedimentary basin in space and time
PREREQUISITE COURSES:	Sedimentology, Stratigraphy, Structural Geology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	If necessary Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/GEO335/

LEARNING OUTCOMES

Learning outcomes

This course requires knowledge of courses of sedimentology, tectonic and Stratigraphy-Palaeontology. The combination of knowledge of the above, who were taught in previous courses, will help him on the particularities of this course.

At the end of this course the student will be able to understand the way of the evolution of a sedimentary basin, in space and time. Student could monitor the progress of sedimentation environments, coupled with the knowledge of the tectonic regime and the age of the sediments.

In particular, the collection of information related to the sedimentation environments, their evolution, the particularities of sub-environments within a basin, combined with the time that these changes are taking place, but also of the tectonic regime, which affects the above changes, would give the ability to synthesize the geological model of the evolution of a sedimentation basin.

General Abilities

By the end of this course the student will, furthermore, have developed the following skills (general abilities):

Search, analysis and synthesis of data and information, using and necessary technologies
Teamwork
Production technologies of new research ideas
Design and project management at the end of this course the student will have further developed the following skills:

1. Ability to process sedimentological information.
2. Ability to process structural information.
3. Ability to process paleontological-stratigraphic information.
   Ability to synthesize and propose the geological evolutionary model for a sedimentary basin.

SYLLABUS

A. Six basins are studied with different sedimentary environments, different tectonic regimes and time of evolution.
1. Mesohellenic Piggy-back basin in Central Greece.
2. Pindos Foreland in western Greece.
3. Patras-Corinth extensional basin.
4. The Complex (foreland and piggy-back) Zakynthos basin - Ionian Foreland Basin.
5. Kalamata extensional Basin.
6. Extensional basins in NW Crete Island (Platanos-Kasteli-Maleme sub-basins) - Mediterranean Ridge.

B. Methods of constructing three-dimensional visualizations of a basin using underground and outcropped information (e.g. Geological sections, lithostratigraphic columns from wells).

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	1. Teaching using power point presentations, workshops with exemplary construction solving three-dimensional visualizations and models of evolution. 2. Field-trip exercises in areas of Zakynthos island, around Patras, Egion - Corinth, Messologgi (in three of the above described basins) while valued and information from field-trip exercises within other courses in previous years (Kalamata basin, Corinth basin).
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Students are informed of all new developments in the application of methodologies for sedimentary basin analysis, in the interpretation and evaluation of seismic data, and have the ability to search through electronic sources into equivalent basins around the world aimed to compare the evolutionary models of sedimentation with what they are taught. Through the platform of e-class where it is posted all the presentations of courses is done and communicating with students to resolve on a daily basis problem.
TEACHING METHODS	**Activity** / **Workload Semester** Lectures - seminars: 2 X 13 = 26 hours Reference study and analysis: 1 X 13 = 13 hours Field trip: 2 days X 8 = 16 hours Writing work: 1 X 13 = 136 hours Workshop-Laboratory Exercise: 10 hours **Total course: 81 hours**
STUDENT PERFORMANCE EVALUATION	1. The students are divided into groups of 2-3 people and undertake the drafting work on one of these basins. They present their work to their colleagues with power point, is examining with questions and answers from both the instructor and between groups, (the above corresponds to 70% of the total final grade). 2. Written examination on general knowledge, tasks that were given for the six basins, and the content of all written and presented tasks for the six basins. Right to participate in the written exam are those who have authored and presented the work assigned (the above written examination corresponds to 30% of the total final grade). 3. Minimum pass grade: 5. The language of assessment is in Greek

ATTACHED BIBLIOGRAPHY

Mesohellenic Piggy-back basin in Central Greece:

1. Zelilidis, A., Piper, D.J.W. & Kontopoulos, N. 2002: Sedimentation and basin evolution of the Oligocene - Miocene Mesohellenic basin, Greece. – American Association of Petroleum Geologists Bulletin, 86 (1), 161-182.
2. Zelilidis, A. & Kontopoulos, N. 1996: Significance of fan deltas without toe-sets within rift and piggy-back basins: examples from the Corinth graben and the Mesohellenic trough, Central Greece. - Sedimentology, 43, 253-262.
3. Doutsos, T., Koukouvelas, I., Zelilidis, A. & Kontopoulos, N. 1994: Intracontinental wedging and post-orogenic collapse in Mesohellenic Trough. - Geol.Rundsch., 83, 257-275.

Pindos Foreland in western Greece:

4. Maravelis, A., Makrodimitras, G. & Zelilidis, A. 2014: Stratigraphic evolution and source rock potential of a Late Oligocene-Early/Middle Miocene continental slope system, Diapondia Islands, Ionian Sea, NW Greece. Geological Magazine, 151(3):394-413.
5. Konstantopoulos, P. & Zelilidis, A., 2013: Sedimentation of submarine fan deposits in the Pindos foreland basin, from late Eocene to early Oligocene, west Peloponnesus peninsula, SW Greece. Geological journal, 48(4), 335-362.
6. Konstantopoulos, P. & Zelilidis, A., 2013: Provenance analysis of Eocene-Oligocene turbidite deposits in Pindos foreland basin, fold and thrust belt of SW Greece: Constraints from framework petrography and bulk-rock geochemistry. Arabian Journal of Geosciences, 6(12), 4671-4700.
7. Konstantopoulos, P., Maravelis, A. & Zelilidis, A., 2013: The implication of transfer faults in foreland basin evolution: Application on Pindos Foreland Basin, West Peloponnesus, Greece. Terra Nova

8. Konstantopoulos, P. & Zelilidis, A. 2012: The geodynamic setting of Pindos foreland basin in SW Greece: Tectonic and sedimentary evolution. Episodes, v.35, no4, 501-512

9. Avramidis, P., Zelilidis, A. & Kontopoulos, N. 2000: Thrust dissection control of deep-water clastic dispersal patterns in the Klematia-Paramythia foreland basin, Western Greece. -Geol.Mag., 137, 667-685.

10. Zelilidis, A. 2003: The geometry of fan-deltas and related turbidites in narrow linear basins. Geological Journal, 38, 31-46.

11. Kokinou, E., Kamberis, E., Vafidis, A., Monopolis, D., Ananiadis, G. & Zelilidis, A. 2005: Deep seismic reflection data from offshore western Greece: a new crustal model for the Ionian Sea. – Journal of Petroleum Geology, 28, 81-98.

12. Avramidis, P., Zelilidis, A. 2001: The nature of deep-marine sedimentation and palaeocurrent trends as an evidence of Pindos foreland basin fill conditions. Episodes, 24, No4, 252-256.

13. Avramidis, P., Zelilidis, A., Vakalas, I. & Kontopoulos, N. 2002: "Interaction between tectonic activity and eustatic sea-level changes in the Pindos and Mesohellenic Basins, NW Greece: basin evolution and hydrocarbon potential. -Journal of Petroleum Geology, 25 (1), 53-82.

Patras-Corinth extensional basin:

14. Vakalas, I., Zelilidis, A., Barkooky, A., Darwish, M. & Tewfik, N. 2015: Comparison between fan deltas in the Gulf of Suez, Egypt, and in the Gulf of Corinth, Greece. Arabian Journal of Geosciences, 8:3603-3613.

15. Zelilidis, A. 2003: The geometry of fan-deltas and related turbidites in narrow linear basins. Geological Journal, 38, 31-46.

16. Kontopoulos, N. & Zelilidis, A. 1997: Depositional environments of the coarse-grained lower Pleistocene deposits in the Rio-Antirio basin, Greece. - In: Engineering Geology and the Environment (Eds. by Marinos,P.G., Koukis,G.C., Tsiambaos,G.C. and G.C.Stournaras). Proceedings of Intern. Symp.Engin.Geol.Envir., 199-204.

17. Zelilidis, A. & Kontopoulos, N. 1996: Significance of fan deltas without toe-sets within rift and piggy-back basins: examples from the Corinth graben and the Mesohellenic trough, Central Greece. - Sedimentology, 43, 253-262.

18. Poulimenos, G., Zelilidis, A., Kontopoulos, N. & Doutsos, T. 1993: Geometry of trapezoidal fan deltas and their relationship to extensional faulting along the south-western active margins of the Corinth rift. -Basin Research, 5, 179-192.

19. Kontopoulos,N. & Zelilidis,A.1992: Upper Pliocene lacustrine environments in the intramontane Rio graben basin, NW Peloponnesus, Greece. N. Jb. Palaont. Mh., 2, 102 114.

20. Zelilidis,A., Koukouvelas,I. & Doutsos,T.1988: Neogene paleostress changes behind the forearc fold belt in the Patraikos Gulf areas Western Greece. N. Jb. Geol. Palaont. Mh., 5: 311 325

The Complex (foreland and piggy-back) Zakynthos basin - Ionian Foreland Basin:

21. Zelilidis, A., Papatheodorou, G., Maravelis, A., Christodoulou, D., Tserolas, P., Fakiris, E., Dimas, X., Georgiou, N. & Ferentinos, G., 2016: Interplay of thrust, back-thrust, strike-slip and salt tectonics in a Fold and Thrust Belt system: an example from Zakynthos Island, Greece. Intr.J.Earth Sciences. 105: 2111-2132.

22. Zelilidis, A., Kontopoulos, N., Piper, D.J.W. & Avramidis, P. 1998: Tectonic and sedimentological evolution of the Pliocene-Quaternary basins of Zakynthos island, Greece: Case study of the transition from compressional to extensional tectonics. - Basin Research, 10, 393-408.

23. Kontopoulos, N., Zelilidis, A., Piper, D.J.W. & Mudie, P.J. 1997: Messinian evaporites in Zakynthos, Greece. -Palaeog., palaeocl., palaeoec, 129, 361-367.

Kalamata Extensional Basin:

24. Zelilidis, A. & Kontopoulos, N. 1999: Plio-Pleistocene architecture in marginal extensional narrow sub-basins: examples from Southwest Geeece. - Geol.Mag., 136(3), 241-262.

25. Zelilidis, A. & Kontopoulos, N. 1994: Pliocene-Pleistocene fluvial/wave dominated deltaic sedimentation: the Pamisos delta in SW Peloponnesus, GREECE. -Geol.Mag.,131,653-668.

26. Zelilidis, A. & Kontopoulos, N. 2001: Post-Miocene sedimentary evolution of south Peloponnesus, Greece. –GAIA, No 16 (1-2), 1-12.

Extensional basins in NW Crete Island (Platanos-Kasteli-Maleme sub-basins) - Mediterranean Ridge:

27. Maravelis, A., Panagopoulos, G., Piliotis, I., Pasadakis, N., Manutsoglou, E. & Zelilidis, A., 2016: Pre-Messinian (sub-Salt) Source-rock potential on Back-stop Basins of the Hellenic Trench system (Messara Basin, Central Crete, Greece). Oil and Gas Science and Technology-Rev.IFP Energies nouvelles 71, 6. (DOI: 10.2516/ogst/2013130).

28. Kontopoulos, N. & Zelilidis, A. 1997: Depositional processes in outer arc marginal sub-basins during the Messinian. Examples from the western Crete Island, Greece. -Geologica Balcanica, 27, 1-2, 91-100.

29. Kontopoulos, N., Zelilidis,A. & Frydas,D. 1996: Late Neogene sedimentary and tectonostratigraphic evolution of southwestern Crete island, Greece. - N. Jb. Geol.Palaont. Abh., 202, 287-311.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _063**	**SEMESTER**	7th
COURSE TITLE	**OPERATIONAL OCEANOGRAPHY APPLICATIONS IN THE MANAGEMENT OF THE MARINE ENVIRONMENT**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	2(L), 1(LW)	4

COURSE TYPE	General knowledge, Scientific Area, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO358/

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of this course , the students will be able to: • Adapt new technologies related to operational oceanographic data sets • Analyze and interpret operational oceanographic data sets • Discuss and compile multi thematic datasets for an intergraded oceanographic study
General Competences
• Data retrieval, analysis and synthesis of data and information through the use of new information technologies • Individual work • Work in a multidisciplinary environment • Respect for the natural environment. • Promotion of free, creative and inductive way of thinking

SYLLABUS

Theory & Laboratory

- Introduction to the Operational Oceanography.
- Systems and Techniques of the Operational Oceanography in national and international level
- Natural processes at the coastal zone
- Systematic and long-term routine measurements of the seas and oceans
- Analysis of the oceanographic data sets
- Impact of human activity to the marine environment
- Applied models on the Operational Oceanography
- oceans, including a history of oceanography and its early development
- Practices and methods in oceanography
- Introduction to the study of the seafloor and marine sediments
- Geological aspects related to ocean basins
- Basic properties of the oceans

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	In classroom and in laboratory (face-to-face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	• Use of Information and Communication Technologies (ICTs) (power point) in teaching • Support of Learning Process and Dissemination of educational material through the e_class platform.
TEACHING METHODS	**Activity** / **Semester Work Load** Lectures: 2X13 = 26 (hours) Laboratory work: 1X13 =13 (hours) Interpretation and writing of the exercises: 26 (hours) Study bibliography: 35 (hours) **Total contact hours and training: 100**
STUDENTS PERFORMANCE EVALUATION	**I. Theory** Final Exam, written, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving. Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams. Marking Scale: 0-10. Minimum Passing Mark: 5. **II. Laboratory** Students are obliged to attend all laboratory classe and to deliver the results of all exercises. Maximum number of non delivered laboratory exercises: 3

ATTACHED BIBLIOGRAPHY

Lecture Notes

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _064**	**SEMESTER**	7th
COURSE TITLE	**MANAGEMENT AND PROTECTION OF WATER RESOURCES**		
INDEPENDENT TEACHING ACTIVITIES		**TEACHING HOURS PER WEEK**	**CREDITS**
Lectures, laboratory work		2 (L), 1 (LAB)	4
COURSE TYPE	Field of Science and Skills Development		
PREREQUISITE COURSES:	Typically, there are not prerequisite course. For a better understanding of the course, it would be advisable for students to have attended first the course of Applied Hydrogeology		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO362/		

LEARNING OUTCOMES

Learning outcomes
The acquisition of skills related to the methodologies and techniques of sustainable management of water resources and their protection from environmental pollution. By the end of this course the student will be able to: • Understand the concept of sustainable management of water resources • Understand the uses of water and the natural ability of water resources • Understand the European Water Framework Directive 2000/60 / EC about water resources management. • Understand the concept of protection of water resources from pollution • Prepare a water resources management study • Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to management and protection of water resources • Ability to apply this knowledge and understanding to the solution of problems related to management and protection of water resources
General Competences
Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Adaptation to new situations Decision making Autonomous (Independent) work Group work Exercise of criticism and self-criticism Promotion of free, creative and inductive thinking Respect to natural environment

Work design and management

SYLLABUS

- Analysis of the European Water Framework Directive 2000/60 / EC
- Presentation of the institutional structure of Water Resources Management in Greece
- Systematic analysis of water resources. Simulation Models of water management.
- Planning and decision-making processes.
- Financial mechanisms for the management of water resources.
- Uses of water.
- Availability of water resources – Groundwater Recharge
- Reservoir operation and management
- Artificial Recharge of aquifers
- Drought and water supply management.
- Pollution – Physicochemical parameters of pollutants
- Categories of surface- and groundwater pollution
- Protection of water resources.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, laboratory work and seminar face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching.
TEACHING METHODS	

Activity	**Semester workload**
Lectures	2X13=26
Laboratory work	1X13=13
Homework in teams	2X13 =26
Hours for private study of the student and preparation of the final project in teams and preparation for the exams	3X13=39
Total number of hours for the Course	**104 hours**

STUDENT PERFORMANCE EVALUATION	1. Written examination during the examination period and 2. Examination of the presentation and the report of the final team project.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Γ. Σούλιος, 2004. Γενική Υδρογεωλογία-Αποθέματα και Διαχείριση υπόγειου νερού, Εκδ. Αφοι Κυριακίδη, 2004.
Ε. Ζαγγανά, 2016 Διαχείριση και Προστασία Υδατικών Πόρων, Παν/κές Σημειώσεις.
Γ. Καλλέργης, 1999. Εφαρμοσμένη – Περιβαλλοντική Υδρογεωλογία. Έκδοση Τεχνικού Επιμελητηρίου Ελλάδος, Τόμος Α, Τόμος Β.
- Related academic journals:
Journal of Hydrology, Elsevier
Water Research, IWA
Environmental Earth Sciences, Springer Publishers; Water Policy, IWA Publishing; Water Resources Management, Springer Publishers; Environmental Monitoring and Assessment, Springer Publishers

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_065**	**SEMESTER**	7th
COURSE TITLE	**ELEMENTS OF GEOTECHNICAL ENGINEERING**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	2(L), 1(LW)	4

COURSE TYPE	Field of Science and Skills Development
PREREQUISITE COURSES:	Typically, there are not prerequisite course. It is however recommended that students should have at least a basic knowledge of Engineering Geology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO368/

LEARNING OUTCOMES

Learning outcomes
The course gives the theoretical and objective knowledge related to the determination of basic soil parameters - characteristics for foundation purposes, as well as the design methodologies of technical work foundations. Additionally, it combines quality control topics related to geomaterials for embankment, aggregates and geosynthetics. By the end of this course the student will possess cognitive and practical skills and has the ability to: Utilization of know - how regarding the quality control of geomaterials (aggregates and embankments) as well as geosynthetics through laboratory and on - site methodologies and simulations (use of appropriate methods, materials and instruments) Application of knowledge and creative thinking to solve problems related to safe design of technical works foundations under difficult geological conditions Also the student in the working environment has the ability to respond: With competence in interdisciplinary required by technical works (study - construction) With responsibility and reliability in the case of autonomous employment
General Competences
Retrieve, analyze and synthesize data and information, using the necessary technologies Decision making Adapt to new situations Working in an interdisciplinary environment

SYLLABUS

The state of stress at soil mass: Stress distribution, geostatic stresses, effective and total stresses Shear strength of soils : soil material failure, determination of shear strength parameters - laboratory testing, shear strength of cohesive and cohesionless soils Deformation of soils – Consolidation. Laboratory testing General principles of foundations in technical works: allowable bearing capacity of soils, types of foundation, design parameters, evaluation of settlements, evaluation of soil susceptibility for liquefaction Soil compaction – construction of embankments Aggregates and quality control Geosynthetic materials: types, characteristics, quality control, uses and applications Laboratory work in soil mechanics testing for: (a) foundations (b) soil suitability for embankment construction and (c) quality control of aggregates, according to ASTM, BS and EN standards.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory work face to face

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	• Use of Information and Communication Technologies (ICTs) (power point) in teaching. • Support of Learning Process and Dissemination of educational material through the e_class platform
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2×13=26
Laboratory work	1×13=13
Writing reports of the laboratory exercises	1X13= 13
Autonomous study	48
Course Total	**100 hours**

STUDENT PERFORMANCE EVALUATION	I) Laboratory and team work evaluation (50%): Each lab exercise is resolved and delivered the next week after its educational process. After it is corrected, marked, and returned to the student. The average mark of all lab exercises is calculated. II) Final Written Course Exams (50%): Five (5) questions related to lectures

ATTACHED BIBLIOGRAPHY

- Text books:

1) Τεχνική Γεωλογία (2002). Γ. Κούκης, Ν. Σαμπατακάκης Εκδόσεις Παπασωτηρίου, σελ. 514
2) Εφαρμογές της Τεχνικής Γεωλογίας και Γεωτεχνικής στα Τεχνικά Έργα (2015). Ν. Σαμπατακάκης, Γ. Κούκης, Ν. Δεπούντης. Εκδόσεις Πανεπιστημίου Πατρών, σελ. 131
3) Element of soil mechanics, Ian Smith, 8th edition
4) Geotechnical Engineering Handbook, Braja Das, Ross Publishing

- Scientific International Journals:

1) Bulletin of Engineering Geology and the Environment. Springer
2) Engineering Geology. Elsevier.
3) Geotechnical and Geological Engineering. Springer

GENERAL

SCHOOL	NATURAL SCIENCE		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol _066**	**SEMESTER**	7th
COURSE TITLE	**HYDROLOGY WITH THE USE OF GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory exercises	1 (lect.) / 2 (lab.)	4

COURSE TYPE	Field of Science (GIS, Remote Sensing & Hydrology)
PREREQUISITE COURSES:	**GIS and Remote Sensing in Applied Geology** (compulsory, 2nd semester) from 2024-2025
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in English)
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO306/

LEARNING OUTCOMES

Learning outcomes

The course aims at familiarizing students with basic concepts of Hydrology, and the use of Geographic Information Systems and Remote Sensing data for implementing integrated hydrological studies. By the end of this course the students will be able to:

1. Understand the concepts of hydrological cycle and hydrological balance.
2. Understand the concepts of spatial analysis and to use tools of spatial interpolation..
3. Study, process and analyse statistically hydrological data from stations or databases.
4. Process digital elevation models for extracting hydrological elements in GIS environment.
5. Process thermal and multispectral Remote Sensing data for calculating evapotranspiration

By the end of this course the student will, furthermore, have developed the following skills:

1. Analogue and digital calculation of basic parametres of the hydrological balance in GIS environment.
2. Analogue and digital calculation of morphometric parametres of drainage basins and drainage networks in GIS environment.
3. Implementation of integrated hydrological studies.
4. Buiding drainage and flood models in GIS environment.

In total, students after successful completion of the semester will be able to demonstrate their knowledge in hydrology, to solve hydrological problems with the use of Geographic Information Systems and Remote Sensing data, to write independently integrated hydrological studies, and to produce thematic maps for information transfer to the public and the related services.

General Competances

- Searching, analysis and synthesis of facts and information, as well as using the necessary technologies
- Decision making
- Autonomous (Independent) work
- Work in an international enviroment
- Work in an interdisciplinary enviroment
- Work design and management
- Respect to natural environment

SYLLABUS

The course is organized in 4 teaching circles which are described below.

- Hydrologic Cycle (Precipitation, Evaportranspiration, Runoff, Infiltration)
- Statistical processing of rainfall observations.
- Average Rainfall Estimation over a drainage basin(Average Rainfall method, Thiessen's Method, Isohyet Method).
- Calculating evaporation - transpiration (Thornthwaite, TURC, Burdon-Papakis, Coutagne).
- Spatial Analysis and Spatial Interpolation methods
- Application of spatial interpolation in Hydrology
- Digital Elevation Models.
- Methods for the creation of Digital Elevation Models
- Drainage basins and drainage network extraction from digital elevation models.
- Hydrological and quantitative basin analysis.
- Stream ordering (Sthrahler and Shreve).
- Horton parameters calculation.
- Calculation of morphometric parametres of drainage basins and drainage networks.
- Thermal Remote Sensing data
- Multispectral Remote Sensing data

- Calculating evapotranspiration with the use of thermal and multispectral Remote Sensing data.
- Buiding drainage models in GIS environment.
- Estimation of flood risk in GIS environment.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures with the use PowerPoint slideshow.
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Laboratories with the use of specialized software for GIS (ESRI, ARCGIS) and Image Processing (ERDAS IMAGINE) in the departmental computer lab. Training in the use of GPS in the field.
TEACHING METHODS	**Activity** / **Semester workload** Lectures in Theory: 1X13 = 13 Laboratory exercises in Hydrology: 2X13 = 26 Writing reports of the laboratory exercises: 1X13= 13 Hours for private study of the student: 48 **Total number of hours for the Course: 100**
STUDENT PERFORMANCE EVALUATION	Written examination after the end of the semester (G_{th}60%)or multiple choice exam online Written reports for each laboratory exercise (G_{lab}40%) Minimum passing grade: 5. Final Course Grade (FCG) FCG = (G_{th} + G_{lab}) / 2

ATTACHED BIBLIOGRAPHY

"Hydrology with the use of Geographic Information Systems and Remote Sensing data", Labrakis, Nikolakopoulos, Katsanou, Kallipos publ. 2015, p. 225 (in Greek language)
"Technical hydrology of surface water",D. Papamichael , Yahoudi publ. Thessaloniki 2004 (in Greek language)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _084**	**SEMESTER**	7th
COURSE TITLE	**SEMINAR ON SCIENTIFIC AND CV WRITING**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
	Presentations	1L	3
COURSE TYPE	Skill Development		
PREREQUISITE COURSES:	There are not prerequisite courses		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, in English		

LEARNING OUTCOMES

Learning outcomes
The students learn the way of scientific (e.g. undergraduate and postgraduate theses, PhD theses, papers to publish in congress proceedings and scientific journals etc.), and CV writing. The seminar provides the basic knowledge on the structure of the text and some technical details as well.

SYLLABUS

Structure of scientific text
Tables, Figures, Annexes

Citing references CV writing

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Seminar face to face.	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of blackboard	
TEACHING METHODS	**Activity**	**Semester workload**
	Lectures (3 conduct hours X 2 hours each)	2X3 = 6
	Course total	**6**
STUDENT PERFORMANCE EVALUATION	The students are not evaluated.	

GENERAL

SCHOOL	NATURAL SCIENCES			
ACADEMIC UNIT	GEOLOGY			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**Geol_89**	**SEMESTER**	7th	
COURSE TITLE	**GEODESY WITH APPLICATIONS IN GEOLOGY**			
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**	
Lectures, seminars and laboratory work		2 (lect.) 1 (lab.)	4	
COURSE TYPE	Field of Science, Skills Development			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBPAGE (URL)				

LEARNING OUTCOMES

Learning outcomes

Upon completion of the course, students will be able to:

- Understand the theoretical foundations of satellite geodesy, including geodetic reference systems, satellite orbits, and measurement methods.
- Apply their knowledge to real-world problems, such as studying the movement of the Earth's crust, monitoring sea level, ground and overlying infrastructure instability.
- Generalize the importance of geodetic measurements for the study of geological phenomena, such as earthquakes, volcanic activity, and hydrology.
- Evaluate, select and apply appropriate data processing methods for different types of geodetic problems related to the topic of geology.
- Create very simple models for describing tectonic processes, such as modeling fault motion and interpreting geodetic data.
- Combine geodetic data together with other data (e.g. seismological, geological) to produce valid results

General Competences

Search, analysis and synthesis of data and information, using the necessary technologies, Autonomous work, Exercise/development of critical thinking, Work in an interdisciplinary environment, Utilization of satellite geodesy software technologies/tools, Application of knowledge in practice.

SYLLABUS

The courses are divided into 9 sections:

Module 1: Introduction to Geodesy and Geology

- What is geodesy? Measuring the Earth, accurately resolving its position and monitoring changes on its surface.
- Connection to geology: Using geodetic data to study geological processes, such as crust displacements and deformations.
- Geodesy tools: Focus on GNSS for position and displacement measurement, with an introduction to InSAR and satellite altimetry.

Module 2: Tectonic Displacement Monitoring

- Basic principles: Displacement of tectonic plates and formation of faults due to tectonic activity.
- Measurement of plate movement speeds and fault slipping with millimeter accuracy.
- Application: GNSS data analysis to understand tectonic displacements and assess seismic risks.

Module 3: Volcanic Deformation

- What is it? Changes in the ground due to magma movement or volcanic activity.
- Monitoring of surface deformations to detect volcanic activity.
- Application: Interpreting data to monitor and predict volcanic events.

Section 4: Ground Subsidence

- Causes: Natural processes (e.g., tectonic activity) or man-made activities (e.g., over-pumping).
- Monitoring of vertical displacements of the groundl due to anthropogenic activity.
- Application: Use of geodetic data for the assessment and management of sedimentary areas.

Module 5: Coastal Erosion and Sea Level Rise

- Impacts: Changes in the coasts due to erosion and sea level rise.
- Measurement of ground displacements and synergy with satellite images for coastal line monitoring.
- Application: Interpreting data to understand the impacts of climate change on coastal areas.

Module 7: Landslide and Overlying Infrastructure Monitoring

- Causes and consequences: Factors that cause landslides, such as rainfall or seismic activity.
- Monitoring of small movements of land and overlying infrastructure for early detection of hazards.
- Application: GNSS data analysis for landslide risk prevention and management.

Module 8: Geodesy Networks and Infrastructures

- What are GNSS networks and geodesic networks in general? GPS/GNSS station systems for continuous data collection, as mentioned in the article on geodetic infrastructure.
- Significance: Support geological studies through reliable location data.
- Understanding the function and importance of networks for geological research.

Module 9: Geodesy and Remote Sensing Synergy

- Synergy: Combining GNSS data with remote sensing (e.g., satellite imagery) for improved analysis.
- Applications: Mapping of surface changes and detection of geological phenomena.
- Application: Use of combined data to study dynamic processes of the Earth

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures in the classroom and laboratory exercises in the computer room of the Computer Center and in the field within the Campus using specialized programs
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of ICT at all levels of the course, in teaching, laboratory and communication with students. Use of open specialized GNSS data processing software in real and later time as well as microwave satellite radars Learning Process Support through the e-class electronic platform Communication with students via email and e-class
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	Written final exam, which may include: -Short Answer Questions -Topic development questions -Problem-solving questions -Comparative evaluation of theory data -Solving problems from selected laboratory exercises

Activity	**Semester workload**
Lectures	2X13 = 26
Laboratory Application Exercises/Outdoor Exercises	1X13 = 13
Preparation of the exercises	1X13 = 13
Independent Study. Literature analysis	46
Total number of hours for the Course	**98 hours**

ATTACHED BIBLIOGRAPHY

Greek:

- Delikaraoglou, D. (2005) Special issues of satellite geodesy. National Technical University of Athens
- Dermanis, A. (1999) Space Geodesy and Geodynamics. Ziti Publications
- Tsoulis D. (2012) Satellite Geodesy. Ziti Publications
- Mertikas S. (2016) Introduction to Geodesy, Satellite Tracking and Altimetry. Kleidarithmos Publications.
- Pikridas Ch., Fotiou A. (2012) GNSS and Geodetic Applications. Ziti Publications

Foreign language:

- European Space Agency (2021) Navipedia (https://gssc.esa.int/navipedia/)
- Ferretti, Satellite InSAR Data Reservoir Monitoring from Space. EAGE
- Bock, Y., & Melgar, D. (2016). Physical applications of GNSS geodesy: A review. Reports on Progress in Physics, 79(10), 106801
- Seeber G. (2003) Satellite Geodesy. Berlin, New York: De Gruyter
- Detlef Angermann_ Roland Pail_ Urs Hugentobler_ Florian Seitz - Mission Earth _ geodynamics and climate change observed through satellite geodesy (2022)
- OGAJA C. (2022) Introduction To GNSS, Geodesy foundations of precise positioning and geoinformatics. SPRINGER NATURE
- Herring, T. A., T. I. Melbourne, M. H. Murray, M. A. Floyd, W. M. Szeliga, R. W. King, D. A. Phillips, C. M. Puskas, M. Santillan, and L. Wang (2016), Plate Boundary Observatory and related networks: GNSS data analysis methods and geodetic products, Rev. Geophys.,54

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol_067**	**SEMESTER**	8th
COURSE TITLE	**GEOLOGY OF GREECE**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**ECTS**
Lectures, laboratory work and tutorial	3L+1LW	5

COURSE TYPE	Field of Science / Επιστημονικής Περιοχής
PREREQUISITE COURSES:	Typically, there are not prerequisite courses. Essentially, the students should possess basic principles provided through all the previously taught theoretical courses.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO356/

LEARNING OUTCOMES

Learning outcomes

The course is aimed at undergraduate students who understand the basic principles of Geology. The aim of the course is to acquire advanced knowledge and skills in subjects related to the geological evolution of Greece and its prolongation in countries bordering Greece. Students will learn the geological evolution of the Greek mountain ranges from the Paleozoic to the Cenozoic Eras. Also, the objective of the course is to acquire advanced knowledge and skills on issues related to the structure of the Hellenic Palaeogeographical province during the Alpine orogeny. The creation of the mountain ranges in Greece that has formed during the convergence of a series of lithospheric plates being bordering the Tethys Ocean and its splays. The complexity of this palaeogeographical province and its structural evolution is high. The Hellenides mountain chain includes magmatic, metamorphic and sedimentary rocks that amalgamated in a complex collage of rocks with peculiar grading in their deformation and metamorphism.
The students after the successful completeness of the course will be able to know:
The paleogeographic and structural variability within the various branches of Tethys (i.e. the Palaeo-Tethys and Neo-Tethys) those that were important for the final complexity of the Greek mountain ranges.
The ways of moving the individual lithospheric units that compiled the Greek mountain ranges.
The rocks deformation, magmatism and metamorphic processes that occurred in the Tethys Ocean area and when the rift-drift procedure of the lithospheric units that eventually led to the formation of the Greek mountain ranges. In addition, students with the help of the tutor they act successively as teachers and as students as well, facing teaching problems.

General Competences

By the end of this course the student will have develop the following skills (general abilities):
Search and analyze key observations regarding tectonostratigraphy and stratigraphy of the Hellenides mountain range. Synthesize geological data and information using the necessary technologies,
Autonomous work,
Teamwork,
Promote free, creative and inductive thinking

SYLLABUS

The content of the course includes the following chapters (for simplicity we will refer only to the parts of thecourse):
Introductory concepts for the Hellenides mountain range
Stratigraphy, palaeogeography and structural evolution of the External Hellenides
Orogenic model of the evolution of the External Hellenides
Tectono-stratigraphy of the Internal Hellenides mountain range

Provinces in the Hellenides mountain range bearing oceanic rock assemblages.
Students teaching a selection of courses in front of an audience. Expanding students' knowledge, developing their skills and forming positive attitudes in relation to the use and pedagogical utilisation of Technology, Informatics and Communication tools. Using a questionnaire, with closed and open type questions, where the views of students that participated in the interdisciplinary exercises as teachers and as students have been recorded.

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	Lectures, laboratory work and fieldwork face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of pdf files. The students can freely download the pdf files.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	3×13=39
Laboratory Work	1×13=13
Tutorial	
Students Report based on the field work in a province of Greece	1X8 field work 5 hours for preparation of homework
Report by students for a province of Greece and its geological evolution (project)	32
Hours for private study of the student.	**33**
Total number of hours for the Course	**130**

STUDENT PERFORMANCE EVALUATION	1. Optionally, preparation of two in total homework from groups of two students each. 30% of the mean mark of the homework is added to the grade obtained in the final written examination, provided that the student has secured at least grade 4. 2. Written examination after the end of the semester - final grade (GSOC), unless the student participated in the preparation of homework during the semester. In that case, 30% of the mean mark of the homework is added to the final examination mark. Minimum passing grade: 5.

ATTACHED BIBLIOGRAPHY

- Recommended Literature:

Koukouvelas I., 2019.Geology of Greece. Liberal Books, Athens, p.343 (in Greek).

- Related Scientific Journals:

Journal of Geological Society of London
Tectonics
Tectonophysics
Gondwana Research
Journal of Strcutural Geology

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_068**	SEMESTER	8th
COURSE TITLE	**ENVIRONMENTAL HYDROGEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and Laboratory Work	2 (lect.) 3 (lab.)	6

COURSE TYPE	Field of Science (Hydrogeology)
PREREQUISITE COURSES:	Basic knowledge of geology, chemistry, physics and mathematics
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in French and English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	The name of the Hydrogeology laboratory Website is http://www.hydrolab.gr

LEARNING OUTCOMES

Learning outcomes
ENVIRONMENTAL HYDROGEOLOGY The aim of the course is to make the students understand the contribution of Hydrogeology to the protection of the environment and the acquisition of knowledge and skills for the protection of groundwater. In particular, it aims to provide students with the necessary knowledge of: *1.* Groundwater movement to the water abstraction projects. *2.* The different types of aquifers, and their relation to the different geological formations. *3.* Coastal aquifers. *4.* Spas and groundwaters of special composition in general. *5.* Ground- and surface water pollution. *6.* Addressing hydrogeological and environmental problems, by compiling data, with the ultimate view of professional self-reliance and successful job positioning in the professional arena. *7.* In addition students with the help of the tutor they act successively as teachers and as students as well, facing teaching problems.
General Competences
Analysis and synthesis of data and information using the necessary technologies. Project design and management.

SYLLABUS

- Groundwater movement to the water abstraction wells. Steady and non-steady flow. Calculation of hydraulic parameters under steady and non-steady flow conditions. Solving Dupuit, Theis, Jacob methods. Borehole arrays and their interaction, Predicting future drawdown. Well losses. Borehole water capacity estimation. Exploitation of groundwater resources.
- Pollution of aquifers, sources of pollution, input and propagation mechanisms of pollutants in aquifers, decontamination techniques.
- Pollution of groundwater due to seawater intrusion. Ghyben-Herzberg law. Freshwater-saltwater interface. Prevention of pollution due to saltwater intrusion Protection of the water abstraction projects and the quality of coastal waters from seawater intrusion.
- Aquifers of carbonate rocks. Differentiations in relation to aquifers of granular formations.
- Hydrothermal phenomena and geothermal fluids. Thermal waters. Thermal springs. Protection zones. Use of Excel, Grapher and Aquatest to the elaboration of pumping tests.
- Students teaching a selection of courses in front of an audience. Expanding students' knowledge, developing their skills and forming positive attitudes in relation to the use and pedagogical utilisation of Technology, Informatics and Communication tools. Using a questionnaire, with closed and open type questions, where the views of students that participated in the interdisciplinary exercises as teachers and as students have been recorded.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	With the use of power point, and instrument samples demonstration
TEACHING METHODS	**Activity** / **Semester workload** The teaching process includes 26 hours of lectures, and 26 hours of lab courses. Lectures are powered by PowerPoint slides, while educational videos are also projected. Other materials are also used in the classroom,

	e.g. water level meters, or borehole casing samples. During the lab courses, students are divided into groups of two to three people, working independently, and under the supervision of the teachers, to complete the exercises they are given each time. The course also includes a field trip, during which students have the opportunity to see hydrogeological structures in the field and discuss about specific hydrogeological subjects.	
	Lectures	2X13 = 26
	Lab courses- exercises	3X13 = 39
	Writing of laboratory exercises	2X13= 26
	Daily Study	39
	Preparation of examinations	20
	Course total	**150 hours (total student work-load)**
STUDENT PERFORMANCE EVALUATION	The examination of the course is in writing. Students are given eight to ten questions of different difficulty level, including questions that require judgment, and exercises with a specific score for each of them. The lab exercises are corrected and graded. Intermediate scheduled tests are often carried out in order to consolidate the content of the course and to bring students closer to its most important subjects. The intermediate tests are positively taken into consideration in the overall assessment of the students.	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. N. Lambrakis, Applied and Environmental Hydrogeology, Patra's University Editions, 130pp
2. N. Lambrakis, Lessons in Applied and Environmental Hydrology, To appeared, 450pp
3. G. Kallergis, 1999. Applied – Environmental Hydrogeology. Technical chamber Editions, Volumes A,B,C.
4. G. Soulios, 1996. General Hydrogeology. University Studio Press. First, Second and third Volume

- Related academic journals:

1. Hydrogeology Journal, Springer
2. Journal of Hydrology, Elsevier

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _069**	**SEMESTER**	8th
COURSE TITLE	**FIELDWORK VIII**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Field work	7days	3

COURSE TYPE	Basic General knowledge / Skills development
RELATED COURSES:	Structural Geology, Geological Mapping, Energy Resources and Coal Geology, Ore Geology, Hydrogeology, Sedimentology, Basin analysis, Petroleum geology, Introduction to Mining exploration and Mining Geology.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

The field course VIII includes two days (2 one-day field exercises) within the course of "Ore Geology", and five (5) days of field exercise as part of the "Geology of Greece" course being in essence the 4th year Synthetic Exercise of the Department of Geology.

The course is targeting the undergraduate students, who are well familiar with and understand the subjects of Ore Geology and Geology of Greece, in order to understand a number of geological applications in the areas where the field work will take place. The aim of the course is students to acquire knowledge and skills in the identification of ore bodies in the field and the familiarization with the geological structure of the Greek Orogeny.

The learning outcomes of this exercise are multiple. As this exercise takes place during the 8th semester of the Department of Geology, and since the students of the department have almost completed their curriculum and have acquired knowledge and skills on the science of geology, they have the opportunity to practice in real field conditions and to study various cases, covering the whole spam of the curriculum of the Department of Geology. The objectives under study include Geology of Greece, Tectonics, Geodynamics, Sedimentology, Stratigraphy, Mineralogy, Petrology, Ore Geology, Mineral Resources, Palaeontology, Hydrology, Hydrogeology, Geomorphology, Palaeontology, Engineering Geology etc.

The student after the successful completion of the course will be able:
To know and to understand the geological environments in relation to the potential presence of ore deposits in the Greek territory.
Be aware of and understand the methods of collecting geological data for ore exploration.
To familiarize themselves with the processes of exploration, processing and metallurgical techniques of minerals.
To recognize the stratigraphic or the tectonostratigraphic structure of the Greek mountain ranges.
To recognize the role of geology in sustainable development of aquifers
To draw up a report on the geological and geological structure of the Greek Mountains.
To familiarize with some of the most important fossils of the Greek Territory, covering the time span of the last 10Ma.
To explore the hydrogeological and hydrological systems of W. Greece, including, lakes, lagoons, rivers, deltas, karstic systems.
To understand the role of the karstic springs, as well as to see the implementation of water-management plans in relation to water supply and irrigation.

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
Adapting to new situations
Working independently
Team work
Respect for the natural environment
Production of free, creative and inductive thinking

SYLLABUS

The course content includes the following chapters:

1 day in the Metallogenic province of Parnassos - Bauxite deposits and metallurgical plants.
1 day at Ag. Ioannis, "LARCO SA" Company in the region of Kokkinou, Prefecture of Viotia.

5-day Synthetic Exercise: In the framework of this exercise, students have the opportunity to see and examine the rocks and formations in seven of the eleven main geotectonic units of the Greek territory, namely the Ionian Unit, and the Units Tripolis, Pindos, Pelagoniki, Axios, Perirodopian and Serbo-Macedonian, covering most of the Geology of Greece. They also visit coastal systems such as the lagoons of Mesolongi and Aitoliko, the estuaries of Acheloos river, karstic springs, land reclamation networks, polje as key localities to study hydrogeological and geomorphological examples. We also study the outcrops of Eocene to Miocene

deposits consisting of deep sea sediments in the foreland basin of Pindos Unit and the Mesohellenic Trough, from Giannena to Grevena and Kalambaka, where the sedimentation represents deltaic and alluvial fan deposits. An important part of the exercise consists of visits to mines, open-pits, ore deposits and industrial and mineral processing plants, as well as lignites at the premises of some of the largest mining companies in Greece. Finally, there are visits to palaeontological museums in the region, where the acquaintance with some of the most important fossils of the Greek area is achieved.
In summary, the training modules of the course include the following:
Basic concepts of identifying and describing of ore deposits in the field
Identification of ore paragenesis in the field for the purposes of ore geology
Methods of geological data collection in Greek mountain ranges
Construction of geological sections
Composition of the stratigraphic or the tectonostratigraphic structure
Hydrological - Hydrogeological Environments of Western Greece
Recognition of sedimentary features in relation to petroleum geology
Palaeontological field work
Reporting of data at different geological environments.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Face-to-face in the field
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	The student assessment is based on the score of the submitted report as well as on oral examination

Activity	**Semester workload**
Fieldwork	7days X 8 = 56
Study (non-directed) -Written report (using data collected in the field)	34
Course total	**90**

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _071**	**SEMESTER**	8th
COURSE TITLE	**METAMORPHISM IN THE HELLENIC REGION**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work	2 (lect.), 1 (lab.)	4

COURSE TYPE	Field of Science (Petrology) and Skills Development (characterization of the metamorphic conditions in a specific area and identification of the parent materials)
PREREQUISITE COURSES:	**Petrography of Sedimentary and Metamorphic rocks (compulsory 4th Semester) from 2024-2025** Essentially, the students should possess: (a) knowledge provided through the previously taught theoretical course of "Petrology of Igneous and Metamorphic Rocks". (b) laboratory skills obtained through the previously attended laboratories included in the course of "Petrology of Igneous and Metamorphic Rocks"
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO302/

LEARNING OUTCOMES

Learning outcomes

By the end of this course the student will be able to:

Understand the distribution and petrogenesis of metamorphic rocks within the Hellenide orogen

Develop skills for writing a scientific report on metamorphism and the metamorphic rocks of an area

By the end of the course the student will have further developed the following skills/competences:

Capability of using the polarizing microscope for recognizing the metamorphic processes through the study of thin sections of metamorphic rocks.

Develop skills needed for the interpretation of metamorphic processes within the Hellenide orogen and its relations with adjacent regions and their geotectonic regime.

General Competences

By the end of this course the student will, furthermore, have developed the following skills (general abilities):

1. Ability to exhibit knowledge and understanding of the essential facts, concepts, theories and applications which are related to the metamorphic conditions of a specific area.
2. Ability to apply this knowledge and understanding to the solution of problems related to the metamorphic processes in the Hellenic region.
3. Ability to adopt and apply methodology to the solution of non familiar problems of other metamorphic terrains
4. Study skills needed for continuing professional development.
5. Ability to interact with others in issues concerning the metamorphic processes in an area and its relation to the wider geotectonic regime.

Generally, by the end of this course the student will, furthermore, have develop the following general abilities (from the list above):

Searching, analysis and synthesis of facts and information, as well as using the necessary technologies

Autonomous (Independent) work

Group work

SYLLABUS

Lectures

The metamorphic history and metamorphic rocks of the Rhodope Massif.

The metamorphic history and metamorphic rocks of the circum-Rhodope zone.

The metamorphic history and metamorphic rocks of the Serbo-Macedonian massif.

The metamorphic history and metamorphic rocks of the Cyclades.

The metamorphic history and metamorphic rocks of the external Hellenides

Plate tectonics and metamorphism in Greece.

Laboratory work

Microscopic and petrological characterization study of sets of thin sections from each one of the main metamorphic terrains comprised in the Internal and External Hellenides

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face. Lectures: using slides for overhead projector and/or power-point presentations. Open eClass - Asynchronous eLearning Platform: storage and presentation of teaching material. Laboratories: Students are assigned a thin section suite to work out an essay on the metamorphic conditions and processes of a specific study area.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (e.g. powerpoint) in teaching. The lectures content of the course for each chapter are uploaded on the internet, in the form of a series of ppt files, where from the students can freely download them using a password which is provided to them at the beginning of the course. Use of polarizing microscope employed with a digital camera for capturing and analyzing representative images through the use of specialized software packages (ProgRes CapturePro 2.9.0.1 by JENOPTIC)
TEACHING METHODS	

Activity	Semester workload
Lectures (2 conduct hours per week x 13 weeks)	2x13=26
Laboratory work (1conduct hour per week x 13 weeks) – recognizing the metamorphic processes	1x13=13

	through the study of thin sections of metamorphic rocks by means of polarizing microscopy	
	Sample preparation for their study in the laboratory	1x13=13
	Hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory)	3x13=39
	Weekend hours for private study of the student and preparation of home-works and reports, for the Laboratory, and preparation for the Laboratory (study of techniques and theory)	1x13=13
	Hours for private study of the student during the week available for exam preparation and two weeks of holidays	2x3=6
	Course total	**110**
STUDENT PERFORMANCE EVALUATION	Written examination (50% of the final mark) An essay comprising the outcome of the exercise assignments on the metamorphic conditions of a specific study area (50% of the final mark). Percentages are valid t only when the student secures the minimum mark of 5 in the final written examination Greek grading scale: 1 to 10. Minimum passing grade: 5. Grades <3 correspond to ECTS grade F. Grade 4 corresponds to ECTS grade FX. For the passing grades the following correspondence normally holds: 5 <-> E, 6 <-> D, 7 <-> C, 8 <-> B and >9 <-> A	

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Metamorphic Petrology», C. Katagas, Patras, 2009 [A textbook in Greek language)
«Igneous and Metamorphic Petrology», M. Best, 2003, Blackwell Publishing.
«An introduction to Igneous and Metamorphic Petrology», J.D. Winter,2001, Pentice Hall.
«An Introduction to Metamorphic Petrology», B.W.D. Yardley, 1989, Longman/Wiley.
«Igneous and Metamorphic Rocks Under the Microscope: Classification, Textures, Microstructures and Mineral Preferred Orientation», D. Shelley, 1992, Springer.

- Related academic journals:

Journal of Petrology
Metamorphic Geology
Bulletin of the Geological Society of Greece

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _072**	**SEMESTER**	8th
COURSE TITLE	**INTRODUCTION TO EXPLORATION AND MINING GEOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Theory lectures, Tutorial and lab exercises	2 lect./1 lab	4

COURSE TYPE	Scientific area and skills development
PREREQUISITE COURSES:	Attedance of Geophysics, Tectonics, Geodynamics, Geological Mapping, Energy Sources and Raw Materials, Coal Geology, Ore Geology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes in English
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO348/

LEARNING OUTCOMES

Learning outcomes

The course is a selection one and is an introduction in the field of Exploration and Mining Geology, with significant elements of Economic Geology.
The Teaching goals include:
Acquiring Knowledge of the "best practices"in the mining industry within a global context, in relation to the profession of the Exploration Geologist and Mining Geologist; to comprehend the available tools and systems used to evaluate in terms of financial viability and to develop deposits, as well as the Standards of Health & Safety required in the field and on minesites.
Analysis of the main methods of field exploration and application of modern techniques in the fields of geochemistry, geophysics, and petrology, as well as the 3D modeling techniques and software regarding the spatial and quality features of the deposits.
Ability in organising and executing geological exploration in the field, as well as the ability for initial evaluation and synthesis of collected data in order to provide input in the scoping and pre-feasibility studies, taking into consideration aspects of sustainable mining.

General Competences

Search, analyze and synthesize data and information, using the necessary technologies
Adaption to new circumstances / conditions
Independent work
Group work
Work in international environment
Work in multidisciplinary environment
Respect of diversity and multiculturalism
Respect of natural environment
Demonstration of social, professional and moral responsibility and gender sensitivity
Exercise of criticism and self-criticism
Promote free, creative and inductive thinking

SYLLABUS

The role of Exploration Geologist & Mining Geologist
Stages of Mining Exploration: from Reconnaissance to Feasibility Study
Methods and Techniques of field exploration
Principles of Project Geology
Principles of Mining Geology
Evaluation and Reporting of Recourses and Reserves
Economic Geology Principles
Health & Safety and Community Responsibility in the Field and Minesites

TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY.</td><td>Direct face to face lectures in class and field.</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td><td>Usage of IT (power point, pdf) and blackboard. Lab exercises on maps and drilling
Support of tutoring through e-class platform.</td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Theory Lectures</td><td>2x13=26</td></tr>
<tr><td>Practical Lab Courses</td><td>1x13=13</td></tr>
<tr><td>Group paper-report</td><td>25</td></tr>
<tr><td>Autonomous study</td><td>36</td></tr>
<tr><td>Total number of hours for the Course</td><td>100</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION</td><td>
A. Written final exam test (50%) that includes:
i. Multiple choice questions
ii. Question of short answers
iii. Synthesis of short essays
iv. Understanding and interpreting metallogenic maps and sections
v. Understanding and interpreting of geophysical logs
vi. Planning exploration
vii. Solving problems of Economic Geology nature.
B. Oral exam on Practical issues (20%) that includes:
i. Interpretation of geological maps and geophysical logs
ii. Core logging
iii. Planning of certain exploration stages
Γ. Group Presentation of working paper during the semester (30%)
Team Oral presentation of a subject within Economic Geology area.

Evaluation criteria:
Students have the opportunity of self-evaluation with material provided to them through e-class.
</td></tr>
</table>

ATTACHED BIBLIOGRAPHY

Moon, C.L., Whateley, M.E.G. and Evans, A.M., 2006. Introduction to Mineral Exploration. Blackwell, 499 p.
Robb, L., 2004. Introduction to ore-forming processes. ISBN: 978-0-632-06378-9, Wiley-Blackwell, 384 p.
Journals Economic Geology Journal **http://www.segweb.org/**

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _073**	**SEMESTER**	8th
COURSE TITLE	**VOLCANOLOGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Theory lectures, Tutorial and lab exercises	2 lect./1 lab	4

COURSE TYPE	Scientific area and skills development
PREREQUISITE COURSES:	Petrography, Petrology, Geochemistry
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes in English
COURSE WEBSITE (URL)	

LEARNING OUTCOMES

Learning outcomes

- The knowledge of Volcanism as a basic action of our planet.
- Understanding magmatic processes and the upward movements of magma that control volcanic eruptions.
- Particularities of the Greek volcanic arc
- Correlation of rock chemistry with the deep processes of the magmatic chamber.
- Risk assessment methods – precursor phenomena
- Awareness of the benefits and risks of volcanoes in Greece and Europe.

General Competences

- Search, analyze and synthesize data and information, using the necessary technologies
- Adaption to new circumstances / conditions
- Independent work
- Group work
- Work in international environment
- Work in multidisciplinary environment
- Respect of natural environment
- Exercise of criticism and self-criticism
- Promote free, creative and inductive thinking

SYLLABUS

- Physical Volcanology
- Chemical Volcanology
- Volcanoes, natural and anthropogenic environment,
- Volcanic activity and natural resources and
- Volcanic Hazard
- Planetary volcanology

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	Direct face to face lectures in class and field.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Usage of IT (power point, pdf) and blackboard. Lab exercises on maps and drilling Support of tutoring through e-class platform.
TEACHING METHODS	

Activity	**Semester workload**
Theory Lectures	2x13=26

	Practical Lab Courses	1x13=13
	Group paper-report	25
	Autonomous study	36
	Total number of hours for the Course	**100**
STUDENT PERFORMANCE EVALUATION	**A. Written final exam test (70%) that includes:** Multiple choice questions Question of short answers Synthesis of short essays **B. Oral exam on Practical issues (20%) that includes:** Identification of volcanic rocks **Group Presentation of working paper (10%)** Team Oral presentation of a subject within Volcanology.	

ATTACHED BIBLIOGRAPHY

Cas, R., Giordano, G., Wright, J.V., 2018. Volcanology. Springer, ISBN 978-3-319-66612-9
Parfitt, L., Wilson, L., 2008. Fundamentals of physical volcanology. Blackwell Science Ltd.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_074**	**SEMESTER**	8th
COURSE TITLE	**GEOTHERMAL ENERGY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work	2 (lect.) + 1 (lab.)	4

COURSE TYPE	Field of Science and Skills Development
PREREQUISITE COURSES:	Typically, there are not prerequisite courses. Essentially, the students should possess knowledge provided through the theoretical courses of Mineralogy, Petrography, Geochemistry, Hydrochemistry, Tectonics and Geodynamics.
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, in English
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO377/

LEARNING OUTCOMES

Learning outcomes
By the end of this course the student will Have a spherical view of the geothermal activity and the factors controlling the geothermal field formation. Be acquainted with the methods and techniques applied in the exploration and the exploitation of geothermal fields. Be aware of the major world and domestic geothermal fields. Estimate the potential environmental impacts from the exploitation of geothermal energy. oreover, the student will have further developed the following skills/competences Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories relative to geothermal energy. Ability to apply such knowledge and understanding to practical issues concerning the exploration and exploitation of geothermal fields. Ability to refer to relative literature to enhance the already possessed knowledge. Study skills needed for continuing professional development. Ability to interact with others on inter or multidisciplinary problems.
General Competences
Generally, by the end of this course the student will have developed the following general abilities: Searching, analysis and synthesis of facts and information, as well as using the necessary technologies Adaptation to new situations Decision making Autonomous (Independent) work Group work Exercise of criticism and self-criticism Promotion of free, creative and inductive thinking Respect to natural environment Work design and management

SYLLABUS

Earth's Heat: Origin, heat flow, geothermal gradient. Regions with geothermal activity. The geothermal Field: Classification. Surface manifestations. Geothermal fluids. Geothermometers. Geothermal exploration and exploitation. Geographical distribution of major geothermal fields worldwide and in Greece. Geothermal Energy and environment.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures, seminars and laboratory work face to face.

USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (e.g. power point presentations) in teaching. The lectures content of the course for each chapter are uploaded on the e-class webpage of the University, in the form of a series of pdf files; the students can freely download them using a password.
TEACHING METHODS	

Activity	Semester workload
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Laboratory work (1 conduct hour per week x 13 weeks)	1X13 = 13
Preparation of presentation	20
Private study of the student and preparation of home-works	41
Course total	**100 hours**

STUDENT PERFORMANCE EVALUATION	**Exercises** During the semester the students have to do homework; the exercises have to be given to the teaching staff on time. This is the basic prerequisite for allowing participation in the final examination. **Presentation** Shortly before the semester end the students have to present in the class certain subjects of the course (certain geothermal fields, geological-technical issues to face in geothermal exploration or exploitation). The mark of the presentation constitutes 30% of the final mark. **Written examination** after the semester end, including questions of short and extended replies, exercise, diagramme interpretation etc. The mark of the written examination constitutes 70% of the final mark. Minimum passing grade: 5.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Christanis K., 1998. Geothermics. University of Patras (textbook in Greek).
Fytikas M. & Andritsos N., 2004. Geothermics. Tziolas Publ., Thessaloniki (in Greek).
Huenges E., 2010. Geothermal Energy Systems. Exploration, Development, and Utilization. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim.

- Related academic journals:

Geothermics (https://www.journals.elsevier.com/geothermics)

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _075**	**SEMESTER**	7th
COURSE TITLE	**APPLIED AND ENVIRONMENTAL GEOCHEMISTRY**		

INDEPENDENT TEACHING ACTIVITIES	WEEKLY TEACHING HOURS	CREDITS
Lectures and laboratory work	2 (lect.),1 (prac.)	4

COURSE TYPE	Scientific Subdiscipline and Skills Development
PREREQUISITE COURSES:	GEOCHEMISTRY
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes

COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO389/

LEARNING OUTCOMES

Learning outcomes
By the end of this course the student will be able to: Understand and appreciate the utility of a variety of geochemical tools and applications in the search and discovery of mineral resources. Elucidate palaeo-environmental perturbations, past biogeochemical processes and their fingerprints in the geological record. Compose scientific assessments and reports of geochemical applications towards solving geological and environmental problems.
General Competences
Search, analysis and synthesis of geochemical data and information through the use of modern tools and technologies Work independently and as part of a team

SYLLABUS

Section 1. Syngenetic and epigenetic mineralization styles – metallogenesis on land and in the submarine environment – development of geochemical halos – principles of geochemical indices, their applications and limitations.
Section 2. Basic principles and applications of stable isotope geochemistry – stable isotopes and fluids – type, origin and interpretation of stable isotope fractionations in surface environments – chemostratigraphy and paleoclimatic perturbations – Oceanic Anoxic Events and their significance in understanding modern climate change.
Section 3. The sedimentary environment in the early Earth – Precambrian biogeochemistry and widespread sedimentation of iron and manganese – biogeochemical proxies and redox evolution – biological innovation and the Great Oxidation Event.
Section 4. Environmental Geochemistry – general principles and types of environmental pollution – detection, management, examples.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	In-person instruction
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of electronic means in lecture/practical presentation (e.g. MS Powerpoint), Communication through the online platform e-class, Availability of course material in electronic form, Utility of computer software for data processing, presentation and application
TEACHING METHODS	

Activity	Semester workload
Lectures	2x13=26
Execution of practical assignments	1x13=13
Bibliographic research and engagement towards final seminar	1x13=13
Final seminar preparation and presentation	1x13=13
Personal reading and engagement with literature relevant to the course content	2x13=26
Course total	**91**

STUDENT PERFORMANCE EVALUATION	Practical exercises in the application of geochemical indices on a grid, and in three-dimensional lithogeochemical campaigns combined with elements of structural geology and stratigraphy. (30% of final mark) Literature search preparation and presentation of final seminar on the topic of heavy metal isotopes in paleoenvironmental research. (40% of final mark) Oral examination (30% of final mark)

ATTACHED BIBLIOGRAPHY

- Bibliography:
Copies of unpublished notes and presentations by the lecturer
A wealth of recommended literature for each course subsection.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	**Geol_076**	**SEMESTER**	8th
COURSE TITLE	**ENVIRONMENTAL OCEANOGRAPHY**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work	2 (L),21(LW)	4

COURSE TYPE	General knowledge, Scientific Area, Skills development
PREREQUISITE COURSES:	**Principles of Oceanography (compulsory 1st Semester)from 2024-2025**
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO322/

LEARNING OUTCOMES

Learning outcomes
Upon successful completion of this course , the students will be able to: • Define, explain and summarize the human activities that lead to the degradation of the oceans • Adapt new technologies to estimate the impact of the human activities to the oceans • Discuss and compile methods for the management of these effects.
General Competences
• Data retrieval, analysis and synthesis of data and information through the use of new information technologies • Individual work • Team work • Work in a multidisciplinary environment • Respect for the natural environment. • Promotion of free, creative and inductive way of thinking

SYLLABUS

Theory and laboratory

- Marine pollution and water pollutants.
- Typology of pollutants
- Sources of marine pollutants
- Marine litter
- Physical and Biological parameters of pollutants
- Effects of pollutants to the oceans. Examples in national and international level
- Methodologies for the evaluation of the marine pollution

TEACHING AND LEARNING METHODS - EVALUATION

DELIVERY	In classroom and in laboratory (face-to-face)
USE OF INFORMATION AND COMMUNICATION	• Use of Information and Communication Technologies (ICTs) (power point) in teaching • Support of Learning Process and Dissemination of educational material through the e_class platform.

<table>
<tr><td>TECHNOLOGY</td><td></td></tr>
<tr><td>TEACHING METHODS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (2 conduct hours per week x 13 weeks)</td><td>2X13 = 26 (hours)</td></tr>
<tr><td>Laboratory work (2 conduct hours per week x 13 weeks)</td><td>1X13 =13 (hours)</td></tr>
<tr><td>Interpretation and writing of the exercises</td><td>20</td></tr>
<tr><td>Individual study</td><td>41 (hours)</td></tr>
<tr><td>Total contact hours and training</td><td>100</td></tr>
</table>
</td></tr>
<tr><td>STUDENTS PERFORMANCE EVALUATION</td><td>I. Theory
Final Exam, written, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving.
Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams.
Marking Scale: 0-10.
Minimum Passing Mark: 5.
II. Laboratory
Students are obliged to attend all laboratory classes and to deliver the results of all exercises.
Maximum number of non delivered laboratory exercises: 3</td></tr>
</table>

RECOMMENDED LITERATURE

Books :
«Περιβαλλοντική Ωκεανογραφία», Εκδόσεις Πανεπιστημίου Πατρών
Relative scientific journals:
Marine Pollution Bulletin, Environmental Earth Sciences

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_077**	**SEMESTER**	8th
COURSE TITLE	**APPLIED MICROPALAEONTOLOGY - PALAEOENVIRONMENT**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, laboratory work, tutorial and fieldwork		2 (lect.), 2 (lab.), 1(fw)	5
COURSE TYPE	Scientific Field and Skills Development		
PREREQUISITE COURSES:	Typically, there are not prerequisite courses, however, for the better understanding of the course it would be considered appropriate students to have attended the following modules: Palaeontology, Stratigraphy and Historical Geology, Biomarkers and Palaeoenvironment		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, teaching may be however offered in English in case foreign students attend the course.		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO333/ (in Greek)		

LEARNING OUTCOMES

Learning outcomes

This is an introductory module for special topics in the fields of applied Micropalaeontology and Palaeoenvironment .
Upon successful completion of this module the students will be able to:

1. Understand the importance of microfossils and micropalaeontology in the stratigraphic and geological research.
2. Being aware of key groups of microfossils that are used widely in biostratigraphy and palaeoecology.
3. Use adequately stereoscopes and optical microscopes for the observation, study and identification of microfossils.
4. Being able to identify with the use of microscopy key groups of microfossils.
5. Learn how to study microfossils for the extraction of biostratigraphical, palaeoecological and palaeoenvironmental conclusions.
6. Be trained in topics concerning the taxonomy of organisms, the evolutionary mechanisms as well as the contribution of fossils in stratigraphic research.
7. Apply methods of preparation, taxonomy and palaeoecology on sediment samples that they have collected.
8. Compose their data collecting information from literature, making comparisons and writing a paper structured essay.

General Competences

Generally, by the end of this course the student will, furthermore, have developed the following general abilities:
1. Search, analyze and synthesize data and information, using the necessary technologies.
2. Working in a multidisciplinary environment
3. Working in an international environment.
4. Independent work.
5. Group work.
6. Generating new research ideas.
7. Respecting the environment.
8. Criticism and self-criticism.
9. Promoting free and creative thinking.

SYLLABUS

1. Micropalaeontology – Microfossils - Applications – Marine environments – Palaeoecology – Microfossils and sedimentation – Preparation and observation methods
2. Phylogenetics – Cladistics
3. Applied Palaeontology
4. The use of microfossils in biostratigraphy, chronostratigraphy and the determination of the palaeoenvironment
5. Foraminifera
6. Radiolaria
7. Diatoms
8. Calcareous nannoplankton
9. Ostracods

10. Microvertebrates
11. Palynology
12. Otoliths

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory practice face to face. Observation and study of real microfossils during laboratory practice
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) (powerpoint) in teaching. Supporting teaching and communication through e-class. The lectures content of the course for each chapter are uploaded on the e-class platform, in the form of a series of ppt files, from where the students can freely download them.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26
Laboratory work (2 conduct hours per week x 13 weeks)	2X13 = 26
Hours for the preparation of laboratory work reports (2h per week x 13 weeks)	2X13= 26
Fieldwork	1X8=8
Hours for private study of the student, preparation and study of working sample in the laboratory and preparation of written long essay (3h per week x 13 weeks))	30
Course total	**116 hours**

STUDENT PERFORMANCE EVALUATION	**I)** Written long essay, preparation and study of actual micropalaeontological sample collected during fieldwork. The mark consists 50% of the final grade. **II)** Written reports following the completion of each practical. The mean mark of the reports consists the other 50% of the final grade. Minimum passing grade: 5. <u>Final Course Grade (FCG)</u> FCG = (written long essay + practical reports) / 2 The language of assessment is in Greek. If foreign students attend the course, their assessment in English.

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

Armstrong, H., Brasier, M., 2005. Microfossils, Blackwell Publishing Ltd, 2nd edition, Oxford
Saraswati, P.K., Srinivasan, M.S., 2016: Micropaleontology: Principles and Applications, Springer.
Martin, R.E. (Ed.), 2000: Environmental Micropaleontology: The Application of Microfossils to Environmental Geology, Springer.
Notes of lecturers in Greek.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _078**	**SEMESTER**	8th
COURSE TITLE	**PROTECTION OF THE GEOLOGICAL, GEOGRAPHIC AND HUMAN HERITAGE**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, and laboratory work	2 (lect.), 1 (lab)	4

COURSE TYPE	General knowledge, Scientific Area, Skills development
PREREQUISITE COURSES:	No
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case that foreign students attend the course
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO338/

LEARNING OUTCOMES

Learning outcomes

Upon successful completion of this course , the students will be able to:

- clarify the necessity for the protection of natural and cultural heritage sites
- examine the practices and strategies for the managements of the sites under protection
- investigate possible threats to the sites under protection
- compose studies on issues relative to the management of sites under protection
- material culture
- recognize the importance of the cultural material to the human development
- discuss the physical and chemical parameters of the cultural material
- recognize the archaeological sites as the result of interaction between human and environment
- identify the human characteristics at a landscape under protection
- map remains of the cultural heritage sites and to link them with geographical and geological data sets
- adapt and apply the legacy related to the natural and cultural heritage sites.

General Competences

- Data retrieval, analysis and synthesis of data and information through the use of new information technologies
- Adapting to new situations.
- Decision making.
- Individual work
- Team work
- Production of new research ideas.
- Respect for the natural environment.
- Promotion of free, creative and inductive way of thinking
- Design and management of projects

SYLLABUS

Theory

- Definition of the cultural and natural heritage sites
- Regulations and strategies of the protected sites on national and international level
- Marine natural and cultural heritage sites: Definitions, regulations and strategies for their management
- Archaeological materials as markers for the cultural heritage
- Archaeometric approach of the cultural materials
- Categories of artifacts

Stone artifacts

Ceramic artifacts

Metallic artifacts
Glass artifacts
- Conservation and protection of the cultural materials

Landscape Archaeology
Regeneration of the landscape through time. Natural and human interplay –Processual and post-processual theory
Non destructive methods for the detection and management of the archeological resources

Laboratory
- Detection and interpretation of marine natural and cultural heritage sites using marine remote sensing techniques
- Mineral, petrological and geochemical analysis of various artifacts by means of analytical techniques (optical microscopy, X-ray powder diffraction, X-ray Fluorescence etc.)
- GIS applications for the mapping of cultural heritage sites

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY.	In classroom and in laboratory (face-to-face)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	• Use of Information and Communication Technologies (ICTs) (power point) in teaching • Support of Learning Process and Dissemination of educational material through the e_class platform.
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2X13 = 26 (hours)
Laboratory work (1 conduct hours per week x 13 weeks)	1X13 =13(hours)
Tutorials	1X13 =13(hours)
Individual Study (Interpretation and writing of the exercises)	61 (hours)
Course total	**100**

STUDENT PERFORMANCE EVALUATION	**I. Theory** Final Exam, written, of increasing difficulty, which may include Multiple choice test, Questions of brief answer, Questions to develop a topic, Judgment questions and Exercise solving. Students are obliged to attend all scheduled laboratory classes and to deliver all the laboratory exercises, during the semester in order to be able to participate to the final exams. Marking Scale: 0-10. Minimum Passing Mark: 5. **II. Laboratory** Students are obliged to attend all laboratory classe and to deliver the results of all exercises. Maximum number of non delivered laboratory exercises: 3 Percentages are valid t only when the student secures the minimum mark of 5 in the final written examination Greek grading scale: 1 to 10. Minimum passing grade: 5. Grades <3 correspond to ECTS grade F. Grade 4 corresponds to ECTS grade FX. For the passing grades the following correspondence normally holds: 5 <-> E, 6 <-> D, 7 <-> C, 8 <-> B and >9 <-> A

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
Notes from the teachers
Published scientific articles and technical reports
Relative Websites

- Related academic journals:
Journal of Cultural Heritage

Journal of Archaeological Science Remote Sensing Archaeometry

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_079**	**SEMESTER**	8th
COURSE TITLE	**LANDSLIDE PHENOMENA IN THE TERRESTRIAL AND MARINE ENVIRONMENTS**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures, Laboratory Work		2(L), 1(LW)	4
COURSE TYPE	Field of Science (geology) and Skills Development (Landslide phenomena)		

PREREQUISITE COURSES:	Typically, there are not prerequisite course. It is however recommended that students should have at least a basic knowledge of Engineering Geology
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO350/

LEARNING OUTCOMES

Learning outcomes
The course gives the theoretical and objective knowledge related to the identification, classification and estimation of basic parameters - characteristics of landslides (terrestrial and marine) on soil and rock, natural and man-made slopes, as well as their design methodologies. Additionally, the remedial - stabilized measures are discussed and the relevant technical works that contribute to landslide stabilization are presented By the end of this course the student will possess cognitive and practical skills and has the ability to: Utilization of know - how as regards the recording and monitoring of slope movement and their safe design (use of appropriate methods, materials and instruments) Application of knowledge and creative thinking to solve problems related to slope stability and safe design and construction of technical works against the landslide phenomena (in roads, villages e,tc.) Also the student in the working environment has the ability to respond: With competence in interdisciplinarity that required by the protection against landsliding With responsibility and reliability in the case of autonomous employment
General Competences
Retrieve, analyze and synthesize data and information, using the necessary technologies Decision making Adapt to new situations Working in an interdisciplinary environment

SYLLABUS

1) LandslideClassification, causal and triggering factors, landslide failure mechanism
2) Ground movement monitoring (inclinometers, Satellite Geodesy)
3) Slope stability analyses, Limit Equilibrium Analyses
4) Remedial measures: Design and construction
5) Landslide susceptibility, hazard and risk. Landsliding in the Hellenic region
6) Submarine landslides: causal factors, sliding mechanism, classification, recording techniques
7) Laboratory work: testing for shear strength determination in (a) soil (peak - residual) (b) mechanical behavior of rock mass discontinuities and (c) slope stability analyses using the relevant software

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures and laboratory work face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	• Use of Information and Communication Technologies (ICTs) (power point) in teaching. • Support of Learning Process and Dissemination of educational material through the e_class platform
TEACHING METHODS	

Activity	**Semester workload**
Lectures (2 conduct hours per week x 13 weeks)	2×13=26
Laboratory work	1×13=13
Writing reports of the laboratory exercises	1X13= 13
Autonomous study	48
Course Total	**100 hours**

STUDENT PERFORMANCE EVALUATION	I) Laboratory and team work evaluation (50%): Each lab exercise is resolved and delivered the next week after its educational process. After it is corrected, marked and returned to the student. The average mark of all lab exercises is calculated. II) Final Written Course Exams (50%): Five (5) questions related to lectures

ATTACHED BIBLIOGRAPHY

- Text books:

1) Τεχνική Γεωλογία (2002). Γ. Κούκης, Ν. Σαμπατακάκης Εκδόσεις Παπασωτηρίου, σελ. 514.
2) Γεωλογία Τεχνικών Έργων (2007). Γ. Κούκης, Ν. Σαμπατακάκης Εκδόσεις Παπασωτηρίου, σελ. 575.
3) Εφαρμογές της Τεχνικής Γεωλογίας και Γεωτεχνικής στα Τεχνικά Έργα (2015). Ν. Σαμπατακάκης, Γ. Κούκης, Ν. Δεπούντης. Εκδόσεις Πανεπιστημίου Πατρών, σελ. 131
4) Engineering Geology. Principle and practice (2009). D.G. Price, Springer.
5) Engineering Geology (2007). F.G. Bell. Second edition. B.H.
6) Rock Slope Engineering. 4th edition. Wyllie, Mah, CRC Press
- Scientific International Journals:
1) Bulletin of Engineering Geology and the Environment. Springer
2) Engineering Geology. Elsevier.
3) Geotechnical and Geological Engineering. Springer
4) Landslides. Springer
5) Natural Hazards. Springer

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol_080**	**SEMESTER**	8th
COURSE TITLE	**ENGINEERING GEOPHYSICS**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures and laboratory work		2 (lectures) 1 (laboratory)	4
COURSE TYPE	Scientific area, Skill Development		
PREREQUISITE COURSES:	Geophysics.		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes, (in English)		
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO354/		

LEARNING OUTCOMES

Learning outcomes
This course is introductory to applied geophysics for engineering works, after successful completion the student will :

Know the basic principles of applied geophysics
Be able to process geophysical data (Basic analysis)
Know the basic interpretation principles for geophysical data application in engineering works

Skills

Application of acquired knowledge in understanding/ solving geophysical problems
Application of acquired knowledge for selecting appropriate geophysical method or combing geophysical methods for solution of problems
Basic skills in geophysical data processing for qualitative and quantitative problems in engineering works

Abilities

Ability to demonstrate knowledge and understanding of essential facts, concepts, principles and theories related to engineering geophysics
Ability to solve geophysical problems, using acquired knowledge and understanding of geophysics
Ability of basic processing and interpretation and quality control of geophysical data.
Ability to interact with other students in order to solve applied geophysics problems
Ability to work in a team

General Competences

By the end of this course the student will, furthermore, have developed the following skills (general abilities):
Ability to apply acquired knowledge and understanding to the solution of problems related to geophysical data processing
Ability to solve problems.
Ability to prepare and execute searching, analysis and synthesis of data and related information
Ability to interact with others in problem solving

SYLLABUS

Introduction to Engineering Geophysics Principles. Geophysical survey design and methodology.
Seismic Methods
Principles, introduction. Seismic refraction, Data acquisition. Data QC. Analysis, processing interpretation of results in relation to engineering works. Combination of results.

Geoelectrical methods
Electric current propagating in earth, Resistance-Resistivity- Apparent resistivity. Geoelectrical arrays and measurements Geoelectrical data acquisition correction processing and analysis, interpretation of results in relation to engineering works.
GPR / Electromagnetic methods.
Principles, controlled source EM methods. GPR. Data acquisition correction processing and analysis, interpretation of results in relation to engineering works.

TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	Lectures in class. Laboratory exercises in Computer Center using specialized software under instructor's supervision. Field measurements and application
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Use of Information and Communication Technologies (ICTs) in teaching. Lab exercises using computer software. Powerpoint presentations from instructors and students. The lectures content of the course, for each chapter, are uploaded in the eclass platform. The same is done for laboratory exercises together with the appropriate presentation. Interaction with students is done through email and the eclass platform as well.
TEACHING METHODS	

Activity	**Semester workload**
Lectures	26
Laboratory exercises	13
Demonstration of methods and equipment- field work	13
Team report preparation - presentation	30
Hours for private study of the student	18
Course total	**100**

STUDENT PERFORMANCE EVALUATION	The assessment is done in the following way: Written examination after the end of the semester (70%) which includes Assessment questions Problem solving questions Data analysis questions

	Presentation of team work/ Report (30%)

ATTACHED BIBLIOGRAPHY

- Suggested bibliography:

1. Lecture notes (eclass)

2. «Applied Geophysics», Tselentis G-A., Paraskevopoulos P., Pub. Liberal Books, Athens, 2013. (In Greek)

3. «Introduction to Geophysics», Papazachos B., Pub. Ziti, 2008. (In Greek)

- Related academic journals:

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _081**	**SEMESTER**	8th
COURSE TITLE	**PETROLEUM GEOLOGY**		
INDEPENDENT TEACHING ACTIVITIES		**WEEKLY TEACHING HOURS**	**ECTS**
Lectures, seminars, laboratory work and field trip exercises		2 (lect.), 1 (lab.), 3 days field trip	4
COURSE TYPE	Scientific area and the development of skills		
PREREQUISITE COURSES:	Sedimentary Basin Analysis		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. Teaching may be however performed in English in case foreign students attend the course.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	If necessary Yes		
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/GEO353/		

LEARNING OUTCOMES

Learning outcomes
At the end of this course the student will be able to recognize structures through seismic sections, and with the knowledge of the evolution of a sedimentary basin to propose places with hydrocarbon fields development in a basin. In particular, the collection of geological information through underground seismic sections, like the thickness of sediments, existing structures (faults, unconformities, change of grain size and organization of sediments) in conjunction with the geochemistry of sediments will give them the opportunity to recognize/predict the source, reservoir and sealing rocks, migration processes and trapping of potential produced hydrocarbons.
General Abilities
Search, analysis and synthesis of data and information, using the necessary technologies Adaptation to new situations. Autonomous decision. Preparing – organizing work either alone or in as teamwork. Production of new research ideas. Design and project management. In the end in this course the student will have to further develop the following skills: 1. Ability to use the model of evolution of a basin in the direction of recognition of potential hydrocarbon fields. 2. Ability to "read" seismic sections. 3. Ability to recognize potential source rocks. 4. Ability to recognize possible reservoir and hydrocarbon traps.

SYLLABUS

The content of the course is divided into three sections:

1. Theory of Petroleum Geology. Includes all processes for developing hydrocarbon fields, from the development processes of source rocks, reservoirs, sealing rocks, trapping, hydrocarbon migration and examples from around the world for hydrocarbons fields in different tectonic regimes and different times of their development.
2. Study and interpretation of seismic sections, sequence stratigraphy.

The application of theory to the Mesohellenic piggy-back basin in central Greece for which there are available seismic sections. Reporting and evaluation is also done in other basins that studied in the previous course of sedimentary basin analysis.

TEACHING and LEARNING METHODS - ASSESSMENT

DELIVERY.	1. Teaching using power point presentations, workshops with exemplary study and interpretation of seismic sections. 2. Field-trip exercises in areas of Western Greece and in Mesohellenic piggy-back basin in Central Greece.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Students are informed of all new developments in the application of methodologies for sedimentary basin analysis, in the interpretation and evaluation of seismic data, and have the ability to search through electronic sources into equivalent basins around the world aimed to compare the evolutionary models of sedimentation with what they are taught. Through the platform of e-class where it is posted all the presentations of courses is done and communicating with students to resolve on a daily basis problem.
TEACHING METHODS	
STUDENT PERFORMANCE EVALUATION	1. The students are divided into groups of 2-3 people and undertake the drafting work on the same basin. They present their work to their colleagues with power point, is examining with questions and answers from both the instructor and between groups, (the above corresponds to 70% of the total final grade). 2. Written examination on general knowledge in petroleum geology (the above written examination corresponds to 30% of the total final grade). 3. Right to participate in the written exam are those who have authored and presented the work assigned. 4. Minimum pass grade: 5. The language of assessment is in Greek

Activity	**Workload Semester**
Lectures - seminars	2 X 13 = 26 hours
Laboratory Exercise	1 X 13 = 13 hours
Field trip exercises	3 days X 8 hours = 24 hours
Reference study and analysis	3 X 13 hours = 26 hours
Writing work	36 hours
Total course	**125** hours

ATTACHED BIBLIOGRAPHY

Mesohellenic Piggy-back basin in Central Greece:

1. Avramidis, P., Zelilidis, A. 2007: Potential source rocks, organic geochemistry and thermal maturation in the southern depocenter (Kipourio-Grevena) of the Mesohellenic Basin, central Greece. - International Journal of Coal Geology, 71 (4), pp. 554-567.
2. Zelilidis, A., Piper, D.J.W. & Kontopoulos, N. 2002: Sedimentation and basin evolution of the Oligocene - Miocene Mesohellenic basin, Greece. – American Association of Petroleum Geologists Bulletin, 86 (1), 161-182.
3. Zelilidis, A. & Kontopoulos, N. 1996: Significance of fan deltas without toe-sets within rift and piggy-back basins: examples from the Corinth graben and the Mesohellenic trough, Central Greece. - Sedimentology, 43, 253-262.
4. Doutsos, T., Koukouvelas, I., Zelilidis, A. & Kontopoulos, N. 1994: Intracontinental wedging and post-orogenic collapse in Mesohellenic Trough. - Geol.Rundsch., 83, 257-275.

Pindos Foreland in western Greece:

5. Zelilidis, A., Maravelis, A.G., Tserolas, P. & Konstantopoulos, P.A. 2015: An overview of the Petroleum systems in the Ionian zone, onshore NW Greece and Albania. Journal of Petroleum Geology, vol. 38 (3), 331-348.

6. Maravelis, A., Koukounya, A., Tserolas, P., Pasadakis, N. & Zelilidis, A. 2015: Geochemistry of Upper Miocene-Lower Pliocene source rocks in the Hellenic Fold and Thrust Belt, Zakynthos Island, Ionian Sea, western Greece. Marine and Petroleum Geology 66, 217-230.

7. Maravelis, A., Makrodimitras, G. & Zelilidis, A. 2014: Stratigraphic evolution and source rock potential of a Late Oligocene-Early/Middle Miocene continental slope system, Diapondia Islands, Ionian Sea, NW Greece. Geological Magazine, 151(3):394-413.

8. Konstantopoulos, P. & Zelilidis, A., 2013: Sedimentation of submarine fan deposits in the Pindos foreland basin, from late Eocene to early Oligocene, west Peloponnesus peninsula, SW Greece. Geological journal, 48(4), 335-362.

9. Konstantopoulos, P. & Zelilidis, A., 2013: Provenance analysis of Eocene-Oligocene turbidite deposits in Pindos foreland basin, fold and thrust belt of SW Greece: Constraints from framework petrography and bulk-rock geochemistry. Arabian Journal of Geosciences, 6(12), 4671-4700.

10. Konstantopoulos, P., Maravelis, A. & Zelilidis, A., 2013: The implication of transfer faults in foreland basin evolution: Application on Pindos Foreland Basin, West Peloponnesus, Greece. Terra Nova Konstantopoulos, P. & Zelilidis, A. 2012: The geodynamic setting of Pindos foreland basin in SW Greece: Tectonic and sedimentary evolution. Episodes, v.35, no4, 501-512

11. Avramidis, P., Zelilidis, A. & Kontopoulos, N. 2000: Thrust dissection control of deep-water clastic dispersal patterns in the Klematia-Paramythia foreland basin, Western Greece. -Geol.Mag., 137, 667-685.

12. Zelilidis, A. 2003: The geometry of fan-deltas and related turbidites in narrow linear basins. Geological Journal, 38, 31-46.

13. Kokinou, E., Kamberis, E., Vafidis, A., Monopolis, D., Ananiadis, G. & Zelilidis, A. 2005: Deep seismic reflection data from offshore western Greece: a new crustal model for the Ionian Sea. – Journal of Petroleum Geology, 28, 81-98.

14. Avramidis, P., Zelilidis, A. 2001: The nature of deep-marine sedimentation and palaeocurrent trends as an evidence of Pindos foreland basin fill conditions. Episodes, 24, No4, 252-256.

15. Avramidis, P., Zelilidis, A., Vakalas, I. & Kontopoulos, N. 2002: "Interaction between tectonic activity and eustatic sea-level changes in the Pindos and Mesohellenic Basins, NW Greece: basin evolution and hydrocarbon potential. -Journal of Petroleum Geology, 25 (1), 53-82.

Patras-Corinth extensional basin:

16. Vakalas, I., Zelilidis, A., Barkooky, A., Darwish, M. & Tewfik, N. 2015: Comparison between fan deltas in the Gulf of Suez, Egypt, and in the Gulf of Corinth, Greece. Arabian Journal of Geosciences, 8:3603-3613.

17. Zelilidis, A. 2003: The geometry of fan-deltas and related turbidites in narrow linear basins. Geological Journal, 38, 31-46.

18. Kontopoulos, N. & Zelilidis, A. 1997: Depositional environments of the coarse-grained lower Pleistocene deposits in the Rio-Antirio basin, Greece. - In: Engineering Geology and the Environment (Eds. by Marinos,P.G., Koukis,G.C., Tsiambaos,G.C. and G.C.Stournaras). Proceedings of Intern. Symp.Engin.Geol.Envir., 199-204.

19. Zelilidis, A. & Kontopoulos, N. 1996: Significance of fan deltas without toe-sets within rift and piggy-back basins: examples from the Corinth graben and the Mesohellenic trough, Central Greece. - Sedimentology, 43, 253-262.

20. Poulimenos, G., Zelilidis, A., Kontopoulos, N. & Doutsos, T. 1993: Geometry of trapezoidal fan deltas and their relationship to extensional faulting along the south-western active margins of the Corinth rift. -Basin Research, 5, 179-192.

21. Kontopoulos,N. & Zelilidis,A.1992: Upper Pliocene lacustrine environments in the intramontane Rio graben basin, NW Peloponnesus, Greece. N. Jb. Palaont. Mh., 2, 102 114.

22. Zelilidis,A., Koukouvelas,I. & Doutsos,T.1988: Neogene paleostress changes behind the forearc fold belt in the Patraikos Gulf areas Western Greece. N. Jb. Geol. Palaont. Mh., 5: 311 325

The Complex (foreland and piggy-back) Zakynthos basin - Ionian Foreland Basin:

23. Zelilidis, A., Papatheodorou, G., Maravelis, A., Christodoulou, D., Tserolas, P., Fakiris, E., Dimas, X., Georgiou, N. & Ferentinos, G., 2016: Interplay of thrust, back-thrust, strike-slip and salt tectonics in a Fold and Thrust Belt system: an example from Zakynthos Island, Greece. Intr.J.Earth Sciences. 105: 2111-2132.

24. Maravelis, A., Makrodimitras, G. & Zelilidis, A. 2012: Hydrocarbon prospectivity in the Apulian platform and Ionian zone, in relation to strike-slip fault zones, foreland and back-thrust basins of Ionian thrust, in Greece. - Oil and Gas European Magazine, 38, 2, 64-89

25. Zelilidis, A., Kontopoulos, N., Piper, D.J.W. & Avramidis, P. 1998: Tectonic and sedimentological evolution of the Pliocene-Quaternary basins of Zakynthos island, Greece: Case study of the transition from compressional to extensional tectonics. -Basin Research, 10, 393-408.

26. Kontopoulos, N., Zelilidis, A., Piper, D.J.W. & Mudie, P.J. 1997: Messinian evaporites in Zakynthos, Greece. -Palaeog., palaeocl., palaeoec, 129, 361-367.

Kalamata Extensional Basin:

27. Zelilidis, A. & Kontopoulos, N. 1999: Plio-Pleistocene architecture in marginal extensional narrow sub-basins: examples from Southwest Geeece. - Geol.Mag., 136(3), 241-262.

28. Zelilidis, A. & Kontopoulos, N. 1994: Pliocene-Pleistocene fluvial/wave dominated deltaic sedimentation: the Pamisos delta in SW Peloponnesus, GREECE. -Geol.Mag.,131,653-668.

29. Zelilidis, A. & Kontopoulos, N. 2001: Post-Miocene sedimentary evolution of south Peloponnesus, Greece. –GAIA, No 16 (1-2), 1-12.

Extensional basins in NW Crete Island (Platanos-Kasteli-Maleme sub-basins) - Mediterranean Ridge:

30. Zelilidis, A., Tserolas, P., Chamilaki, E., Pasadakis, N., Kostopoulou, S. & Maravelis, A.G., 2015. Hydrocarbon prospectivity in the Hellenic trench system: organic geochemistry and source rock potential of upper Miocene-lower Pliocene successions in the eastern Crete Island, Greece. Intr.J.Earth Sciences, 105: 1859-1878.

31. Maravelis, A., Manutsoglou, E., Konstantopoulos, P., Pantopoulos, G., Makrodimitras, G., Zoumpoulis, E. & Zelilidis, A. 2015: Hydrocarbon plays and prospectivity of the Mediterranean ridge. - Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, 37:347–355.

32. Maravelis, A., Panagopoulos, G., Piliotis, I., Pasadakis, N., Manutsoglou, E. & Zelilidis, A., 2016: Pre-Messinian (sub-Salt) Source-rock potential on Back-stop Basins of the Hellenic Trench system (Messara Basin, Central Crete, Greece). Oil and Gas Science and Technology-Rev.IFP Energies nouvelles 71, 6. (DOI: 10.2516/ogst/2013130).

33. Kontopoulos, N. & Zelilidis, A. 1997: Depositional processes in outer arc marginal sub-basins during the Messinian. Examples from the western Crete Island, Greece. -Geologica Balcanica, 27, 1-2, 91-100.

34. Kontopoulos, N., Zelilidis,A. & Frydas,D. 1996: Late Neogene sedimentary and tectonostratigraphic evolution of southwestern Crete island, Greece. - N. Jb. Geol.Palaont. Abh., 202, 287-311.

GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF GEOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**Geol _086**	**SEMESTER**	8th
COURSE TITLE	**SEMINAR: TEACHING GEOSCIENCES IN SECONDARY SCHOOL**		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	2	2
COURSE TYPE	General background	
PREREQUISITE COURSES:	NO	

LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://eclass.upatras.gr/courses/GEO397/

LEARNING OUTCOMES

Learning outcomes
The aim of this seminar course is for students to acquire the required knowledges and skills about the education methods used to teach geosciences subjects in secondary schools. By the end of this seminar course the students are able to: Know the curriculum of courses "Geology-Geography" taught in secondary school Know and understand the evaluation methods in secondary schools Know and understand the standard education processes in secondary school's class Define and describe the educational aims of individual lessons Discriminate and choose the appropriate teaching methods Know the prerequisite knowledge that learners should have Create lesson plans for various subjects of geosciences Modify the lesson plans according to knowledge level of learners
General Competences
Generally, by the end of this seminar course the students furthermore, have develop the following general abilities (from the list above): Search for, analysis and synthesis of data and information, with the use of the necessary technology Decision-making Working independently Team work Respect for difference and multiculturalism 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

SYLLABUS

The course content includes the following chapters: Lesson plans in section "MAPS" of the textbook "Geology-Geography" for 1st year high school students Lesson plans in section "NATURAL ENVIRONMENT" of the textbook "Geology-Geography" for 1st year high school students Lesson plans in section "HUMAN ENVIRONMENT" of the textbook "Geology-Geography" for 1st year high school students Lesson plans in section "CONTINENTS" of the textbook "Geology-Geography" for 1st year high school students Lesson plans in section "THE MAPS" of the textbook "Geology-Geography" for 2st year high school students Lesson plans in section "NATURAL ENVIRONMENT OF EUROPE" of the textbook "Geology-Geography" for 2st year high school students Lesson plans in section "THE PEOPLE OF EUROPE" of the textbook "Geology-Geography" for 2st year high school students Lesson plans in section "FINANCIAL ACTIVITIES OF EUROPEAN PEOPLE" of the textbook "Geology-Geography" for 2st year high school students