



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Εθνικόν και Καποδιστριακόν
Πανεπιστήμιον Αθηνών
— ΙΔΡΥΘΕΝ ΤΟ 1837 —

SCHOOL OF SCIENCE

DEPARTMENT OF GEOLOGY AND GEOENVIRONMENT

**Study Guide of the MSc Programme
“Exploration and Sustainable Exploitation of
Mineral Resources”**



INDICATIVE STUDY GUIDE

POSTGRADUATE STUDIES PROGRAMME

Exploration and Sustainable Exploitation of Mineral Resources

Athens, 2027

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Preface

Dear students,

Today, the geosciences are increasingly called upon to address complex challenges arising from growing societal needs and expanding human activity. Understanding these challenges—and promoting sustainable development to the greatest extent possible—requires a broad scientific perspective and the integration of diverse knowledge and skills. It is therefore essential to foster new interdisciplinary approaches and collaboration among specialized scientists capable of responding effectively to contemporary demands.

The establishment of the Department of Geology and Geoenvironment's MSc Programme in “Exploration and Sustainable Exploitation of Mineral Resources” represents both a scientific and a societal necessity. The contemporary world is characterized by rapid economic and technological development, population growth and mobility, and accelerating urbanization. These trends generate increasing demand for raw materials and energy resources, intensified construction activity, mounting environmental pressures, and greater exposure to natural and technological hazards.

The MSc Programme focuses on the scientific fields of economic geology and mineral deposits, encompassing the exploration, extraction, management, and sustainable exploitation of mineral raw materials, including metallic, energy, industrial, and other mineral resources. Its scope satisfies the fundamental epistemological criteria that define a distinct and clearly delimited scientific field: it addresses specific and identifiable objects of study, applies specialized methodologies to each of them, and is founded on a coherent conceptual and ontological framework.

The Programme aims both to advance research and to provide students with advanced knowledge and specialized expertise at postgraduate level, while also preparing those who wish to pursue doctoral research. It equips graduates with the knowledge and skills required for further scientific and professional development and for active participation in economic and social progress within an increasingly international environment. High-level education and the dissemination of knowledge to the wider public are essential for strengthening awareness and preparedness and, ultimately, for enhancing society's resilience and capacity to adapt.

The Programme seeks to educate scientists with a strong foundation in geological research methodologies; techniques for the exploration, identification, extraction, and processing of mineral raw materials; resource and reserve estimation; mining-project management; and environmental-impact assessment. Particular emphasis is placed on the application of modern digital technologies, including geoinformatics, remote sensing, three-dimensional deposit modelling, and computational simulation. The expected strong demand for admission among professionals and early-career scientists reflects the Programme's relevance to both the employment prospects and the scientific development of new graduates, particularly at a time when the associated technological sectors are evolving rapidly.

The Programme also seeks to make a meaningful contribution to the development of educational policies that respond to changing scientific, technological, economic, and social conditions. In this respect, it serves both as a driver and as an instrument of development. Its graduates, equipped with a sound scientific background and relevant experience, can in turn promote a culture of adaptability and contribute responsible, informed perspectives within their respective professional fields.

The curriculum combines in-person and online lectures with synchronous and asynchronous teaching. It includes exercises, written assignments, seminars, and other educational activities designed to develop students' knowledge of, and familiarity with, emerging technologies and contemporary scientific methods.



National and Kapodistrian University of Athens

The University at a glance...

The University of Athens, inaugurated on 3 May 1837, was initially housed in a renovated Ottoman building on the north-eastern side of the Acropolis, which has since been restored and now operates as the University History Museum. It was originally named the “Othonian University” after Otto, the first King of Greece, and comprised four academic faculties with 52 students. As the first university of the newly established Greek state, as well as of the broader Balkan and Mediterranean region, it acquired an important socio-historical role that was decisive in the production of knowledge and culture within the country.

In 1841, the administrative services and academic faculties were transferred to what is now widely known as the “Central Building” of the University of Athens. In 1932, the University was officially named the National and Kapodistrian University of Athens, in honor of Ioannis Kapodistrias, the first Governor of Greece following national liberation. Today, the Central Building houses the Rectorate, the Senate, the Great Hall of Ceremonies, and other important central services. Its forecourt (the Propylaea) has acquired socio-historical significance, having become a venue for political gatherings, social protest, and demonstrations by students and other social groups involved in movements defending social rights.

Until the academic year 1925/26, the University of Athens was the only university in Greece. It provided Greek society with qualified professionals in medicine, the natural and social sciences, law and economics, the humanities, and theology.

Throughout its many years of operation, it has provided the country with a center of intellectual production, encouraging circles of intellectuals both within and beyond its premises. Today it continues to offer important social services, as its academic and teaching staff frequently participate in national and international committees, carry out educational and other research projects, and organize and take part in seminars for a wide range of social groups, often alongside their full-time duties at the University. One of its most important contributions is in the field of public health, as health-sciences students undertaking practical training provide medical services to the public under the supervision of teaching staff.

The University of Athens, perhaps the country’s most prestigious university, has established its own tradition in the sciences and in creative participation in society.

Vision

The National and Kapodistrian University of Athens (NKUA) seeks to continue its decisive and leading role in Greek society through innovation in education, the strengthening of research, excellence, and the international presence and distinction of the members of its academic community in every field in which it is active.

It also aims to strengthen outward engagement, foster values, cultivate creativity and social contribution, and promote Greece’s historical and contemporary culture to the global scientific community through scholarly activities.

Mission and Policy of the University

Under Article 4 of Law 4009/2011, the National and Kapodistrian University of Athens, like all Higher Education Institutions (HEIs) in Greece, has the following mission:

- i. to produce and disseminate knowledge through research and teaching, prepare students to apply it in professional practice, and cultivate the arts and culture;
- ii. to provide higher education and contribute to lifelong learning through modern teaching methods, including distance education, grounded in scientific and technological research of the highest quality according to internationally recognized criteria;

- iii. to develop students' critical thinking and skills, support graduates' integration into professional life, and create the conditions necessary for the emergence of new researchers;
- iv. to respond to the needs of the labor market and professional fields, as well as to the country's development needs, and to promote the dissemination of knowledge, the utilization of research results and innovation, while adhering to the principles of scientific ethics, sustainable development and social cohesion;
- v. to promote cooperation with other educational institutions and research bodies in Greece and abroad, and the effective mobility of teaching staff, students and graduates, thereby contributing to the development of the European Higher Education and Research Area; and
- vi. to contribute to the development of responsible citizens capable of meeting the demands of every field of human activity with scientific, professional and cultural competence and responsibility, while respecting the values of justice, freedom, democracy and social solidarity.

Strategic Planning – Strategic Development Plan 2019–2028

As the country's oldest higher education institution, the National and Kapodistrian University of Athens is distinguished by its deep and strong roots. The present historical period is marked by fundamental and intense social and economic changes, as well as changes in the natural environment. NKUA ought to:

- Demonstrate adaptability, insight and visionary action in shaping its identity in harmony with new conditions, to preserve and enhance its historic role in higher education while remaining a major institution of the State.
- Attract and make use of genuine and diverse talents, as well as younger, distinguished and talented personnel, in a balanced manner across the full range of the University's mission; and seek resources to support the abilities and efforts of teaching staff and students, thereby providing an environment that facilitates success for all.
- Apply innovative approaches to teaching, learning and research.
- Create the conditions for distinction in all areas of the University's activity.
- Develop a sense of community and institutional responsibility.

For these reasons, NKUA has drawn up the Strategic Development Plan 2019–2028 (Government Gazette 1726, Series B, 6¹May 2020), intended to serve as an inspiration and guide for the future at a time when international competition exerts significant pressure; the landscape of higher education and research is being radically reshaped in a country that must emerge from a prolonged, multidimensional and profound crisis; society's expectations are high; technology is changing rapidly; and the global environment is prompting the reconsideration of almost every aspect of tertiary education.

Governing Bodies

Under the new legislative framework, the University's governing bodies are as follows:

¹ The complete Strategic Development Plan 2019–2028 is available [here](#).

Rectoral Authorities

- **Rector: Gerasimos Siasos**, Professor, School of Medicine, School of Health Sciences
- **Vice-Rectors**
 - Vice-Rector for Academic Affairs, International Relations and Outreach: Professor **Sofia Papaioannou**
 - Vice-Rector for Finance and Development: Professor **Aristeidis Samitas**
 - Vice-Rector for Administrative Affairs, Student Welfare and Lifelong Learning: Professor **Christos Karagiannis**

Council of Administration

- **RECTOR – CHAIR OF THE COUNCIL: Gerasimos Siasos**, Professor, School of Medicine, School of Health Sciences
- **DEPUTY CHAIR: Nikolaos Thomaidis**, Professor, Department of Chemistry, School of Science
- **INTERNAL MEMBERS**
 - Spyridon Vlachopoulos, Professor, School of Law
 - Dimitrios Kainourgios, Professor, Department of Economics, School of Economics and Political Sciences
 - Athanasia Smyrniotou, Professor, Department of Physical Education and Sport Science, School of Physical Education and Sport Science
 - Achilleas Chaldaiakis, Professor, Department of Music Studies, School of Philosophy
- **EXTERNAL MEMBERS**
 - Vasileios Vasileiou, Professor, Yale, USA
 - Anastasios Germenis, Emeritus Professor, Department of Medicine, University of Thessaly
 - Ayrin-Evelyn-Mikela-Mary Sharp, Honorary President of the Council of State
 - Georgios Stasinou, President of the Technical Chamber of Greece (TCG)
 - Pantelis Tzortzakis, Executive Vice-President of the Hellenic Development Bank

Senate

- Rector
- Vice-Rectors
- Deans of the Schools
- Chairs of Departments
- Representatives of staff categories

Executive Director

- **Dr Eleni Vasilopoulou**

Technical Council

- **Chair:** Professor Ioannis Tigkelis
- **Members:**
 - Nikolaos Kavantzias, Professor, School of Medicine, with alternate Pantelis Karaikos, Professor, School of Medicine, School of Health Sciences.
 - Georgios Vougioukalakis, Associate Professor, Department of Chemistry, with alternate Panagiotis Pafilis, Professor, Department of Biology, School of Science.
 - Zafeirios Tsolakidis, Associate Professor, Department of Law, School of Law, with alternate Ioannis Basiakos, Professor, Department of Economics, School of Economics and Political Sciences.
 - Petros Roussos, Associate Professor, Department of Psychology, School of Philosophy, with alternate Evdokia Balasi, Professor, Department of German Language and Literature, School of Philosophy.
 - Ioannis Avthinos, Professor, Department of Physical Education and Sport Science, with alternate Grigorios Bogdanis, Professor, Department of Physical Education and Sport Science, School of Physical Education and Sport Science.
 - Nikolaos Orfanoudakis, Professor, Department of Rural Development, Agro-Food and Natural Resources Management, with alternate Michail Vrachopoulos, Professor, Department of Rural Development, Agro-Food and Natural Resources Management, School of Rural Development, Nutrition and Sustainability.
 - Ioannis Pachygiannis, NKUA employee in the University Education (PE) Engineering branch, with alternate Maria Pagkalou, NKUA employee in the PE Architects branch,
 - Konstantinos Chousos, Civil Engineer, representative of the Panhellenic Association of Technical Companies (SATE), with alternate Evangelos Kasselas, Electrical and Mechanical Engineer, representative of the Panhellenic Association of Graduate Engineers–Public Works Contractors (PEDMEDE),
 - Efterpi Kontou, member of the Special Technical Laboratory Staff (ETEP), representative of NKUA Special Technical Laboratory Staff, with alternate Sofia Kounia, member of NKUA ETEP, and
 - Theodoros Chatzipavlou, NKUA employee, representative of the Administrative Staff, with alternate Georgios Lampos, NKUA employee.

Education: Studies, Benefits and Services

NKUA offers 41 Undergraduate Study Programmes bearing the names of the Departments that provide them. In addition, two English-language Undergraduate Study Programmes are offered exclusively to international students (the “BA Program in the Archaeology, History, and Literature of Ancient Greece” of the School of Philosophy and the “Medical Degree” of the Medical School).

During the 2025–26 academic year, 250 Postgraduate Study Programmes operated, 33 of which were taught in a foreign language.

Undergraduate Studies²

The minimum duration of study in most academic Departments is eight semesters. In the Department of Dentistry, the Department of Pharmacy and the Department of Music Studies, the minimum duration is ten semesters, while in the School of Medicine it is twelve semesters.

The first cycle of undergraduate studies consists of completing a programme comprising courses and other educational activities corresponding to at least 240, 300 or 360 credits (ECTS - European Credit Transfer and Accumulation System) for study programmes lasting eight, ten or twelve semesters, respectively. Each academic year includes educational activities corresponding to 60 credits. Course teaching is also supported by online courses posted on the NKUA e-Class platform (<https://eclass.uoa.gr/>).

A student graduates upon completing the minimum number of semesters required for a Level 6 degree (eight, ten or twelve semesters), provided that they have successfully passed the prescribed courses and accumulated the minimum required number of credits (240, 300 or 360). The Departments of Music Studies and Pharmacy award a “Single and Integrated Postgraduate-Level Degree – Integrated Master” (i.e., first-cycle students may obtain a Level 7 postgraduate qualification upon fulfilment of the required conditions and in accordance with the applicable legislation).

The degree certifies successful completion of the programme, and passing grades correspond to the classifications stated on the degree certificate as follows: Excellent (8.50 to 10.00), Very Good (6.50 to 8.49) and Good (5.00 to 6.49).

To meet the needs arising from student-exchange programmes with other countries and from any other foreign-language Undergraduate Study Programmes, NKUA's academic Departments include elective courses taught in English or other official languages of the European Union in their undergraduate curricula.

The structure and content of courses are determined by each Department's Study Programme, which is reviewed annually in light of new scientific and educational trends, new technologies, and labor-market requirements. The University's substantial number of officially established Laboratories, Clinics, Museums, Libraries and Reading Rooms, together with the Foreign Languages Teaching Centre and the Modern Greek Language Teaching Centre for international students, is considered particularly important for achieving a high standard of studies, since these facilities contribute to the educational process, research, and engagement with society.

Most Undergraduate Study Programmes offered at NKUA include specializations, allowing students to focus their studies if they so wish.

Certain academic Departments offer courses through which the pedagogical and teaching competence of graduates of those, or other Departments, may be certified. A relevant certificate is awarded following successful completion of these courses.

Courses completed by NKUA students within educational programmes (ERASMUS+, ERASMUS Traineeship) or other bilateral cooperation programmes with universities abroad are recognized with the corresponding ECTS credits and the grade awarded.

In every first-cycle study programme, students are given the opportunity to evaluate courses, instructors and the Department's overall Undergraduate Study Programme by completing relevant questionnaires.

Postgraduate Studies – Postgraduate Study Programmes

The National and Kapodistrian University of Athens (NKUA) offers a large number of Postgraduate Study Programmes (departmental, interdepartmental, inter-institutional and international), covering a wide range of

² Further information on the Study Programmes of all cycles at NKUA is available on the following webpage: <https://www.uoa.gr/spoydes/>

scientific fields and enabling both its own graduates and graduates of other academic institutions to advance knowledge and pursue their place in the labor market.

To strengthen international outreach and broaden its audience, NKUA has also organized and operates foreign-language Postgraduate Study Programmes.

Postgraduate Study Programmes are funded either through the regular budget or primarily through tuition fees. To ensure their sound operation and sustainability, NKUA also seeks other sources of funding, such as donations, sponsorships and research programmes. It also promotes a scholarship system based on socioeconomic criteria and student performance.

Doctoral Studies

NKUA Departments encourage innovation and research and offer graduates the opportunity to undertake a doctoral dissertation. For information on the terms and admission requirements for a Doctoral Study Programme, please visit the Departments' websites.

NKUA Departments offer the opportunity to undertake a jointly supervised doctoral dissertation in cooperation with other NKUA Departments, another Higher Education Institution in Greece or abroad, and/or other research and technological bodies (research institutes, foundations and research centers).

In addition, NKUA Departments may conclude special cooperation agreements with an industry or company for an industrial doctorate involving industrial or applied research, to produce research results for innovative products or services.

Postdoctoral Research

The University may cooperate with researchers conducting postdoctoral research in fields falling within the research disciplines of its Departments. Such cooperation may include supervision or advisory support for the postdoctoral research by one or more faculty members, access to scientific materials or equipment, or the assignment by the University of a specific research project, with or without remuneration.

Centre of Continuing Education and Lifelong Learning of the National and Kapodistrian University of Athens (CCELL-NKUA)

Lifelong Learning is directly connected with the University's mission, responding to the need for individuals to continuously improve, supplement and upgrade their knowledge, skills and competences, continue their personal and professional development, and actively adapt to the rapidly changing social and professional environment.

Every University activity concerning continuing education, further education, training and Lifelong Learning in general is implemented through NKUA's Centre of Continuing Education and Lifelong Learning (CCELL) and is founded on four pillars: developing cognitive abilities, cultivating professional skills, developing personal competences and cultivating social skills. CCELL is an independent academic unit of the University that organizes and coordinates educational programmes, ensures interdisciplinary cooperation and awards approved certificates. Its principal activities are:

- Continuing education for higher-education graduates on developments in science and technology.
- Specialization programmes for scientists in specific fields and applications whose subject matter requires extensive in-depth study.
- Summer schools and seminars on the latest research developments, the promotion of Greek culture and the Greek language, and economic development.
- Series of structured lectures and seminars in the sciences, arts and humanities, addressed to the general adult population.
- Actions to address contemporary forms of illiteracy (technological, financial, environmental, and relating to the management of the vast amount of available information), as well as counselling initiatives.
- Actions addressed to socially vulnerable groups and promoting the social economy.

Educational programmes and teaching methods are based on the principles of adult education, adapted to learners' needs, and delivered either in person, remotely through a dedicated platform, or through a blended method combining face-to-face and distance education:

The National and Kapodistrian University of Athens has a long tradition and extensive experience in this field. Since 2000, it has offered educational programmes covering more than 400 subject areas, which contribute to the development of a dynamic and competitive professional profile.

The academic standing of NKUA's professors, their experience in organizing educational programmes, and the University's comprehensive, modern infrastructure guarantee the quality and reliability of the educational services provided, together with the award of a recognized qualification carrying the prestige of the University.

Facilities and Amenities

The buildings used for education, research and administration form five university campuses (Zografou, Athens City Centre, Goudi, Dafni and Psachna, Euboea).

The Rectorate ³and many of the University's administrative services are located in the heart of the city, as are the restored historic building of the Law School, several University departments and other important NKUA buildings, including the Students' Club, housed in a neoclassical building on Ippokratous Street; the former Chemistry Building, which has been renovated; and the Teaching Staff Club, housed in the restored "Kostis Palamas" building. Near central Athens is the Ilissia University Campus, extending over 320 acres and housing the Schools of Philosophy and Theology, the School of Science, and the Department of Pharmacy. The Medical School is located in Goudi, together with the other Departments of the School of Health Sciences, namely the Departments of Dentistry and Nursing.

Table 1. NKUA facilities and services supporting undergraduate and postgraduate students.

Support Amenities	Counseling Services	Educational and Recreational Facilities
Unit of Coequal Access for persons with disabilities and persons with special educational needs	Psychosocial Intervention Unit	9 building complexes of University Libraries (in Schools), 2 Libraries-Reading Rooms in the University Club
Health Care Service	Student's Ombudsman	Computing Centre
Student Meals Department	Laboratory of Student Psychological Counseling	Multimedia Service for Students
Student Aid Fund	Public Relations and Job Placement Department	Student Residences (4 buildings)
Scholarships and Awards		Gerostathopoulos University Observatory
Support Unit for Foreign Students		Modern Greek Language Teaching Centre
		Foreign Languages Teaching Centre
		University Gym, Swimming Pool and Sports Center
		Cultural Club

The School complexes contain auditoria and classrooms with modern information-technology and audiovisual equipment, fully equipped teaching and research laboratories, libraries, and other supporting infrastructure. NKUA owns substantial real estate and endowments, whose income is used mainly for student scholarships and awards and to support public health. The University's facilities include, among others, nineteen thematic Museums, the University History Museum, the Historical Archive, the University Observatory, three University Hospitals, an eleventh-century Byzantine university church, the Foreign Languages Teaching Centre, the Modern Greek Language Teaching Centre for non-native speakers, the Centre of Continuing Education and Lifelong Learning, a computing center, eleven libraries, four student-residence buildings, student restaurants, reading rooms, a university gymnasium, swimming pool and sports center, facilities for students' cultural associations, and two childcare centers. Permanent counselling and healthcare services are also provided, along with services established according to circumstances and needs.

³ University Central Building – *Propylaea*
30 Panepistimiou Street, 106 79 Athens



The Department of Geology and Geoenvironment

The Department of Geology and Geoenvironment

Establishment and Administration

The Department of Geology and Geoenvironment covers the field of Geosciences and, together with the Departments of Mathematics, Physics, Chemistry, Biology, Informatics and History and Philosophy of Science, belongs to the School of Science of the National and Kapodistrian University of Athens. It offers Undergraduate, Postgraduate and Doctoral Study Programmes and has more than 50 years of operation and service to society, while also demonstrating noteworthy activity in research and innovation.



History

The history of the Department begins in 1839, when the Rector at the time and Professor of the Chair of Natural History, Iraklis Mitsopoulos, seeking to draw the government's attention to natural-history studies, stated in his annual report:

«Natural History requires more than one chair, since Mineralogy, compelled to explore the still unexplored and virgin land of Greece and reveal its hidden treasures, certainly requires a separate chair, etc.; these would render this institution both more illustrious and more beneficial to the public.»

In 1935, the Department of Natural Sciences was established as the fifth department of the School of Physics and Mathematics, and the School consequently began awarding, among other qualifications, a degree in Natural

Sciences and Geography.

In 1970, the Department of Natural Sciences and Geography was divided into the independent Departments of Biology and Geology, awarding the corresponding degrees; in 1982, the Department's six Sections were established and remain in place today.

In 2004, the Department of Geology was renamed the "Department of Geology and Geoenvironment", simultaneously expanding its remit to cover all areas of the Geosciences related to the environment.

Administrative Organization of the Department of Geology and Geoenvironment

The governing bodies of the Department, as of all Departments of Higher Education Institutions, are:

- The Chair and Deputy Chair (who substitutes for the Chair whenever the latter is unable to perform their duties).
The current Chair of the Department (term of office 2025–2028) is Professor Dr A. Antonarakou, and the Deputy Chair is Professor Dr I. Alexopoulos.



- Division of Economic Geology and Geochemistry
- Division of Dynamic, Tectonic and Applied Geology

Laboratories

Within its six Divisions, the Department operates [12 officially established Laboratories](#) comprising approximately 18 Laboratory Units in total.

Division of Historical Geology and Palaeontology	Laboratory of Historical Geology and Biogeosciences Laboratory and Museum Research Centre Laboratory of Geoscience Education
Division of Dynamic, Tectonic and Applied Geology	Laboratory of Tectonics and Geological Mapping Laboratory of Natural-Hazard Prevention and Management
Geography and Climatology	Laboratory of Physical Geography Laboratory of Climatology and Atmospheric Environment Laboratory of Remote Sensing
Division of Geophysics and Geothermics	Laboratory of Seismology Laboratory of Geophysics
Division of Mineralogy and Petrology	Laboratory of Mineralogy and Petrology
Division of Economic Geology and Geochemistry	Laboratory of Economic Geology and Geochemistry

Museums

Museum of Mineralogy and Petrology⁴



NKUA's Museum of Mineralogy and Petrology is the most important museum of its kind in Greece, with a long research and educational tradition. The Museum holds the oldest and most complete mineralogical and petrographic collection in Greece, as well as a collection of international significance featuring world-class mineral specimens. The collections of the Museum of Mineralogy and Petrology were created within the Natural History Society, founded in 1835. To date, it has welcomed thousands of primary- and secondary-school pupils, undergraduate and postgraduate students, mineral collectors, and Greek and international researchers, serving as an important link between science and society. The Museum belongs to the Department of Geology and Geoenvironment, located on the Zografou University Campus. It comprises four halls, together with a laboratory, office, and storage areas, with a total area of approximately 1,200 m².

Most of the Museum's exhibits were acquired through donations of specimens from Greece and abroad. The Museum obtained its first important collections in 1858 and 1860 through donations by Kämmerer and Kharitov, a ministerial adviser and consul in St Petersburg, respectively, comprising mineral and gemstone specimens from Imperial Russia. Other major donations of minerals from Greece were those of Otto and Amalia in 1863, A. Lindermayer in 1868, and Fokion Negris in 1928.



Today, the Museum of Mineralogy and Petrology holds at least 10,000 mineral specimens and 15,000 rock and ore specimens, of which approximately 3,000 mineral specimens and 650 rock specimens are displayed in its showcases. The Museum has the finest systematic mineral collection in Greece, containing more than 700 mineral species classified within all recognized classification categories. The Museum's collections also include a rich historical archive containing original donation documents and historic geological maps.

The importance of the Museum's collection lies not only in its presentation of exceptionally aesthetic mineral specimens, but also in the abundance and quality of specimens from "historic" localities of the former Austro-Hungarian Monarchy and Imperial Russia, as well as other well-known foreign localities such as Cornwall, Vesuvius and the Alps, especially sites now known only from the literature. Unique exhibits cover a broad spectrum of minerals and gemstones mined in the eighteenth and nineteenth centuries, mainly in the Urals and Siberia. Many are type-locality minerals—that is, minerals first identified worldwide at those particular localities. Outstanding specimens include platinum, malachite and gemstones comparable only to those in the world's largest mineralogical collections: topaz, alexandrite, emerald, sapphire, aquamarine and numerous other "historic" specimens of great aesthetic and

⁴ Museum website: <http://museums.geol.uoa.gr/mineralogy/>

historical value, some among the finest of their kind. A scepter-shaped smoky quartz specimen mined in Minas Gerais, Brazil, possibly the largest quartz scepter in the world, is a unique Museum exhibit. A prominent place is also occupied by specimens from “classic” Greek localities, including Lavrion, Serifos and Chalkidiki. The Museum’s first hall is devoted to Lavrion, a region that played an important role in the “course of history” and the development of civilization and is also a mineralogical “paradise”. The Lavrion collections contain unique exhibits dating from the late nineteenth to the early twentieth century, as well as exceptional specimens of extremely rare minerals from the Lavreotiki district, where more than 750 different mineral species have been identified, representing 12% of the world’s known minerals.

Museum Educational Activities and Educational Programmes

The collections of the Museum of Mineralogy and Petrology support the educational work of the Department of Geology and Geoenvironment at undergraduate and postgraduate level, strengthening scientific research and the transmission of knowledge both within the university community and to the wider public. To fulfil its objectives, the Museum creates and maintains teaching and research collections from Greece and abroad, conducts scientific research, and organizes lectures, exhibitions, educational programmes and other events that help disseminate knowledge and promote and protect the country’s finds. By educating and training school and university students in Mineralogy, Petrology and Geology, and by disseminating knowledge of the Greek natural environment more broadly, it contributes to their environmental awareness.

Responding to current demands and the gradual transition towards renewable energy sources, specific raw materials and critical metals, the Museum of Mineralogy and Petrology aims to highlight and scientifically document mineralogical collections from regions of Greece that have high-technology applications. The need to demonstrate the importance of mineral wealth makes one of the Museum’s foremost objectives imperative: the direct dissemination of knowledge to non-specialist audiences through interactive and digital educational programmes.

The Museum provides guided tours to thousands of visitors each year. These include free guided tours for people with disabilities, conducted by specially trained Museum staff following their participation in the experiential seminar “Understanding Disability”, organized by the Hellenic Association of Artistic Programmes for Persons with Special Needs in cooperation with and with the support of the Ministry of Culture. As part of university museums’ outreach, the Museum participates in numerous events, international mineral exhibitions and workshops, including “Sustainable Development and Education”, “Sunday Mornings at the Museum of Mineralogy”, and “Researchers’ Night”. It also runs interactive educational programmes for pupils, teachers and educators in primary and secondary education. Their purpose is to focus attention on the inseparable relationship between the living world and the mineral world.

In the service of education and interdisciplinarity, the Museum makes its collections available for research, study and practical training to undergraduate and postgraduate students not only from the Department of Geology and Geoenvironment but also from other Departments, including the Department of History and Philosophy of Science, the Department of Informatics and Telecommunications, and the Postgraduate Programme in Museology. The results of these collaborations have been presented over time in postgraduate theses, scientific workshops and conferences.

The Museum of Mineralogy and Petrology is located on the ground floor of the Department of Geology and Geoenvironment, University Campus, 15784 Zografou, Athens.



Museum of Paleontology and Geology⁵



NKUA's Museum of Paleontology and Geology is Greece's oldest and richest center of paleontological research in terms of its finds and conducts scientific research and rescue or planned excavations throughout the country in fields related to its subject matter.

The collection of the first natural-history specimens—animals, plants, fossils, rocks and minerals—began with the establishment of the Natural History Society in 1835 and formed the original core of the Natural History Museum. The Natural History Museum was incorporated into the University of Athens in 1858, while its collections were continuously enriched through donations, purchases and material collected during research in Greece. In 1906, NKUA's Museum of Paleontology and Geology

began its independent course and was housed on the ground floor of the building at the corner of Akadimias and Sina Streets in Athens. After 1932, it operated under a law that gave it extensive research opportunities and ensured the protection of mammalian fossils. In 1981, the Museum was transferred to the University Campus, to the School of Science building within the premises of the Department of Geology and Geoenvironment. In 1989, the Pikermi fossils were presented outside the Museum for the first time as part of the temporary exhibition "Attic Landscape and Environment". In 1994, the first exhibition concerning the Museum's excavations in Charkadio Cave was held on Tilos. In 1998, the Vrisa–Lesvos Natural History Collection was established as a branch of the Museum in premises provided for this purpose by the Municipality of Polichnitos.



The collection of the Museum of Paleontology and Geology and its branch includes animal and plant fossils from throughout Greece, covering more than 300 million years of the country's geological history, and is distinguished by its richness—numbering tens of thousands of specimens—the excellent preservation and uniqueness of its material. It also includes specimens from abroad, micropaleontological and stratigraphic collections, and reconstructions of paleoenvironments dating from the early twentieth century. Its collections are enriched with finds originating exclusively from research programmes conducted by members of the Section of Historical Geology and Paleontology, paleontological excavations carried



out by faculty members, and donations. The aim is to secure annually the basic resources required for planned paleontological excavations and specimen collection, improve the presentation of exhibits, create three-dimensional reconstructions of the most impressive animals that lived in Greece, and present Greece's geotectonic zones using appropriate specimens.

In the Museum's exhibition area, visitors can admire some of the most important fossils found in Greece, as well as landmark fossils in the history of the evolution of life on Earth, travelling back through time with fossils as their guide. A central position in

the Museum hall is occupied by the world-famous Pikermian fauna, including primitive hipparions, saber-toothed cats, gazelles, giraffes, rhinoceroses and hyenas that lived approximately seven million years ago on the plains covering the Greek region, as well as the famous fossil mammals from Isoma Karyon near Megalopolis that lived during the Pleistocene. The exhibits include reconstructed skeletons of endemic mammals, a hipparion and a Pikermian rhinoceros. More recently, the Museum collections have been supplemented by a lifelike reconstruction of the Tilos dwarf elephant *Elephas tiliensis* and a life-size reconstruction of a giant tortoise that lived during the Late Miocene. In 1985, as part of the Vertebrate Paleontology course laboratories and the preparation of postgraduate projects and theses, a systematic effort began to conserve and catalogue old collections that had remained in boxes for more than 100 years. A basic comparative collection was also established, followed more recently by a database. The Museum's collections include various holotypes, such as the skull of *Choerolophodon chioticus*, a primitive

⁵ Museum website: <http://paleo-museum.uoa.gr/paleontology/index.php?lang=el>

proboscidean that lived on Chios 14 million years ago. Plant fossils in the exhibits provide irrefutable evidence of the evolution of past flora. Specimens are displayed from the Oligocene of Evros, the Miocene of Kymi, Ellassona and Vegora, and the first appearance of modern Mediterranean flora on Santorini 60,000 years ago. The marine world is represented by fossil mollusks, brachiopods, corals, sponges, echinoids and fish, as well as a replica skeleton of a mosasaur (*Mosasaurus*) that lived 70 million years ago.

In May 2010, the exhibition was extended into Hall B–C, which, in addition to permanent exhibits, is intended to host temporary exhibitions, includes an area configured for screenings and events, and provides space for educational programmes for university students, trainees and school pupils.

Every year, the collections are visited by dozens of international researchers, postgraduate students and doctoral candidates. The Museum serves as a venue for education and practical training for undergraduate and postgraduate students of the Department of Geology and Geoenvironment and the Department of Biology, students of the Department of Conservation of Antiquities and Works of Art of the Technological Educational Institute of Athens, and postgraduate students of NKUA's Interdepartmental Postgraduate Programme in Museology.

It is open to the public with the aim of disseminating knowledge and raising awareness of issues relating to the promotion and protection of Greece's paleontological heritage. Perhaps the most important step in this direction was taken in 1984, when, following years of representations and a decision by the Central Archaeological Council, the Pikermi excavation area was designated an archaeological site of exceptional natural beauty. With the support of the Section's faculty members, the Museum organizes and holds various exhibitions and events, for example at the Zappeion, the Eugenides Foundation, the Library of Alexandria, the House of Cyprus, Tilos and Isoma Karyon. It receives daily visits from schools and organizes educational programmes for pupils; to help them better understand the exhibits and the exhibition, guided tours are provided by its scientific staff, most of whom hold doctoral degrees.

Department Secretariat

The Department Secretariat consists of the Head of Secretariat and administrative staff. It is located in the Department of Geology and Geoenvironment building and is open to the public on Monday, Wednesday and Friday from 11:00 to 14:00. The Department of Geology and Geoenvironment is connected to NKUA's electronic ⁶request-submission service. Requests addressed to the Department Secretariat are now received and registered electronically through the website <https://eprotocol.uoa.gr>, which hosts the platform. Access to the University's electronic request-submission service is obtained using Taxisnet credentials or the applicant's academic account.

Postal address: Department of Geology and Geoenvironment, University Campus, 157 84 Zografou, Athens

Email address: secre@geol.uoa.gr

Table 2. Secretariat staff of the Department of Geology and Geoenvironment.

Department Secretariat Staff		
Athanasia Michopoulou	Head of Secretariat	210 727 4279, nancym@geol.uoa.gr
Eleni Chrysopoulou	Secretariat Staff	
Taxiarchis Skenteris	Secretariat Staff	
Kelly Choraopoulou	Secretariat Staff	

Postgraduate students contact the Department Secretariat only on matters falling within the Department's jurisdiction, and not on matters concerning the respective MSc Programme.

Infrastructure – Department Premises

The Department of Geology and Geoenvironment is housed in the School of Science building complex on the University Campus. The Department occupies the western section of the complex.

⁶CLARIFICATION: For general information and administrative-support enquiries, please contact only the Secretariat's telephone numbers or email address (secre@geol.uoa.gr), and not the NKUA online application platform [eprotocol](https://eprotocol.uoa.gr).

The main entrance to the Department of Geology is on the western side of the building. A second entrance is located on the eastern side at a level corresponding to the second floor. The Department is internally connected to the other Departments in the complex by a network of corridors.

Teaching Rooms

The Department has three large-capacity auditoria (A13, Drakopoulos Auditorium and FM1) and several smaller teaching rooms (G1–G15). The rooms are equipped with the necessary electronic facilities for visual and audio presentation and internet access. The auditoria also have sound-amplification systems.

Laboratory Rooms

Laboratory rooms are distributed throughout the premises of the Sections and equipped according to the needs of student practical training in each subject area, including microscopes, collections of rock and fossil specimens, seismographs, maps, preparation facilities, chemistry-laboratory equipment and analytical instruments.



E-Learning Rooms

For the education of undergraduate and postgraduate students, the Department of Geology and Geoenvironment provides computer teaching rooms equipped with computers and specialized software for the study, analysis and processing of geological data.

Core Facility

On the ground floor of the Department of Geology and Geoenvironment, there is access to the central analytical facility (Core Facility), which serves the School of Science. Among other facilities, it houses the electron-microscopy, Raman spectroscopy, and inductively coupled plasma mass spectrometry (ICP-MS) laboratories.

Libraries

The School of Science Library meets the needs and requirements of the School's Departments and the



independent Departments of Pharmacy and History and Philosophy of Science. It is housed on the first and second floors of the Department of Mathematics building on the Zografou University Campus.

Information telephone: 210 7276599

Secretariat telephone: 210 7276525,

Website: www.lib.uoa.gr/sci

Email: sci@lib.uoa.gr

Loans email: sci-loan@lib.uoa.gr

Opening hours: Monday to Friday, 08:30–19:30; Saturday, 09:30–14:30. The Library is closed on official holidays as determined by the Rector's Council. During holiday periods (Christmas, Easter and summer), opening hours are adjusted accordingly.

Departmental Study Programmes

Undergraduate Study Programme

Each academic year is divided into two (2) teaching periods, called semesters: the winter and spring semesters. Courses in the Department's curriculum are classified as compulsory or elective and are distributed across eight (8) semesters. During the winter semester, courses corresponding to semesters A, C, E and G of the indicative curriculum are taught. During the spring semester, courses corresponding to semesters B, D, F and H are taught.

Students of the Department of Geology and Geoenvironment are educated through lectures, laboratory exercises and field exercises, and complete their studies by preparing a thesis.

Postgraduate Study Programme

The following Postgraduate Study Programmes operate in the Department of Geology and Geoenvironment of the National and Kapodistrian University of Athens:

- i. Tectonics, Hydrogeology and Engineering Geology
- ii. Environmental, Disaster and Crisis Management Strategies
- iii. Earth and Environmental Sciences
- iv. Museum Studies (Inter-institutional)
- v. Paleontology and Geobiology (Inter-institutional)
- vi. Oceanography and Marine Environment Management (Inter-institutional)
- vii. Water, Biosphere and Climate Change (Inter-institutional)
- viii. Geographic Information Systems (G.I.S.)
- ix. Industrial and Environmental Applications in Micropaleontology (Energy and Environmental Applications in Micropaleontology)
- x. Hydrocarbon Exploration and Exploitation (Inter-institutional)
- xi. MSc in Archaeological Science (Interdepartmental)



The Post-graduate Programme of Studies «Exploration and Sustainable Exploitation of Mineral Resources»

The need to establish the Postgraduate Study Programme

Establishment and Regulations

The MSc Programme entitled “Exploration and Sustainable Exploitation of Mineral Resources” is supported by the Department of Geology and Geoenvironment of the National and Kapodistrian University of Athens (NKUA). The establishment of the Programme was approved at the 5th meeting of the NKUA Senate on 4 February 2026.

The subject area of the MSc Programme is the scientific field of economic geology and mineral deposits, encompassing the exploration, extraction, management and sustainable exploitation of mineral raw materials (metallic, energy, industrial and other mineral resources).

Purpose of the MSc Programme

The purpose of the MSc Programme is to meet contemporary requirements for the education of specialized scientific personnel, provide high-level scientific and technological training, and prepare the next generation of researchers and executives capable of successfully addressing the complexity of problems arising in every modern field of activity relating to the exploration, discovery, extraction, exploitation and sustainable management of mineral resources.

Learning outcomes

Upon successful completion of the Programme, graduates will be able to:

- develop and apply innovative ideas in basic and, above all, applied research on Mineral Raw Materials, based on the knowledge and skills acquired;
- solve problems in the Exploration and Sustainable Exploitation of Mineral Resources in new or unfamiliar environments and situations within a broader interdisciplinary context;
- integrate knowledge and apply their acquired skills comprehensively in complex situations, enabling them to substantiate their judgement and make decisions, even on the basis of incomplete information and data;
- manage contemporary challenges in the exploration, evaluation and exploitation of mineral raw materials, taking environmental, economic and social factors into account.

The Degree Awarded

The MSc Programme awards a **Postgraduate Studies Diploma (MSc)** in “**Exploration and Sustainable Exploitation of Mineral Resources**” (**MSc**) involving advanced study of the geosciences and modern techniques and technologies for the exploration, discovery and evaluation of mineral raw materials; the study of contemporary methods for their management and sustainable exploitation; an understanding of legislation and policies relating to mineral-deposit exploration, the extractive industry, mining in general and sustainable development; training in modern data-analysis and geospatial-visualization techniques for mineral-deposit exploration and the sustainable exploitation of mineral raw materials; and the development of critical thinking and decision-making skills for the sustainable and responsible management of mineral resources (90 ECTS).

Duration of Studies

The **duration of study** in the MSc Programme leading to the award of the Postgraduate Studies Diploma is **three (3) academic semesters**, including the period required to prepare the Master’s thesis.

Governing Bodies of the MSc Programme

In accordance with Law 4957/2022 and the University's Regulations for Second- and Third-Cycle Studies, the bodies responsible for the operation of the MSc Programme are:

At University level, the **Postgraduate Studies Committee** and the **Senate**.

At Department level, the **Assembly of the Department of Geology and Geoenvironment**, whose responsibilities include the following:

- appointing the Director and the members of the Coordinating Committee of each MSc Programme of the Department;
- establishing Committees to evaluate applications from prospective postgraduate students and approving their enrolment in the MSc Programme;
- assigning teaching duties among the MSc Programme's instructors and, under the supervision of an MSc Programme instructor, assigning supplementary teaching duties to doctoral candidates of the Department or School;
- establishing examination committees for the assessment of postgraduate students' Master's theses and appointing a supervisor for each thesis;
- certifying the successful completion of studies and awarding the Postgraduate Studies Diploma.

The **MSc Programme Coordinating Committee (CC)** consists of the Director of the MSc Programme and four (4) members of the Department's Teaching and Research Staff (faculty), as well as emeritus professors, whose subject area is related to that of the MSc Programme and who undertake teaching duties in it. The CC is responsible for monitoring and coordinating the Programme's operation. Its responsibilities include:

- the financial management of the MSc Programme;
- approving the award of scholarships, whether work-study or otherwise, in accordance with the decision establishing the MSc Programme and the Regulations for Postgraduate and Doctoral Studies; planning amendments to the curriculum and submitting them to the Departmental Assembly;
- recommending to the Departmental Assembly the redistribution of courses among academic semesters, as well as matters relating to the qualitative enhancement of the curriculum.

The Director of the MSc Programme is selected from among the Department's faculty members, preferably at the rank of Professor or Associate Professor, and is appointed by decision of the Departmental Assembly for a two-year term, renewable without limitation. The Director has the following responsibilities:

- chairs the CC, prepares the agenda and convenes its meetings;
- submits matters concerning the organization and operation of the MSc Programme to the Departmental Assembly;
- submits to the CC and the other bodies of the MSc Programme and the Higher Education Institution matters relating to the effective operation of the MSc Programme;
- serves as the Programme's Scientific Coordinator and exercises the corresponding responsibilities;
- monitors implementation of the decisions of the MSc Programme's bodies and of the Internal Regulations for Postgraduate and Doctoral Study Programmes, as well as execution of the MSc Programme budget;
- exercises any other responsibility specified in the decision establishing the MSc Programme.

The MSc Programme "Exploration and Sustainable Exploitation of Mineral Resources" is supported **by the Programme Secretariat**, which is based in NKUA's Department of Geology and Geoenvironment and **operates under the supervision of the Secretariat of NKUA's Department of Geology and Geoenvironment**. The MSc Programme Secretariat provides administrative support for the Programme, including preparation of the candidate-admission procedure, maintenance of the Programme's financial records, administrative support for the CC, registration of grades, and related duties.

Contact Details

Director of the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources”

Tel...: 210 727 4863,

e-mail: aantonar@geol.uoa.gr

Dr Asimina Antonarakou

Professor of Micropaleontology, Marine Geology and Geoscience Education

Postgraduate Study Programme Secretariat

Tel...: 210 727 4783

Paraskevi Tsiouma

e-mail: ptsioum@geol.uoa.gr

Categories and Number of Admitted Students

The MSc Programme accepts university graduates of Departments of Geology and Geoenvironment, Geology and Mineral Resources Engineering, Schools of Mining and Metallurgical Engineering and Mineral Resources Engineering, and related Departments in Greece, as well as graduates of Departments of recognized equivalent institutions abroad and graduates of Technological Educational Institute Departments in a relevant discipline.

The maximum number of students admitted to the Postgraduate Study Programme is set at **twenty (20) in total**. The maximum intake is determined in accordance with the number of instructors in the MSc Programme and the student-to-instructor ratio, available infrastructure, teaching rooms, and graduates' absorption by the labor market.

In addition to the number of admitted students, one (1) member of the Special Educational Staff (SES), Laboratory Teaching Staff (LTS) or Special Technical Laboratory Staff (STLS) categories may be admitted each year, provided that the work they perform at the University is related to the subject area of the MSc Programme.

State Scholarships Foundation (SSF) scholars and international scholars of the Greek State in the same or a related subject area may be admitted without examinations, provided that they meet the Programme's admission terms and conditions.

Admission Criteria – Selection and Admission Procedure

Students are selected in accordance with the legislation in force, the NKUA Regulations for Postgraduate and Doctoral Studies, and the provisions of these Regulations.

Each May, following a decision of the Assembly of NKUA's Department of Geology and Geoenvironment, a call for applications for admission to the MSc Programme is published and posted on the websites of the Department and the University. Applications and the required supporting documents are submitted to the MSc Programme Secretariat within the deadline specified in the call, which may be extended by decision of the Departmental Assembly.

The Departmental Assembly assigns the admission-selection procedure to the CC.

The required supporting documents are:

- Application form
- Curriculum vitae
- Photocopy of both sides of the national identity card or passport
- Copy of degree certificate or certificate of completion of studies
- Transcript of undergraduate course grades
- Certificate of English-language proficiency at a minimum level of B2. A candidate who does not hold a qualification or equivalent certificate of English-language proficiency may request certification of their level through written and oral examinations before a Special Examination Committee appointed by the CC.
- Letters of recommendation
- Scientific publications, where applicable
- Evidence of professional or research activity, where applicable

- Certificate of proficiency in Greek or sufficient knowledge of the Greek language, as verified by the CC, for international candidates.
- Recognition of a foreign academic qualification. The relevant procedures are described in detail in the MSc Programme Regulations and determined by the legislation in force.
- Certificates of computer skills, training seminars related to the programme's subject areas, etc.

Candidates are evaluated and admitted based on the following criteria:

1. Undergraduate degree grade (30%)
2. Grade in undergraduate courses related to the subject area of the MSc Programme (10%)
3. Grade of an undergraduate dissertation or thesis related to the subject area of the MSc Programme, where applicable (10%)
4. Knowledge of other foreign languages (5%)
5. Relevant research activity, scientific publications and participation in conferences (5%)
6. Relevant professional activity (5%)
7. Possession of a postgraduate or doctoral degree (5%)
8. Oral interview before a three-member committee appointed by the CC (30%)

On the basis of the overall criteria, the CC draws up the candidate evaluation table and submits it to the Assembly for approval.

Successful candidates must enroll with the MSc Programme Secretariat within thirty (30) days of the Assembly's decision. In the event of tied scores, mathematically rounded to the nearest whole number on the 100-point scale, the tied candidates are admitted up to a number not exceeding 10% of the maximum intake.

If one or more admitted students fail to enroll, the next candidate on the approved ranking list, where available, will be invited to enroll in the MSc Programme.

Interruption and Suspension of Studies

Part-time study is available following a reasoned application by the student and approval by the Assembly.

The following students are entitled to apply for part-time study:

- i. students who can demonstrate that they work at least twenty (20) hours per week;
- ii. students with disabilities and special educational needs;
- iii. students who are also athletes and, during their studies, belong to sports clubs registered in the electronic register of sports clubs under Article 142 of Law 4714/2020 (Series A, 148), maintained by the General Secretariat of Sports. The specific requirements are set out in detail in the Programme Regulations.

The duration of part-time study may not exceed **six (6) academic semesters**. The maximum duration of study also applies in this case.

An extension may be granted following a reasoned application by the student and approval by the Assembly or the Study Programme Committee. The extension may not exceed the number of semesters of the MSc Programme's standard period of study. The maximum permitted period for completing the programme is therefore set at **six (6) academic semesters**.

Students **who have not exceeded the maximum period of study** may, following a reasoned application to the Departmental Assembly, **suspend their studies for a period not exceeding two (2) consecutive semesters**. Suspension of studies is granted for serious reasons. The application must state the reasons and be accompanied by all relevant supporting documents from competent public authorities or organizations proving the grounds for suspension. Student status is suspended during the interruption of studies, and participation in any educational process is not permitted. Semesters during which student status is suspended are not counted towards the prescribed maximum duration of standard study.

At least two weeks before the suspension period ends, the student must re-enroll in the Programme in order to continue their studies with the rights and obligations of an active student. Students may apply to terminate their suspension and return to the Programme only where they originally requested suspension for two consecutive

academic semesters. An application to terminate the suspension must be submitted no later than two weeks before the beginning of the second semester of suspension.

The duration of a suspension or extension of study is considered and approved on a case-by-case basis by the CC, which submits its recommendation to the Departmental Assembly.

Educational Process – Study Programme

The MSc Programme begins in the winter semester of each academic year.

To obtain the MSc degree, students must complete **a total of ninety (90) credits** (ECTS). All courses are taught weekly and, as appropriate, include lectures, laboratory exercises, seminars, field exercises, etc.

The language of instruction and of the Master's thesis is Greek and, where appropriate, English (e.g., lectures by visiting professors), while the Master's thesis may be written in Greek or English.

During their studies, postgraduate students are required to attend and successfully complete postgraduate courses, engage in research and write scientific papers, and prepare a Master's thesis. The thesis is completed during the third (C) semester and is awarded thirty (30) ECTS.

The MSc Programme does not require an internship.

Courses are taught **in person**, in accordance with the legislation in force and the provisions of Article 7 of the Internal Regulations.

Course lectures are delivered in person, while other activities—such as research for written assignments, review of instructional material, and completion of closed- or open-ended exercises—may be carried out using asynchronous distance-education tools.

The student-assessment and feedback tools used in distance education are: (a) Exercises: production of closed-ended exercises (multiple choice, matching and gap filling); (b) Assignments: management, submission and grading of assignments; (c) Questionnaires: creation of polls and surveys; (d) Gradebook: recording learners' grades; (e) Attendance register: recording learner attendance and absences; (f) Mid-term tests: helping learners improve their performance and achieve their goals; and (g) Statistics: user statistics.

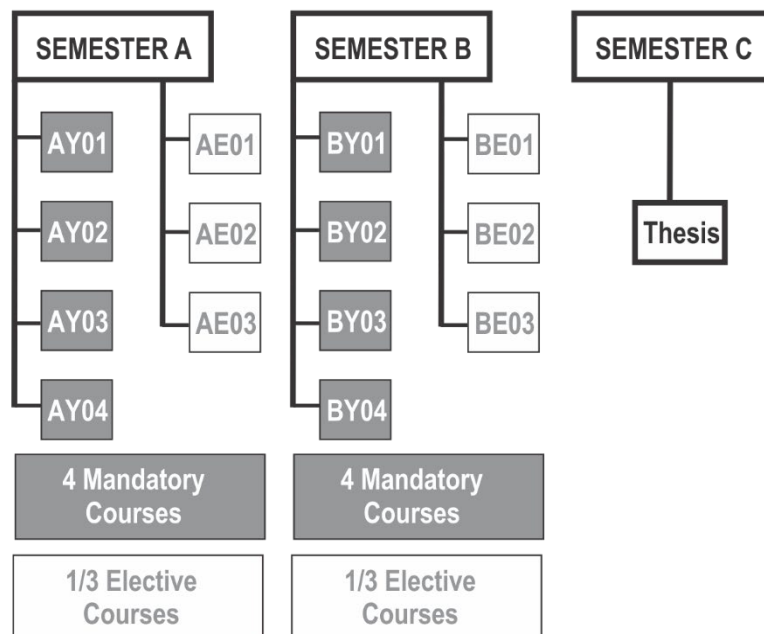
The technological equipment students need in order to use distance-education tools may consist of a personal computer with an internet connection or a portable device such as a tablet or smartphone with an internet connection.

Structure of the MSc Programme

The Programme lasts three semesters:

- Semester A: Students attend four compulsory courses and one elective course.
- Semester B: Students attend four compulsory courses and one elective course.
- Semester C: Students prepare a Master's Thesis (MT).

STRUCTURE OF THE POSTGRADUATE PROGRAM EXPLORATION AND SUSTAINABLE EXPLOITATION OF MINERAL RESOURCES



Teaching Staff

The teaching staff of the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” are drawn primarily from the teaching staff of the Department of Geology and Geoenvironment, in accordance with the applicable legislation.

The MSc Programme may also be taught by professors from other Departments of the National and Kapodistrian University of Athens and by visiting professors from other Higher Education Institutions and research institutions in Greece who have expertise and recognized standing in the subject areas of the Programme’s courses.

Scientists of recognized professional standing in fields related to the subject areas of the MSc Programme may also teach in the Programme, following the procedures prescribed by the legislation in force.

Course List

The indicative course list is as follows:

Semester A			
Mandatory Courses		Teaching Hours/ week	ECTS
AY01	Mineral Deposits of Critical and Strategic Mineral Raw Materials (CRM)	3	6
AY02	Applications of Remote Sensing in Mineral Exploration – Introduction to Machine Learning	3	6
AY03	Mineral exploration mapping, sampling and the use of modern portable equipment	3	6
AY04	Geochemical and Geophysical Survey Methods in Mineral Exploration	3	6
Elective Courses (1 of 3 is selected)		Teaching Hours/ week	ECTS
AE01	Digital mapping and GIS in mineral exploration	3	6
AE02	Applications of Microscopy in the Exploration and Evaluation of Mineral Raw Materials	3	6
AE03	Mining Activity and Sustainability	3	6
Total		15	30

Semester B			
Mandatory Courses		Teaching Hours/ week	ECTS
BY01	Introduction to Mining Project Management – Health and Safety in Exploration and Mining	3	6
BY02	Introduction to Geostatistics – Applications of Geostatistics in mineral exploration, resource estimation and resource management	3	6
BY03	Hydrocarbon reservoirs and geological storage of CO ₂	3	6
BY04	Geotechnical Assessment of Open Excavations and Underground Works	3	6
Elective Courses (1 of 3 is selected)		Teaching Hours/ week	ECTS
BE01	Mining Project Permitting and Environmental Management	3	6
BE02	Industrial Minerals and Sustainable Development	3	6
BE03	Tectonics in the Exploration and Exploitation of Mineral Raw Materials	3	6
Total		15	30

Semester C			
Mandatory Courses		Teaching Hours/ week	ECTS
MT	Master's Thesis (MSc Thesis)		30
Total			30

Seminars

The MSc Programme provides for invited lectures and seminars on specialized topics related to the Programme's subject areas.

A Seminar on Scientific Writing and Master's Thesis Preparation is also provided.

Assessment of Postgraduate Students

The educational work of each academic year is divided into two semesters, winter and spring, each comprising at least thirteen (13) weeks of teaching and three (3) weeks of examinations. Courses of both the winter and spring semesters are re-examined during the September examination period. If a course cannot be held, a replacement session is scheduled on a date and at a time posted on the MSc Programme website and the synchronous-learning platform.

Attendance at courses, laboratories and other activities is compulsory. A postgraduate student is considered to have attended a course—and is therefore entitled to sit its examinations—only if they have attended at least 70% of the course hours. Otherwise, the student must repeat the course in the following academic year. If a student's absences exceed 50% across all courses, the possibility of removal from the Programme is raised. The matter is examined by the CC, which submits its opinion to the Assembly of the School/Department.

Postgraduate students' assessment and performance in the courses they are required to attend within the MSc Programme are evaluated at the end of each semester through written or oral examinations, assignments completed throughout the semester, interim progress tests, written assignments, laboratory work, or a combination of the above. The assessment method is determined by the instructor of each course. Where written or oral examinations are used, the integrity and impartiality of the process must be ensured.

Grades are awarded on a scale of 1–10. Examination results are announced by the instructor and sent to the Secretariats of the MSc Programme and the Department no later than four (4) weeks after the course examination. If an instructor repeatedly exceeds this deadline, the Director of the MSc Programme informs the Assembly of the School/Department.

The contribution of laboratory exercises, assignments and seminars to the final grade of each course is determined separately for each course following a proposal by its instructor and is stated in this Study Guide.

Students in second-cycle study programmes organized through distance-education methods may be assessed by remote examinations, provided that the integrity and impartiality of the assessment process are ensured. The same applies in emergencies or circumstances of force majeure.

Alternative assessment methods may be applied for students with disabilities and special educational needs (see below). In cases of illness or recovery from serious illness, instructors are advised to facilitate the student by any means they consider appropriate, such as a remote oral examination. During oral examinations, the instructor must ensure that they are not alone with the student being examined.

A student who does not obtain a passing grade in a course must repeat it. However, a laboratory or exercise assessed independently is credited and need not be repeated if attendance was judged successful.

If a student fails the same course more than three (3) times, the procedure prescribed by the legislation in force is followed.

A grade may be corrected where an evident clerical or calculation error has occurred, following a written statement from the responsible instructor and a decision of the Departmental Assembly.

Master's Thesis

A Master's thesis is assigned after the student has attended all courses in the curriculum.

The third semester of the Programme is devoted to the preparation of a Master's thesis. The thesis must be **individual and original and must be prepared in accordance with the writing guidelines posted on the MSc Programme website. The subject of the Master's thesis must be research-based or applied nature research.**

Master's Thesis Assignment Procedure

- Following an application by the candidate stating the proposed thesis title and proposed supervisor, and accompanied by an abstract of the proposed work, the Assembly appoints the supervisor and establishes a three-member examination committee to approve the thesis, one member of which is the supervisor. The thesis may be written in English or Greek, and the language is determined when the topic is approved.
- The thesis title may be modified following an application by the student and the supervisor's agreement, submitted to the MSc Programme Coordinating Committee. The application must also contain a brief justification for the change.
- For the thesis to be approved, the student must defend it before the three-member examination committee.

The supervisor and the members of the three-member Master's thesis examination committee are appointed from the following categories of persons who have undertaken teaching duties in the MSc Programme:

- i. members of the Teaching and Research Staff (faculty), Special Educational Staff (SES), Laboratory Teaching Staff (LTS) and Special Technical Laboratory Staff (STLS) of the Department or other NKUA Departments, another Higher Education Institution (HEI), or a Higher Military Educational Institution;
- ii. Emeritus Professors or retired faculty members of the Department, other NKUA Departments, or another HEI;
- iii. Adjunct professors;
- iv. Appointed instructors;
- v. Visiting professors or visiting researchers;
- vi. researchers and specialist scientific officers of research and technological bodies under Article 13A of Law 4310/2014 (Series A, 258), or other research centers and institutes in Greece or abroad.

By decision of the Assembly, supervision of Master's theses may also be assigned to faculty, SES, STLS and LTS members of the Department who have not undertaken teaching duties in the MSc Programme.

Once approved by the examination committee, Master's theses must be uploaded to the "PERGAMOS" Digital Repository, in accordance with NKUA Senate decisions. Where a thesis contains original unpublished results, the supervisor may request, with the postgraduate student's co-signature, that only the abstracts be published on the website and that the full text be published at a later date.

Calculation of the Postgraduate Degree Grade

The grade of the degree takes into account the weighting of each course in the curriculum, expressed by the number of credits (ECTS). The number of ECTS credits assigned to a course is also its weighting coefficient. To calculate the final degree grade, the grade of each course is multiplied by the corresponding number of course credits, and the sum of these products is divided by the total number of credits required for the award. This calculation is expressed by the following mathematical formula:

$$\text{Degree Grade} = (\sum_{k=1}^N \text{BM}_k \cdot \text{PM}_k) / \text{TC}$$

where:

N = number of courses required for the award of the relevant degree

BM_k = grade of course k

PM_k = credits of course k

TC = total credits required for the award of the relevant degree

To obtain the Postgraduate Studies Diploma, each postgraduate student must attend and successfully pass all compulsory courses and the required number of electives offered by the MSc Programme, and complete a Master's thesis, thereby accumulating ninety (90) ECTS.

Award of the Postgraduate Degree

A student completes the programme leading to the Postgraduate Studies Diploma by completing the minimum number of courses and credits required for the award and successfully completing the Master's thesis. The Assembly certifies completion of the programme so that the Postgraduate Studies Diploma may be awarded.

Upon completion of the above procedure, the postgraduate student is issued a certificate of completion of studies, loses student status, and ceases to participate in the University's collective governing bodies.

The Postgraduate Studies Diploma certifies successful completion of the programme and states a grade to two decimal places, according to the following scale: Excellent (8.5 to 10), Very Good (6.5 to less than 8.5), and Good (5 to less than 6.5).

Within the MSc Programme, the following is awarded: **Postgraduate Studies Diploma in "Exploration and Sustainable Exploitation of Mineral Resources"**.

A Postgraduate Studies Diploma is not awarded to a student who has not been exempted from the obligation to pay tuition fees and has outstanding financial obligations after completing the programme.

Graduation Ceremony

Taking the oath is not a constitutive requirement for successful completion of studies, but it is a necessary prerequisite for issuing the formal degree certificate.

The oath-taking ceremony is held within the framework of the Assembly of the Department of Geology and Geoenvironment and on Department premises, in the presence of the Director of the MSc Programme, the Chair of the Department or the Dean of the School or their deputy, and, where possible, a representative of the Rector.

Postgraduate students who have successfully completed the MSc Programme may, in exceptional circumstances (studies, residence or employment abroad, health reasons, etc.), apply to the Secretariat of the School/Department for exemption from the obligation to take the oath. The exemption is approved by the Chair of the School/Department and the Vice-Rector for Academic Affairs, International Relations and Outreach.

Obligations and Rights of Postgraduate Students

Postgraduate students have **all the rights and benefits provided to first-cycle undergraduate students** until the expiry of any extension of studies granted, **except for the right to receive free textbooks**.

Postgraduate students are invited to participate in and attend research-group seminars, literature-update discussions, laboratory visits, conferences and workshops related to the subject area of the MSc Programme, lectures and other scientific events of the Programme, and similar activities.

Students may participate in international student-exchange programmes, such as ERASMUS+ or CIVIS, in accordance with the legislation in force. In such cases, a maximum of thirty (30) ECTS may be recognized. This option is available after completion of the first semester. Students must apply to the CC and comply with the programme's terms. The MSc Programme may also be attended by students from international student-exchange programmes, such as ERASMUS+, in accordance with the cooperation agreements concluded.

NKUA postgraduate students may enroll in an MSc Programme of the same or another Higher Education Institution in Greece or abroad within educational or research cooperation programmes, in accordance with the legislation in force.

Concurrent enrolment is permitted in an undergraduate study programme and a postgraduate study programme, or in two (2) Postgraduate Study Programmes of the same or another Department, at the same or another Higher Education Institution.

At the end of each semester, postgraduate students evaluate each course and each instructor.

Postgraduate students may request the issuance of a Diploma Supplement in Greek and English.

Loss of student status

Following a recommendation by the CC, the Assembly of the Department of Geology and Geoenvironment may decide to remove postgraduate students from the Programme if they:

- exceed the maximum permitted number of absences;
- fail the examination of one or more courses and do not successfully complete the Programme in accordance with the Regulations;
- exceed the maximum duration of study in the MSc Programme, as specified in the Study Regulations;
- breach the provisions in force concerning the handling of disciplinary offences by the competent disciplinary bodies;
- personally submit a request to withdraw.

A postgraduate student removed from the MSc Programme may request an official transcript of the courses they have successfully passed.

Services for MSc Programme Students

Accessibility – Students with Disabilities

Certain accommodations are provided for students with disabilities and/or special educational needs, including the following:

- During their studies, they are informed in good time by a designated member of the Department Secretariat staff about the course schedule, times and locations, and any change relating to their student status.
- During examination periods, they sit examinations in accessible locations, may be accompanied to the examination rooms, where necessary, by NKUA staff or persons of their choice, and are examined by methods appropriate to their individual circumstances.
- Throughout the academic year, a Professor is available for students to discuss their difficulties and may subsequently liaise with the University authorities to help resolve them.

In addition, NKUA operates a “Student Accessibility Unit” for students with disabilities and special educational needs. Its ⁷purpose is to ensure equal access in practice to academic studies for students with differing abilities and requirements by providing environmental adaptations, assistive information technologies, access services, and psychological and educational counselling. The University ensures that students with disabilities and/or special educational needs have access to the recommended textbooks and teaching (<https://access.uoa.gr/>).

Services for MSc Programme Students

The MSc Programme provides its students with several important services. Detailed information is available on the websites of the MSc Programme, the Department and the University. The services provided are:

Electronic Classroom

The e-Class electronic classroom is a comprehensive online course-management system that supports NKUA’s asynchronous distance-learning service without restrictions or limitations. The service is accessed through a standard web browser and requires no specialized technical knowledge. Integrating supplementary distance-learning methods into NKUA’s learning process supports and enhances teaching and access to knowledge by providing new approaches that complement traditional teaching methods.

Electronic Secretariat Services

Through the electronic Secretariat service based on the Unitron Information System, students of the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” have access to a range of online Secretariat services.

Library and Information Centre

All electronic resources and related online services are included on the website of the Library and Information Centre, hosted and maintained by NKUA’s Libraries Computing Centre. More specifically, the electronic services offered include access to online information resources, the public-access OPAC catalogue, electronic publication of NKUA journals, bibliographic databases, the integrated “Pergamos” institutional-repository/digital-library platform, specialized digital libraries and collections, thematic portals, article-ordering services, interlibrary loans, and the “Ask a Librarian” service.

“Multimedia Content Hosting and Search” Service

The “Multimedia Content Hosting and Search” service is intended both for content creators—namely the University’s teaching and research staff, who can upload and manage content—and for any internet user as a recipient, who can search it. The content is recorded either during the educational process or at University events (conferences, workshops, seminars, etc.). Live broadcasts of courses and lectures from teaching rooms and of University events are also available. Users can access this educational content through search functions or by browsing freely.

Academic Advisor

The Academic Advisor guides and supports students in the MSc Programme, providing a range of advice concerning the Programme and the student’s possible further academic development. This service forms part of a sound educational process that creates the appropriate conditions for the effective transmission of knowledge while also recognizing the need for communication and support on other matters that may concern students.

⁷ The Institution’s detailed accommodations and specific provisions are described on the website of the Accessibility Unit for Students with Disabilities of the National and Kapodistrian University of Athens (<https://access.uoa.gr/>).

Academic Identity Card

An academic identity card is provided, conferring entitlement to reduced fares.

Digital Services

As an NKUA study programme, the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” provides students with the following electronic services: email; wireless-network access (Wi-Fi); hosting of personal web pages; virtual private network (VPN); alumni network; open academic courses; academic video lectures; access to live lecture broadcasts; and completion of online questionnaires. (For a detailed presentation of the digital benefits and services available to MSc Programme students, visit the webpage https://www.uoa.gr/el/foitites/elektronikes_ypiresies/psifiakes_parocheis/)

Counselling Services

The MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” gives students access to counselling services on career guidance and psychosocial difficulties through the University’s specialist units and structures. Examples include the Career Office for career guidance, career counselling and links with the labor market (visit the website of the [Career Office](#) for further information), the Vyronas–Kaisariani Mental Health Centre, the Psychosocial Intervention Unit and the Peer Counselling Centre (visit the website containing the pages of these specific units and services).

Student Ombudsman

This institution has the following responsibilities: examining student requests concerning problems encountered with academic and administrative services and seeking solutions; facilitating students’ contact with administrative bodies and services; examining student reports and complaints concerning breaches of provisions and rules of university legislation and ethics; and informing students of their rights and obligations as members of the University Community.

Foreign Languages Teaching Centre

NKUA’s Foreign Languages Teaching Centre is an independent and autonomous academic unit that provides advanced instruction in 26 foreign languages. NKUA students pay reduced fees.

Students’ Cultural Club

It is a space for collective expression and creativity. Students engage with works of art and are encouraged to create their own artistic works. It comprises five sections: music, theatre, dance, cinema and photography.

Tuition Fees

Postgraduate students are not required to pay tuition fees to participate in the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources”.

Scholarships and Awards

Work-Study Scholarships

Following a recommendation by the MSc Programme CC, the Departmental Assembly may award up to three (3) work-study ⁸scholarships to postgraduate students for supplementary teaching duties in first-cycle study programmes, depending on the MSc Programme intake and the Programme’s financial capacity.

The amount of a work-study scholarship is calculated based on actual hours worked. The hourly rate is decided at the beginning of each year following a recommendation by the CC and a decision of the Departmental Assembly. The decision is communicated to MSc Programme students.

Requirements, Criteria and Procedure

The following requirements, criteria and procedure apply to the award of work-study scholarships:

⁸ Auxiliary teaching work is defined as assisting members of the Teaching and Research Staff (faculty) in their teaching duties, supervising first-cycle student exercises, conducting tutorials and laboratory exercises, invigilating examinations, and marking exercises.

Requirements

Candidates must not hold a paid position in the public or private sector or receive a scholarship from any other body during the period concerned.

Criteria

- course performance (grade average greater than or equal to eight)
- successful completion of all courses in accordance with the curriculum
- individual and family income

In the event of equal grades and equal income, selection is made by lot. If a student declines the scholarship, it is offered to the next person in the ranking.

Procedure

Following the call, students submit an application to the Secretariat of the Department of Geology and Geoenvironment, accompanied by the following mandatory supporting documents:

- academic transcript
- a solemn declaration signed through the gov.gr platform, containing the following statement: "I do not hold a paid position in the public or private sector, nor do I receive a scholarship from any other body during the period concerned."
- recent tax assessment statement (individual and family)

The MSc Programme CC examines the applications and submits a recommendation to the Departmental Assembly, which makes the decision.

Excellence Awards

Following a recommendation by the CC and a decision of the Departmental Assembly, the MSc Programme may award excellence prizes to the top three students in each cohort upon completion of the courses in semesters A and B. **The prizes carry no financial benefit.** The award certificate is signed by the Director of the MSc Programme and the Chair of the Department.

Requirements

- i. Average grade for courses in semesters A and B greater than or equal to eight (8).
- ii. Completion and successful examination during the February examination period (Semester A) and June examination period (Semester B) within the standard years of study (semesters A and B of each cohort).

Procedure

After the June grades have been submitted, the CC reviews the grades of the cohort's students and, provided that the above requirements are met, ranks them in descending order by grade average and recommends to the Departmental Assembly that prizes be awarded to the top three (3) students.

Average: In all cases involving the award of scholarships or prizes, the average is calculated using the formula:

$$\text{Average} = \left(\sum_{k=1}^N \text{BM}_k \cdot \Pi \text{M}_k \right) / \text{TC}$$

where:

N = number of courses in the relevant semester(s), BM_k = grade of course k, ΠM_k = credits of course k, TC = total credits in the relevant semester(s).

Course Content and Descriptions

Mandatory Courses

AY01 Mineral Deposits of Critical and Strategic Mineral Raw Materials (CRM) Availability of mineral resources and modern technological civilization. General principles and terminology relating to critical and strategic mineral raw materials. Economic, social, and geopolitical significance. Critical Raw Materials Act. Classification of mineral resources and reserves. Stages of mineral raw material exploration. Genetic models of Critical and Strategic Mineral Raw Material deposits in different geotectonic settings. Rare-earth element deposits. Uranium and thorium deposits. Deposits of rechargeable-battery metals (lithium, cobalt, nickel, graphite). Platinum-group element deposits. Copper deposits. Indium, gallium, and germanium deposits. Tungsten and antimony deposits. Cadmium and tellurium deposits. Other deposits of mineral raw materials of critical importance. Secondary sources of metals—anthropogenic deposits—metal recycling. Critical mineral raw materials in mining waste. Critical mineral raw materials in Greek deposits.	AY03 Mineral Exploration Mapping, Sampling and Use of Modern Portable Equipment Sampling theory, sampling errors and sampling methods. Types of drilling. Introduction to data quality-assurance and quality-control systems and procedures. Basic statistical principles and the concepts of accuracy, precision, and systematic error. Mapping and data recording. Mapping of mines and quarries; sampling methods in the field and in underground mines. Collection of representative samples of minerals, rocks, ores, and sediments. Drill-core description procedures (recording Munsell color, lithology, stratigraphic structures, etc.). Drill-core sampling techniques. In-situ geochemical analyses using portable spectrometers (XRF, LIBS, Vis–NIR–SWIR, etc.), and processing and evaluation of the results.
AY02 Applications of Remote Sensing in Mineral Raw Material Exploration – Introduction to Machine Learning Availability of mineral resources and introduction to electromagnetic radiation and its propagation. Reflectance spectroscopy. Spectral properties of minerals and rocks—spectral signatures. Basic principles of Remote Sensing (Earth Observation): platforms, sensors, orbits, and types of data/measurements. Methods for the (pre-) processing of optical remote-sensing data (e.g., atmospheric corrections, image enhancement and transformations). Detection and mapping of minerals, rocks, ores, and their alteration. Basic principles of Machine Learning (e.g., clustering, classification and spectral unmixing). Combined machine-learning and reflectance-spectroscopy techniques in mineral-resource exploration—introduction to imaging spectroscopy. Examples (e.g., assessment of environmental impacts from mining activities, such as secondary minerals in tailings, etc.). Future needs and trends in remote-sensing techniques for the exploration and identification of natural resources.	AY04 Geochemical and Geophysical Prospecting Methods in Mineral Exploration The geochemical cycle. Primary and secondary environments. Indicator elements. Sample preparation for chemical analysis. Lithogeochemistry. Soil geochemistry; stream-sediment and river-sediment geochemistry. Water geochemistry. Vegetation geochemistry. Gas geochemistry and hydrocarbon exploration. Geochemical methods for deposit exploration in different geological and topographic/climatic environments. Survey design and sampling. Sample handling, transport and storage; preservation materials and sample packaging. Presentation and analysis of geochemical data and preparation of maps. Identification and interpretation of geochemical anomalies. Basic geophysical methods for subsurface investigation: operating principles of the main geophysical instruments and processing of measurements. Theoretical analysis of the methods, geophysical surveying, processing and interpretation of measurements, presentation of results in diagrams, and development of a geophysical–geological model. Applications of the principal geophysical methods to the investigation of metallic-mineral deposits, structures associated with oil and natural-gas deposits, and coal deposits. Vertical electrical soundings and electrical resistivity tomography. Self-potential method. Electromagnetic prospecting methods. VLF method. Transient electromagnetic method. Magnetotelluric method. Ground-penetrating radar. Seismic methods. Criteria for selecting the appropriate geophysical

method according to the type and stage of ore-deposit exploration.

BY01 Introduction to Mining Project Management – Health and Safety in Exploration and Extraction

Processes and operations of mines and mining facilities, from exploration through production. Introduction to the concept of “Mining Reconciliation” and the causes of unsuccessful reconciliation. Ore and waste rock. Determination of the cut-off grade. Methodology for preparing business plans; market research; investigation of business opportunities; supply-and-demand analysis; financial planning and budgeting of a business plan; costing; pricing policy; investment decisions; marketing plan; use of information and communication technologies; business partnerships; stages in establishing a company; types of companies; start-up financing; management of business names; and preparation of a business plan. Introduction to investment appraisal. On-site management and storage. Introduction to human-resource management. Strategic objectives of mining companies.

Introduction to and fundamental principles of risk management in mining. Risk analysis and assessment. Prevention and response measures. Occupational risk assessment. Health and safety legislation and the Regulation on Mining and Quarrying Operations. Job-hazard analyses and accident reports. Rules governing rational operations, the health and safety of workers and nearby residents, and environmental protection during the exploration, extraction, utilization, or processing of mineral raw materials, as well as during the corresponding rehabilitation works at every mining or quarry site.

BY02 Introduction to Geostatistics – Applications of Geostatistics in Ore-Deposit Exploration, Resource Estimation and Reserve Management

Introduction to statistics and probability theory; random variables; probability distributions; means; standard deviation; least-squares method; regression; and correlation. Introduction to geostatistics; spatial distributions; support; dispersion; structural analysis—variograms; variogram models; geometric and zonal anisotropy; nested models; extension and estimation variances; kriging; multivariate analysis; classification; clustering; principal component analysis; and data transformation. Practical kriging; forms of kriging; kriging neighborhood analysis (KNA); sampling-interval

analysis; and geostatistical simulation. Collection and types of geological data. Data reliability checks. Processing and analysis of drilling data (geochemical, geophysical, lithological, structural, and technical data). Application of descriptive statistics and geostatistics to drilling data. Three-dimensional deposit modelling. Geological modelling of stratiform and non-stratiform deposits. Grade estimation and calculation of resources in grid and block models. Optimization of open-pit limits. Open-pit mine design and calculation of mineral reserves in accordance with international reporting codes.

BY03 Hydrocarbon Reservoirs and Geological Storage of CO₂

The role of Carbon Capture and Storage (CCS) in the Energy Transition. Underground Geological Storage of CO₂ and Natural Gas. Petroleum systems. Hydrocarbon reservoirs and depleted hydrocarbon fields. Reservoir rocks and cap rocks (seals). Traps (types of traps: structural, stratigraphic, and hydrodynamic). Physicochemical and mineralogical characteristics of reservoirs. Petrophysical properties (porosity, saturation, permeability, etc.). Saline aquifers. Geochemical interactions among reservoir rocks, the gases to be stored (H₂ or CO₂), and the aqueous phases in the reservoir (brine or residual hydrocarbons). Analysis of newly formed mineral phases that could cause changes in the physicochemical parameters of the reservoir. Alternative methods of Geological Storage. Geochemical interactions among reservoir rocks, the gases to be stored (H₂ or CO₂), and the aqueous phases in the reservoir (brine or residual hydrocarbons). Simulations of geological CO₂ storage systems. Legal framework governing the storage of carbon dioxide in geological formations.

BY04 Geotechnical Assessment of Open Excavations and Underground Works

Classification of engineering-geological soil and rock-mass types. Engineering-geological behavior and excavatability of geological formations. Laboratory and in-situ tests on rock and soil samples. Assessment of geological hazards in an extractive project and determination of the critical geotechnical parameters for its design.

Open-pit mining methods; open-pit design and scheduling; stripping ratio; and mining phases. Physical, economic, environmental, and legal design parameters. Methods for extracting, loading and transporting raw materials, and for

disposing of waste rock, in relation to the deposit type. Mining ratio. Optimization of the geometric limits of the operation. Optimization of the economic pit limit. Medium- and long-term planning and monitoring of the development of the operation and its individual phases. Design and construction of surface support works. Methods of slope-stability analysis. Slope-stability assessment. Instrumental monitoring of landslides. Stabilization of slopes and landslides.

Underground mining methods; parameters affecting method selection; types of mining faces; and mechanical equipment. Methods of underground excavation. Ventilation of underground works. Failure mechanisms; stress-induced and structurally controlled failures; rock-wedge analysis; and estimation of deformations and convergence. Stabilization measures and their dimensioning for common underground mining methods, including natural rock support in room-and-pillar mining, artificial support by backfilling voids in cut-and-fill mining, and props and beams or hydraulic supports in longwall mining. Design and construction of underground support works. Immediate rock-mass stabilization measures. Permanent rock-mass stabilization measures. Prediction and control of groundwater inflows.

AE02 Applications of Microscopy in the Exploration and Evaluation of Mineral Raw Materials

Optical microscopy and scanning electron microscopy. Electron microanalysis. Mineralogical and textural characteristics of ores. Petrographic evaluation of ores and interpretation of genetic models. Fluid inclusions and determination of the conditions of deposit formation. Relationships between ore and rock-forming minerals. Mineralogical and textural characteristics of magmatic and hydrothermal deposits. Identification of host rocks and alteration zones. Mineralogical and textural characteristics of deposits associated with sedimentary processes. Textural study of deposits associated with metamorphic processes. Mineralogical and textural characteristics of deposits associated with metasomatic processes. Characteristic textures in supergene deposits. Relationship of mineralogy and texture to the exploitation, metallurgy, and environmental assessment of mineral raw materials.

Elective Courses

AE01 Digital Mapping and GIS in Mineral Exploration

Processing, synthesis, and creation of geospatial-information layers; cartographic base layers (orthophoto maps, maps, topographic diagrams, etc.). Coordinate reference systems. Map georeferencing. Data types. Digital-mapping methods and modern equipment. Collection and processing of digital field data. Uncertainties in data collection. Digital mapping using unmanned aerial vehicles and LiDAR. Creation of a geodatabase. Digitization and vectorization of maps and diagrams. Tools for processing, analyzing, and visualizing geological data. Spatial-interpolation tools. Terrain analysis. Compilation of thematic maps in accordance with international and national standards. Digital elevation models (DEM). Three-dimensional visualization of geological data. Creation of databases and display of data (geophysical, geochemical, lithological, structural, etc.) in a GIS environment. Spatial analysis and processing of data/maps using the Spatial Analyst tool. Integration of information layers and databases for ore-deposit exploration.

AE03 Mining Activity and Sustainability

Introduction to Sustainable Development: historical evolution and fundamental principles. United Nations Sustainable Development Goals. Climate Change and Resilience: causes, impacts, adaptation, and mitigation. Biodiversity and Conservation of Natural Resources: strategies for protecting and conserving biodiversity. Life-Cycle Assessment of Mining Projects. Principles of Sustainable Mineral Raw Material Management and the Circular Economy. Environmental Policy and Governance; local and international initiatives and regulatory frameworks. Social Dimension of Sustainability and Environmental Justice. Legislation, mining, and the environment. Corporate Social Responsibility.

Environmental impacts of the extraction, beneficiation, and metallurgical processing of mineral raw materials. Mining waste, regulatory framework, existing technologies, and innovative technologies. Methodological tools required to understand the processes and procedures involved in mining-waste management, with emphasis on the circular economy. Composition, characterization, and sampling of mining waste—European and national regulatory framework. Categories of solid waste from metallurgical, mining and energy activities. Management of beneficiation tailings: tailings characteristics according to ore type—improvement of the physical and geochemical stability of storage facilities. Management of solid waste from pyrometallurgical and hydrometallurgical

processes. Stabilization, recycling, and disposal methods. Recovery and reuse of materials—the circular economy. Tests for determining key physical, geotechnical, and geochemical parameters. Storage, collection, transport, transfer, and sorting. Final treatment and disposal of unusable materials. Economics of mining-waste management. Environmental Impact Assessments for quarries and mines.

BE01 Mining Project Permitting and Environmental Management

The mineral-resources industry: historical development and current status. Factors determining mineral availability: geological, technical, environmental, and economic. Mining Code: exploration and exploitation rights. Processes and operations of mines and mining facilities: from exploration to production. Introduction to the concept of “Mining Reconciliation” and the reasons why reconciliation is not achieved. Ore and waste rock. Stripping ratio. Cut-off grade. Methodology for preparing business plans, feasibility studies and due-diligence reports. Commodity value and price forecasting; market research; investigation of business opportunities; supply-and-demand analysis; financial planning and budgeting of a business plan; capital and operating costs; pricing policy; taxation; theory of the minimum economically viable grade; investment decisions; quantification of investment risk; commodity insurance; commodity profiles; marketing plan; use of information and communication technologies; business partnerships; stages in establishing a company; types of companies; financing the launch of new businesses; management of business names; and preparation of a business plan. Introduction to investment appraisal: indicators, time value of money, capital budgeting, evaluation, cost of capital, sensitivity analysis and break-even analysis. Introduction to human-resource management: basic functions of project organization and management, classical management theories, leadership and guidance, performance, motivation, incentives and remuneration, and staff changes and appraisal. Non-financial evaluation of extractive projects: Environment, Society and Governance. Introduction to reporting in accordance with international standards.

Introduction to and fundamental principles of risk management in mining. Risk analysis and assessment. Prevention and response measures. Occupational risk assessment. Health and safety legislation and the Regulation on Mining and Quarrying Operations. Job-hazard analyses and accident reports. Rules governing rational

operations, the health and safety of workers and nearby residents, and environmental protection during the exploration, extraction, utilization, or processing of mineral raw materials, as well as during the corresponding rehabilitation works at every mining or quarry site.

BE02 Industrial Minerals and Sustainable Development

Uses of industrial minerals in the twenty-first century and sustainable development. Industrial minerals and climate change. Methods for identifying and evaluating industrial minerals and rocks. Technical and environmental studies for the exploration and extraction of industrial minerals and rocks. Onshore and subsea extraction. Legal framework and permitting. Processing and beneficiation of industrial minerals and rocks. Techniques for evaluating the quality of industrial minerals and rocks according to their use: cements, aggregates, mortars, pigments, coatings, soil conditioners, fillers, ceramics, glass, plastics, paper, elastomers, adhesives, etc. Environmental applications. Research and development of potential applications for the utilization of mining by-products. Research and development of secondary uses after completion of the life cycle of the above products. Prospects for the Greek industrial-minerals and rocks sector.

BE03 Tectonics in Mineral Exploration and Exploitation

Spatial distribution of deposit types and their relationship to geotectonic settings. Tectonic structures associated with metallogenesis (metallotects) and their importance in mineral raw material exploration. Tectonic studies and exploration for mineral raw materials. Volcanotectonic structures in epithermal systems. Tectonic controls on magma trapping, emplacement, and crystallization. Tectonic structures and deformation in fault zones associated with hydrothermal deposits. Metamorphic core complexes, exhumation and metallogenesis. Sedimentary tectonic structures. Field measurement of structural elements—statistical analysis, data processing and projections. Measurement and characterization of structural elements in drill cores.

Appendices

- I. Template of the Degree in Greek and English
- II. Diploma Supplement Template
- III. Regulations governing the student complaints and appeals management procedure
- IV. Regulation of the Academic Advisor
- V. Course Outlines

Appendix I

Template of the Diploma in Greek and English



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Εθνικόν και Καποδιστριακόν
Πανεπιστήμιον Αθηνών
—ΙΔΡΥΘΕΝ ΤΟ 1837—

ΠΡΟΓΡΑΜΜΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ
«ΠΜΣ ΕΡΕΥΝΑ ΚΑΙ ΒΙΩΣΙΜΗ ΕΚΜΕΤΑΛΛΕΥΣΗ ΟΡΥΚΤΩΝ ΠΟΡΩΝ»
ΤΟΥ ΤΜΗΜΑΤΟΣ ΓΕΩΛΟΓΙΑΣ ΚΑΙ ΓΕΩΠΕΡΙΒΑΛΛΟΝΤΟΣ

ΔΙΠΛΩΜΑ ΜΕΤΑΠΤΥΧΙΑΚΩΝ ΣΠΟΥΔΩΝ

Ο/Η (ονοματεπώνυμο) ΤΟΥ (πατρώνυμο)
πτυχιούχος του Τμήματος (όνομα Τμήματος και Ιδρύματος, στην περίπτωση που ο
πτυχιούχος έχει περισσότερα πτυχία του ενός αναφέρεται μόνο το συναφές με το ΠΜΣ), μετά την ευδόκιμη
παρακολούθηση των μαθημάτων και την επιτυχή δοκιμασία στις προβλεπόμενες εξετάσεις
του Προγράμματος Μεταπτυχιακών Σπουδών με τίτλο: «ΕΡΕΥΝΑ ΚΑΙ ΒΙΩΣΙΜΗ
ΕΚΜΕΤΑΛΛΕΥΣΗ ΟΡΥΚΤΩΝ ΠΟΡΩΝ», έτυχε του Διπλώματος Μεταπτυχιακών Σπουδών, με
βαθμό «...» (π.χ. «Άριστα (10/10)»), την 00/00/0000 (ημερομηνία ολοκλήρωσης σπουδών).

ΣΕ ΠΙΣΤΩΣΗ ΤΩΝ ΑΝΩΤΕΡΩ
ΕΚΔΙΔΕΤΑΙ ΤΟ ΠΑΡΟΝ ΔΙΠΛΩΜΑ

Αθήνα, 00/00/0000

Ο/Η ΠΡΥΤΑΝΗΣ

Ο/Η ΠΡΟΕΔΡΟΣ ΤΟΥ ΤΜΗΜΑΤΟΣ

Ο/Η ΓΡΑΜΜΑΤΕΑΣ ΤΟΥ ΤΜΗΜΑΤΟΣ



HELLENIC REPUBLIC
**National and Kapodistrian
University of Athens**
— EST. 1837 —

MASTER'S DEGREE

POSTGRADUATE PROGRAMME

OF THE DEPARTMENT OF GEOLOGY AND GEOENVIRONMENT

IN “EXPLORATION AND SUSTAINABLE EXPLOITATION OF MINERAL RESOURCES”

..... (first name/last name/father's name), having completed the approved course as above and passed the examinations, has been awarded the Degree of Master of Science in “Exploration and Sustainable Exploitation of Mineral Resources” with the grade of “.....” (excellent/very good/good) ON (date).

In witness whereof, this degree is issued

Athens, 00/00/0000

THE RECTOR

THE CHAIR OF THE DEPARTMENT

THE SECRETARY OF THE DEPARTMENT

Appendix II

Template of the Diploma Supplement in Greek and English

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ



ΕΘΝΙΚΟ ΚΑΙ ΚΑΠΟΔΙΣΤΡΙΑΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ ΣΧΟΛΗ: ΘΕΤΙΚΩΝ ΕΠΙΣΤΗΜΩΝ ΤΜΗΜΑ: ΓΕΩΛΟΓΙΑΣ ΚΑΙ ΓΕΩΠΕΡΙΒΑΛΛΟΝΤΟΣ

ΠΑΡΑΡΤΗΜΑ ΔΙΠΛΩΜΑΤΟΣ ΓΙΑ ΤΟ Π.Μ.Σ. «ΕΡΕΥΝΑ ΚΑΙ ΒΙΩΣΙΜΗ ΕΚΜΕΤΑΛΛΕΥΣΗ ΟΡΥΚΤΩΝ ΠΟΡΩΝ»

Αυτό το Παράρτημα Διπλώματος ακολουθεί το υπόδειγμα που ανέπτυξε η Ευρωπαϊκή Επιτροπή, το Συμβούλιο της Ευρώπης και η UNESCO/CEPES. Στόχος του παραρτήματος είναι να παράσχει επαρκή ανεξάρτητα στοιχεία για τη βελτίωση της διεθνούς «διαφάνειας» και τη δίκαιη ακαδημαϊκή και επαγγελματική αναγνώριση των τίτλων σπουδών (διπλώματα, πτυχία, πιστοποιητικά κ.τ.λ.). Σχεδιάστηκε για να δίνει περιγραφή της φύσης, του επιπέδου, του υπόβαθρου, του περιεχομένου και του καθεστώτος των σπουδών οι οποίες ολοκληρώθηκαν με επιτυχία από το άτομο που αναγράφεται ονομαστικά στο πρωτότυπο του τίτλου στον οποίο επισυνάπτεται αυτό το παράρτημα. Στο παράρτημα αυτό δεν θα κρίνεται η αξία και δεν θα υπάρχουν δηλώσεις ισοτιμίας ή προτάσεις σχετικά με την αναγνώριση. Θα υπάρχουν πληροφορίες και στα οκτώ τμήματα. Όπου δεν υπάρχουν πληροφορίες, θα δίδεται η σχετική εξήγηση.

1. ΠΛΗΡΟΦΟΡΙΕΣ ΣΧΕΤΙΚΑ ΜΕ ΤΗΝ ΤΑΥΤΟΤΗΤΑ ΤΟΥ ΚΑΤΟΧΟΥ ΤΟΥ ΤΙΤΛΟΥ ΣΠΟΥΔΩΝ

- 1.1 Επώνυμο :
- 1.2 Όνομα :
- 1.3 Ημερομηνία γεννήσεως (ημέρα/μήνας/έτος) – Τόπος – Χώρα :
- 1.4 Αριθμός φοιτητικής ταυτότητας ή κωδικός (αν υπάρχει):

2. ΠΛΗΡΟΦΟΡΙΕΣ ΣΧΕΤΙΚΑ ΜΕ ΤΟ ΕΙΔΟΣ ΤΟΥ ΤΙΤΛΟΥ ΣΠΟΥΔΩΝ

- 2.1 Ονομασία του τίτλου σπουδών: **ΜΕΤΑΠΤΥΧΙΑΚΟ ΔΙΠΛΩΜΑ ΕΙΔΙΚΕΥΣΗΣ**
- 2.2 Κύριος τομέας σπουδών για την απόκτηση του τίτλου: **ΕΡΕΥΝΑ ΚΑΙ ΒΙΩΣΙΜΗ ΕΚΜΕΤΑΛΛΕΥΣΗ ΟΡΥΚΤΩΝ ΠΟΡΩΝ**
- 2.3 Ονομασία και καθεστώς του απονέμοντος ιδρύματος: **ΕΘΝΙΚΟ ΚΑΙ ΚΑΠΟΔΙΣΤΡΙΑΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ, ΔΗΜΟΣΙΟ**
- 2.4 Ονομασία και καθεστώς του Ιδρύματος που παρέχει τις σπουδές (στην πρωτότυπη γλώσσα): –
- 2.5 Γλώσσα (-ες) διδασκαλίας/εξετάσεων: **ΕΛΛΗΝΙΚΗ / ΑΓΓΛΙΚΗ (όταν απαιτείται)**

3. ΠΛΗΡΟΦΟΡΙΕΣ ΣΧΕΤΙΚΑ ΜΕ ΤΟ ΕΠΙΠΕΔΟ ΤΟΥ ΤΙΤΛΟΥ

- 3.1 Επίπεδο του τίτλου: **Δεύτερος Κύκλος Σπουδών – Μεταπτυχιακές Σπουδές**
- 3.2 Επίσημη διάρκεια του προγράμματος: **τρία (3) εξάμηνα**
- 3.3 Απαιτήσεις εισαγωγής: **Πτυχίο Πρώτου Κύκλου Σπουδών των τμημάτων Γεωλογίας Και Γεωπεριβάλλοντος, Γεωλογίας, Μηχανικών Ορυκτών Πόρων και των σχολών Μεταλλειολόγων – Μεταλλουργών Μηχανικών, και Μηχανικών Ορυκτών Πόρων, και συναφών τμημάτων της ημεδαπής ή τμημάτων αναγνωρισμένων ομοταγών ιδρυμάτων της αλλοδαπής, καθώς και πτυχιούχοι τμημάτων Τ.Ε.Ι. συναφούς γνωστικού αντικείμενου. ελάχιστος βαθμός 6,5/10 · λειτουργική γνώση αγγλικής γλώσσας (επίπεδο B2 και άνω) · συνέντευξη**

4. ΠΛΗΡΟΦΟΡΙΕΣ ΣΧΕΤΙΚΑ ΜΕ ΤΟ ΠΕΡΙΕΧΟΜΕΝΟ ΚΑΙ ΤΑ ΑΠΟΤΕΛΕΣΜΑΤΑ ΠΟΥ ΕΠΙΤΕΥΧΘΗΚΑΝ

- 4.1 Τρόπος σπουδών: **Πλήρης Φοίτηση**
- 4.2 Απαιτήσεις του προγράμματος: **ελάχιστη διάρκεια φοίτησης τρία (3) και μέγιστη έξι (6) εξάμηνα σπουδών · επιτυχής εξέταση¹ σε δέκα (10) μαθήματα εκ των οποίων οκτώ (8) υποχρεωτικά και δυο (2) επιλογής · εκπόνηση και επιτυχής υπεράσπιση διπλωματικής εργασίας². Για απονομή του τίτλου σπουδών συνολικά απαιτούνται ενενήντα (90) πιστωτικές μονάδες του συστήματος ECTS.**

¹ Επιτυχής θεωρείται η εξέταση ενός μαθήματος εάν ο φοιτητής/φοιτήτρια εξασφαλίσει βαθμό *μεγαλύτερο ή ίσο* των 6/10.

² Επιτυχής θεωρείται η Διπλωματική Εργασία που εξασφαλίζει βαθμό *μεγαλύτερο ή ίσο* των 6/10.

4.3 Λεπτομέρειες Προγράμματος: Ακολουθεί κατάλογος μαθημάτων με βαθμούς και πιστωτικές μονάδες· για λεπτομέρειες βλ. Κανονισμό Σπουδών, Φύλλο Εφημερίδας Κυβέρνησης, Τεύχος Β, Αριθμός 4003/17/9/2018.

Κωδικός μαθήματος	Τίτλος μαθήματος	Τύπος Μαθήματος ³	Εξάμηνο	Πιστωτικές Μονάδες ECTS	Βαθμός
AY01	Κοιτασματολογία Κρίσιμων και Στρατηγικών Ορυκτών Πρώτων Υλών (ΟΠΥ).	Υ	1 ^ο	6	
AY02	Εφαρμογές της τηλεπισκόπησης στην Έρευνα για ΟΠΥ – Εισαγωγή στη Μηχανική Μάθηση	Υ	1 ^ο	6	
AY03	Κοιτασματολογική χαρτογράφηση, δειγματοληψίες και χρήση σύγχρονου φορητού εξοπλισμού	Υ	1 ^ο	6	
AY04	Γεωχημικές και Γεωφυσικές Μέθοδοι Διασκόπησης στην Έρευνα για ΟΠΥ	Υ	1 ^ο	6	
AE01	Ψηφιακή χαρτογραφία και GIS στην κοιτασματολογική έρευνα	Ε	1 ^ο	6	
AE02	Εφαρμογές Μικροσκοπίας στην έρευνα και αξιολόγηση ΟΠΥ	Ε	1 ^ο	6	
AE03	Μεταλλευτική δραστηριότητα και αειφορία	Ε	1 ^ο	6	
BY01	Εισαγωγή στη Διαχείριση Μεταλλευτικών Έργων - Υγιεινή και Ασφάλεια κατά την έρευνα και τις εξορύξεις	Υ	2 ^ο	6	
BY02	Εισαγωγή στη Γεωστατιστική - Εφαρμογές Γεωστατιστικής στην κοιτασματολογική έρευνα, την εκτίμηση και την διαχείριση των αποθεμάτων	Υ	2 ^ο	6	
BY03	Ταμιευτήρες υδρογονανθράκων και γεωλογική αποθήκευση CO ₂	Υ	2 ^ο	6	
BY04	Γεωτεχνική Εκτίμηση Ανοικτών Εκσκαφών και Υπογείων Έργων	Υ	2 ^ο	6	
BE01	Αδειοδοτήσεις Μεταλλευτικών Έργων και Περιβαλλοντική Διαχείριση	Ε	2 ^ο	6	
BE02	Βιομηχανικά ορυκτά και βιώσιμη ανάπτυξη	Ε	2 ^ο	6	
BE03	Τεκτονική στην έρευνα και εκμετάλλευση ΟΠΥ	Ε	2 ^ο	6	
ΜΔΕ	Μεταπτυχιακή Διπλωματική Εργασία		3 ^ο	30	
				ΣΥΝΟΛΟ 90	

³ Υ –Μάθημα Υποχρεωτικό, Ε – Μάθημα Επιλογής.

Γνώσεις

Οι απόφοιτοι διαθέτουν εξειδικευμένες και διεπιστημονικές γνώσεις στους τομείς της έρευνας, αξιολόγησης και διαχείρισης κρίσιμων και στρατηγικών ορυκτών πρώτων υλών. Κατανοούν τις αρχές της κοιτασματολογίας, τα μοντέλα γένεσης των κοιτασμάτων, τη γεωλογική τους κατανομή και τη σημασία τους για την οικονομία, την κοινωνία και την ενεργειακή μετάβαση. Διαθέτουν γνώσεις γεωχημικών, γεωφυσικών και τηλεπισκοπικών μεθόδων διασκόπησης, καθώς και των αρχών της φασματοσκοπίας, της γεωπληροφορικής και της μηχανικής μάθησης για εφαρμογές στην έρευνα φυσικών πόρων. Επιπλέον, κατέχουν γνώσεις στατιστικής και γεωστατιστικής ανάλυσης, εκτίμησης αποθεμάτων, τρισδιάστατης μοντελοποίησης κοιτασμάτων, σχεδιασμού και λειτουργίας μεταλλευτικών έργων, οικονομικής αξιολόγησης επενδύσεων, διαχείρισης κινδύνων και βιώσιμης αξιοποίησης φυσικών πόρων. Παράλληλα, κατανοούν τις βασικές αρχές των ταμιευτήρων υδρογονανθράκων, της γεωλογικής αποθήκευσης διοξειδίου του άνθρακα (CO₂) και του γεωτεχνικού σχεδιασμού επιφανειακών και υπόγειων έργων.

Δεξιότητες

Οι απόφοιτοι είναι σε θέση να εφαρμόζουν μεθόδους γεωλογικής και κοιτασματολογικής χαρτογράφησης, να σχεδιάζουν και να υλοποιούν προγράμματα δειγματοληψίας και να εφαρμόζουν διαδικασίες ποιοτικού ελέγχου δεδομένων. Χρησιμοποιούν σύγχρονο εργαστηριακό και φορητό εξοπλισμό για γεωχημικές και φασματοσκοπικές αναλύσεις και αξιοποιούν εξειδικευμένα λογισμικά για την επεξεργασία, ανάλυση και ερμηνεία γεωεπιστημονικών δεδομένων. Διαθέτουν δεξιότητες ανάλυσης δεδομένων τηλεπισκόπησης, εφαρμογής τεχνικών μηχανικής μάθησης, ερμηνείας γεωχημικών και γεωφυσικών δεδομένων και επιλογής κατάλληλων μεθόδων έρευνας ανάλογα με το γεωλογικό περιβάλλον. Εφαρμόζουν τεχνικές γεωστατιστικής ανάλυσης και τρισδιάστατης μοντελοποίησης για την εκτίμηση αποθεμάτων και τον σχεδιασμό εκμετάλλευσης κοιτασμάτων. Επιπλέον, είναι σε θέση να συμμετέχουν στον σχεδιασμό και την αξιολόγηση μεταλλευτικών και ενεργειακών έργων, στη σύνταξη επιχειρηματικών σχεδίων και στην αξιολόγηση επενδυτικών επιλογών, καθώς και στην ανάλυση γεωτεχνικών και περιβαλλοντικών παραμέτρων.

Ικανότητες

Οι απόφοιτοι μπορούν να συνδυάζουν γνώσεις από διαφορετικά επιστημονικά πεδία για την επίλυση σύνθετων προβλημάτων που σχετίζονται με την έρευνα, αξιολόγηση και βιώσιμη αξιοποίηση ορυκτών πόρων. Είναι ικανοί να αξιολογούν δεδομένα και να λαμβάνουν τεκμηριωμένες αποφάσεις σε συνθήκες αβεβαιότητας, να οργανώνουν και να διαχειρίζονται ερευνητικές, τεχνικές και επιχειρησιακές δραστηριότητες και να λειτουργούν αποτελεσματικά σε διεπιστημονικά περιβάλλοντα εργασίας. Επιδεικνύουν επαγγελματική υπευθυνότητα και συμμόρφωση με τις αρχές της ασφάλειας, της δεοντολογίας και της περιβαλλοντικής προστασίας, λαμβάνοντας υπόψη τις απαιτήσεις της βιώσιμης ανάπτυξης. Παράλληλα, διαθέτουν ανεπτυγμένες ψηφιακές και επικοινωνιακές ικανότητες, οι οποίες τους επιτρέπουν να παρουσιάζουν και να τεκμηριώνουν τεχνικά και επιστημονικά αποτελέσματα σε εξειδικευμένο και μη εξειδικευμένο κοινό, σε εθνικό και διεθνές επαγγελματικό περιβάλλον.

4.4 Σύστημα βαθμολογίας και κλίμακα κατανομής βαθμών:

Το Σύστημα Βαθμολογίας του ΠΜΣ «Έρευνα και Βιώσιμη Εκμετάλλευση Ορυκτών Πόρων» εφαρμόζει δεκαβάθμια βαθμολογική κλίμακα η οποία κυμαίνεται από το Ένα (1) μέχρι το Δέκα (10).

Επιτυχής θεωρείται η βαθμολογία η οποία κυμαίνεται από το Έξι (6) μέχρι το Δέκα (10) και ταξινομείται ως ακολούθως:

ΚΑΛΩΣ,	6,00 – 6,49
ΛΙΑΝ ΚΑΛΩΣ,	6,50 – 8,49
ΑΡΙΣΤΑ,	8,50 – 10

4.5 Γενική ταξινόμηση του τίτλου (στην πρωτότυπη γλώσσα): Π.Χ. 6,83 (ΛΙΑΝ ΚΑΛΩΣ)

5. ΠΛΗΡΟΦΟΡΙΕΣ ΣΧΕΤΙΚΑ ΜΕ ΤΙΣ ΠΕΡΑΙΤΕΡΩ ΔΥΝΑΤΟΤΗΤΕΣ ΠΟΥ ΠΡΟΣΦΕΡΕΙ Ο ΤΙΤΛΟΣ

5.1 Πρόσβαση σε περαιτέρω σπουδές: Πρόσβαση στον 3^ο Κύκλο Σπουδών (Διδακτορικές Σπουδές)

5.2 Επαγγελματικό καθεστώς: Πρόσβαση στην Αγορά Εργασίας σχετική με Έρευνα Εντοπισμού/Αξιοποίηση Ορυκτών και Ενεργειακών Πόρων, Διαχείριση Μεταλλευτικών Έργων, Αποτίμηση/Αντιμετώπιση Περιβαλλοντικών Προβλημάτων σχετιζόμενων με Μεταλλευτική Δραστηριότητα, Αξιολόγηση και Βιώσιμη Διαχείριση Ορυκτών Πρώτων Υλών κ.α.

6. ΣΥΜΠΛΗΡΩΜΑΤΙΚΕΣ ΠΛΗΡΟΦΟΡΙΕΣ

4.6 Συμπληρωματικές πληροφορίες: Δεν Απαιτείται Περίοδος Σπουδών σε άλλο Εκπαιδευτικό Ίδρυμα· Δεν Απαιτείται Πρακτική Άσκηση.

4.7 Άλλες πηγές πληροφοριών:

α) Ιστοσελίδα του ΠΜΣ «Έρευνα και Βιώσιμη Εκμετάλλευση Ορυκτών Πόρων» (<https://minexplo.geol.uoa.gr/>)

β) Ιστοσελίδα του Τμήματος Γεωλογίας και Γεωπεριβάλλοντος, <https://www.geol.uoa.gr/index.php?&lang=el?&lang=el>

γ) Ιστοσελίδα του Εθνικού Και Καποδιστριακού Πανεπιστημίου Αθηνών, (<https://www.uoa.gr/>)

δ) Ιστοσελίδες Υπουργείου Εθνικής Παιδείας Και Θρησκευμάτων <https://www.minedu.gov.gr/aei-9/to-thema-te> και <https://www.minedu.gov.gr/aei-9/metaptixiaka-menu>

7. ΠΙΣΤΟΠΟΙΗΣΗ ΤΟΥ ΠΑΡΑΡΤΗΜΑΤΟΣ

4.8 Ημερομηνία:

4.9 Όνομα και Υπογραφή:

4.10 Ιδιότητα:

4.11 Σφραγίδα:

8. ΠΛΗΡΟΦΟΡΙΕΣ ΣΧΕΤΙΚΑ ΜΕ ΤΟ ΕΘΝΙΚΟ ΣΥΣΤΗΜΑ ΤΡΙΤΟΒΑΘΜΙΑΣ ΕΚΠΑΙΔΕΥΣΗΣ

• Προπτυχιακός Κύκλος Σπουδών

Σύμφωνα με το Σύνταγμα της Ελλάδος (Άρθρο 16, παράγραφος 5), η πανεπιστημιακή εκπαίδευση παρέχεται από το Κράτος σε ιδρύματα που είναι πλήρως αυτοδιοικούμενα νομικά πρόσωπα δημοσίου δικαίου. Η κρατική εποπτεία ασκείται από τον Υπουργό Εθνικής Παιδείας και Θρησκευμάτων. Ο γενικός στόχος της διδασκαλίας, στα Τμήματα των Πανεπιστημίων αποβλέπει στην υψηλή θεωρητική και σφαιρική κατάρτιση του μελλοντικού επιστημονικού και ακαδημαϊκού δυναμικού της χώρας. Στα προγράμματα σπουδών των πανεπιστημίων δίνεται έμφαση στη θεμελίωση, παραγωγή, ανάπτυξη και μετάδοση της επιστήμης και της τεχνολογίας, στη βασική και εφαρμοσμένη έρευνα καθώς επίσης και στην ανάπτυξη σύγχρονων μεταπτυχιακών σπουδών. Ο απώτερος στόχος της Πανεπιστημιακής Εκπαίδευσης είναι η δυνατότητα προσαρμογής των πτυχιούχων στις συνεχώς μεταβαλλόμενες και αυξανόμενες απαιτήσεις του οικονομικού και κοινωνικού γίγνεσθαι. Υπάρχουν 23 Πανεπιστήμια στην ελληνική επικράτεια.

Τα Πανεπιστήμια αποτελούνται από Σχολές. Οι Σχολές καλύπτουν ένα σύνολο συγγενών επιστημών, έτσι ώστε να εξασφαλίζεται η αναγκαία, για την επιστημονική εξέλιξη, αλληλεπίδρασή τους και ο αναγκαίος για την έρευνα και τη διδασκαλία συντονισμός. Οι Σχολές διαιρούνται σε Τμήματα. Το Τμήμα αποτελεί τη βασική λειτουργική ακαδημαϊκή μονάδα και καλύπτει το γνωστικό αντικείμενο μιας επιστήμης. Το πρόγραμμα σπουδών του Τμήματος οδηγεί σε ένα ενιαίο πτυχίο. Κάθε Τμήμα μπορεί να χορηγεί πτυχία που πιστοποιούν μία ή περισσότερες ειδικεύσεις του ενιαίου πτυχίου του. Τα Τμήματα διαιρούνται σε Τομείς. Ο Τομέας συντονίζει τη διδασκαλία μέρους του γνωστικού αντικείμενου του Τμήματος που αντιστοιχεί σε συγκεκριμένο πεδίο της επιστήμης. Τα Πανεπιστήμια λειτουργούν και με ανεξάρτητα τμήματα τα οποία δεν υπάγονται σε Σχολές ή και μόνο με Τμήματα χωρίς να υπάρχουν Σχολές. Για την καλύτερη λειτουργία κάθε Πανεπιστημίου ιδρύονται εργαστήρια και κλινικές οι οποίες ανήκουν στον Τομέα ή στο Τμήμα και κάτω από ορισμένες προϋποθέσεις στη Σχολή. Η λειτουργία τους διέπεται από τον εσωτερικό κανονισμό τους. Σε κάθε Πανεπιστήμιο ιδρύεται ενιαία βιβλιοθήκη, για την εξυπηρέτηση των σκοπών της έρευνας και της διδασκαλίας. Αυτή λειτουργεί ως αυτοτελής και αποκεντρωμένη υπηρεσία και αποτελείται από την κεντρική βιβλιοθήκη του Πανεπιστημίου και τις βιβλιοθήκες των Τμημάτων.

Εισαγωγή

Η εισαγωγή των φοιτητών στα τριτοβάθμια εκπαιδευτικά ιδρύματα εξαρτάται από την επίδοσή τους σε γενικές εθνικές εξετάσεις εποπτευόμενες από το Υπουργείο Παιδείας και Θρησκευμάτων, οι οποίες λαμβάνουν χώρα μετά το πέρας των Λυκειακών Σπουδών.

Δίδακτρα – Χρηματοδότηση Φοιτητών

Η φοίτηση στα πανεπιστήμια είναι δωρεάν. Τα συγγράμματα χορηγούνται δωρεάν σε όλους τους φοιτητές. Παρέχεται επίσης δωρεάν σίτιση ανάλογα με την προσωπική ή οικογενειακή οικονομική κατάσταση του κάθε φοιτητή, ενώ οι φοιτητές δικαιούνται ιατροφαρμακευτική περίθαλψη καθώς επίσης και μειωμένο εισιτήριο στα δημόσια μέσα μεταφοράς.

Ακαδημαϊκό Έτος

Το ακαδημαϊκό έτος αρχίζει την 1^η Σεπτεμβρίου κάθε χρόνου και λήγει την 31^η Αυγούστου του επομένου. Το εκπαιδευτικό έργο - κάθε ακαδημαϊκού έτους- διαρθρώνεται χρονικά σε δύο εξάμηνα. Κάθε εξάμηνο περιλαμβάνει τουλάχιστον δεκατρείς (13) πλήρεις εβδομάδες για διδασκαλία και τρεις (3) εβδομάδες για εξετάσεις. Το πρώτο εξάμηνο αρχίζει το δεύτερο δεκαπενθήμερο του Σεπτεμβρίου και το δεύτερο εξάμηνο λήγει το δεύτερο δεκαπενθήμερο του Ιουνίου.

Μαθήματα

Το Πρόγραμμα Σπουδών, σε κάθε Τμήμα Πανεπιστημίου, περιλαμβάνει κατάλογο μαθημάτων υποχρεωτικών, υποχρεωτικής επιλογής και απλής επιλογής, το περιεχόμενο των οποίων, ώρες διδασκαλίας, αριθμό των πιστωτικών μονάδων και κάθε χρήσιμη για τις σπουδές πληροφορία. Το Πρόγραμμα Σπουδών προσαρμόζεται στον αριθμό εξαμήνων –το λιγότερο οκτώ (8)- που απαιτούνται για τη λήψη του πτυχίου.

Κάθε εξαμηνιαίο μάθημα περιλαμβάνει έναν αριθμό Πιστωτικών Μονάδων (ΠΜ) του συστήματος ECTS. Μία Πιστωτική Μονάδα αντιστοιχεί σε περίπου 25 ώρες κάθε είδους απασχόλησης του φοιτητή/φοιτήτριας (παρακολούθηση μαθημάτων/εργαστηριακών ασκήσεων, εργασία κατ' οίκο κ.λπ.). Το Πρόγραμμα Σπουδών εκάστου Τμήματος προβλέπει τον ελάχιστο αριθμό ΠΜ που απαιτείται για τη λήψη του πτυχίου.

Το Πρόγραμμα Σπουδών ενός Τμήματος ενδέχεται να περιλαμβάνει προαιρετική ή υποχρεωτική πρακτική άσκηση σε Επαγγελματικούς Οργανισμούς συμβεβλημένους με το Πανεπιστήμιο για διάστημα τριών έως έξι μηνών.

Το διδακτικό έργο περιλαμβάνει: 1) την αυτοτελή διδασκαλία ενός μαθήματος, 2) τις εργαστηριακές και κλινικές ασκήσεις

και την εν γένει πρακτική άσκηση των φοιτητών και, 3) την επίβλεψη διπλωματικών εργασιών και την πραγματοποίηση σεμιναρίων ή άλλων ανάλογων δραστηριοτήτων που αποσκοπούν στην εμπέδωση των γνώσεων των φοιτητών. Το διδακτικό έργο υποβοηθείται με τα αντίστοιχα διδακτικά βιβλία ή άλλα βοηθήματα, τα οποία χορηγούνται δωρεάν στους φοιτητές και με τη χορήγηση της σχετικής ελληνικής και ξένης βιβλιογραφίας.

Αξιολόγηση – Τίτλοι σπουδών

Σε κάθε μάθημα η βαθμολογία του φοιτητή καθορίζεται από το διδάσκοντα, ο οποίος οργανώνει γραπτές ή/και προφορικές εξετάσεις, ή στηρίζεται σε εργασίες ή εργαστηριακές ασκήσεις. Σε περίπτωση αποτυχίας σε υποχρεωτικό μάθημα, ο φοιτητής υποχρεούται να το επαναλάβει σε επόμενο εξάμηνο. Σε περίπτωση αποτυχίας σε μάθημα επιλογής, ο φοιτητής οφείλει, ή να το επαναλάβει σε επόμενα εξάμηνα ή να επιλέξει άλλο μάθημα επιλογής.

Ο φοιτητής ολοκληρώνει τις σπουδές του και λαμβάνει πτυχίο όταν επιτύχει στα προβλεπόμενα μαθήματα και συγκεντρώσει τον απαιτούμενο αριθμό Πιστωτικών Μονάδων. Το πτυχίο, ο τύπος του οποίου καθορίζεται από τον εσωτερικό κανονισμό των Πανεπιστημίων έχει ισχύ για την αγορά εργασίας χωρίς καμία περαιτέρω πιστοποίηση.

• Μεταπτυχιακός Κύκλος Σπουδών

Στα ελληνικά Πανεπιστήμια λειτουργούν *Προγράμματα Μεταπτυχιακών Σπουδών (ΠΜΣ)* που οδηγούν στη λήψη *Μεταπτυχιακού Διπλώματος Ειδίκευσης (ΜΔΕ)* και/ή *Διδακτορικού Διπλώματος*. Την ευθύνη για την υλοποίηση του ΠΜΣ έχει το αντίστοιχο -με το επιστημονικό πεδίο του μεταπτυχιακού προγράμματος- Τμήμα και η τελική έγκριση δίνεται από τον Υπουργό Παιδείας. Η εισαγωγή των υποψηφίων στα ΠΜΣ γίνεται με διαδικασία επιλογής ή εξετάσεων (προφορικών ή/και γραπτών). Απαραίτητη προϋπόθεση αποτελεί η γνώση μιας ξένης γλώσσας (για τους Έλληνες υποψήφιους), ενώ κατά τη διαδικασία επιλογής συνεκτιμώνται ο βαθμός του πτυχίου, η επίδοση στα προπτυχιακά μαθήματα που είναι συναφή με το ΠΜΣ, η προπτυχιακή διπλωματική εργασία και η τυχόν ερευνητική – συγγραφική δραστηριότητα του υποψηφίου. Απαραίτητη προϋπόθεση για την εγγραφή σε πρόγραμμα απόκτησης διδακτορικού διπλώματος αποτελεί η απόκτηση ΜΔΕ. Η χρονική διάρκεια ενός ΠΜΣ δεν μπορεί να είναι μικρότερη από ένα ημερολογιακό έτος. Τα αναλυτικά προγράμματα σπουδών, τα μαθήματα που διδάσκονται και ο αριθμός των ωρών που προβλέπονται για κάθε μάθημα καθορίζονται από τη Γενική Συνέλευση Ειδικής Σύνοψης (ΓΣΕΣ) του οικείου Τμήματος και εγκρίνονται από τη Σύγκλητο του οικείου Πανεπιστημίου. Για την απονομή διδακτορικού διπλώματος απαιτείται η εκπόνηση πρωτότυπης μελέτης η οποία αναμένεται να συμβάλει στην προαγωγή της επιστήμης. Η προς τούτο ερευνητική εργασία χωρεί υπό την επίβλεψη τριμελούς συμβουλευτικής επιτροπής που έχει οριστεί από το οικείο Τμήμα.

HELLENIC REPUBLIC



NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS SCHOOL OF SCIENCES DEPARTMENT OF GEOLOGY AND GEOENVIRONMENT

DIPLOMA SUPPLEMENT FOR THE POSTGRADUATE STUDIES PROGRAMME “EXPLORATION AND SUSTAINABLE EXPLOITATION OF MINERAL RESOURCES”

The Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international “transparency” and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free from any value judgments, equivalence statements or suggestions about recognition. Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why.

1. INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

- 1.1 Family name(s):
- 1.2 Given name(s):
- 1.3 Date of birth (*day/month/year*) – Place – Country of Birth:
- 1.4 Student identification number or code (*if available*):

2. INFORMATION ON THE IDENTITY OF THE QUALIFICATION

- 2.1 Name of qualification: **“METAPTYCHIAKO DIPLOMA SPOUDON” (POSTGRADUATE STUDIES DIPLOMA, COMMONLY “MASTER’S DEGREE)**
- 2.1 Main field(s) of study for the qualification: **EXPLORATION AND SUSTAINABLE EXPLOITATION OF MINERAL RESOURCES**
- 2.2 Name and status of awarding institution: **ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON (NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS), PUBLIC UNIVERSITY**
- 2.3 Name and status of institution (*if different from 2.3*) administering studies (*in original language*): –
- 2.4 Language(s) of instruction/examination: **Greek/ English (when required)**

3. INFORMATION ON THE LEVEL OF THE QUALIFICATION

- 3.1 Level of qualification: **Second Cycle Studies – Postgraduate Studies**
- 3.2 Official duration of programme: **3 semesters**
- 3.3 Access requirement(s): **First cycle degree of a relevant discipline (ptychio or bachelor equivalent) with a minimum grade of 6.5/10; functional knowledge of English (level b2 and higher); interview**

4. INFORMATION ON THE PROGRAMME CONTENTS AND RESULTS GAINED

4.1 Mode of study: Full-Time

4.2 Programme requirements: Minimum attendance of three (3) and maximum six (6) semesters; successful completion¹ of ten (10) courses, of which eight (8) are compulsory, and two (2) are elective; completion and successful defense of a postgraduate dissertation (thesis)². For the degree to be awarded, a minimum total of ninety (90) ECTS credits is required.

4.3 Programme details: There follows a list of the Courses taken, with grades and ECTS credits. For details pls. to the Postgraduate Programme Regulation published in the **Government Gazette, Issue B' 4003/17/9/2018.**

Course Code	Course Title	Course Type ³	Semester	ECTS Credits	Grade
AY01	Ore Geology of Critical and Strategic Raw Materials	C	1	6	
AY02	Remote sensing applications in mineral exploration- Introduction to Machine Learning	C	1	6	
AY03	Mineral exploration mapping, sampling techniques and use of modern portable equipment	C	1	6	
AY04	Geochemical and Geophysical reconnaissance methods in mineral exploration	C	1	6	
AE01	Digital mapping and GIS applications in mineral exploration	E	1	6	
AE02	Applications of Microscopy in mineral exploration and ore evaluation	E	1	6	
AE03	Mining operations and Sustainability	E	1	6	
BY01	Introduction to mining operation management- Health and safety during mineral exploration and exploitation	C	2	6	
BY02	Introduction to Geostatistics- Geostatistical applications in mineral exploration, evaluation and resource management	C	2	6	
BY03	Hydrocarbon reservoirs and geological CO ₂ storage	C	2	6	
BY04	Geotechnical evaluation of open-pit and underground excavations	C	2	6	
BE01	Permit procedures of mining operations and environmental management	E	2	6	
BE02	Industrial minerals and sustainable development	E	2	6	
BE03	Structural Geology and Tectonics in mineral exploration and exploitation	E	2	6	
MDS	Master's Dissertation	C	3	30	
				TOTAL 90	

Knowledge

Graduates possess specialized and interdisciplinary knowledge in the fields of exploration, evaluation, and management of critical and strategic mineral raw materials. They understand the principles of economic geology, ore deposit genetic models, their geological distribution, and their significance for the economy, society, and the energy transition. They have knowledge of geochemical, geophysical, and remote sensing exploration methods, as well as the principles of spectroscopy, geoinformatics, and machine learning for applications in natural resource exploration. In addition, they possess knowledge of statistical and geostatistical analysis, resource estimation, three-dimensional modelling of ore deposits, the design and operation of mining projects, economic evaluation of investments, risk management, and the sustainable exploitation of natural resources. At the same time, they understand the basic principles of hydrocarbon reservoirs, geological storage of carbon dioxide (CO₂), and geotechnical design of surface and underground works.

Skills

Graduates are able to apply methods of geological and economic-geological mapping, design and implement sampling programmes, and apply data quality control procedures. They use modern laboratory and portable equipment for geochemical and spectroscopic analyses and make use of specialized software for the processing, analysis, and interpretation of geological data. They have skills in remote sensing data analysis, the application of machine learning techniques, the interpretation of geochemical and geophysical data, and the selection of appropriate exploration methods according to the geological setting. They apply geostatistical analysis and three-dimensional modelling techniques for resource estimation and the planning of ore deposit exploitation. In addition, they are able to participate in the design and evaluation of mining and energy projects, the preparation of business plans and the assessment of investment options, as well as the analysis of geotechnical and environmental parameters.

Competences

Graduates are able to combine knowledge from different scientific fields to solve complex problems related to the exploration, evaluation, and sustainable exploitation of mineral resources. They can evaluate data and make evidence-based decisions under conditions of uncertainty, organizing and managing research, technical, and operational activities, and working effectively in interdisciplinary professional environments. They demonstrate professional responsibility and compliance with the principles of safety, ethics, and environmental protection, taking into account the requirements of sustainable development. At the same time, they possess advanced digital and communication competences, which enable them to present and document technical and scientific results to both specialized and non-specialized audiences, within national and international professional environments.

4.4 Grading scheme and characterization:

The grading scheme of the PG programme “Exploration and Sustainable Exploitation of Mineral Resources” is based on a 10-degree scale ranging from 1 (lowest) to 10 (highest). Passing grades range from 6 to 10 and are characterized as follows:

“Well” when 6 – 6.49

“Very Well” when 6.50 – 8.49

“Excellent” when 8.50 – 10

4.5 Overall classification of the qualification (*in original language*): e.g. 6.83 - “Very Well”

5. INFORMATION ON THE FUNCTION OF THE QUALIFICATION

5.1 Access to further study: Access to 3rd cycle (doctoral) studies

5.2 Professional Status: Qualification for careers related to engineering/ geotechnical applications, mitigation/prevention of natural disasters, prospecting and exploitation of energy and natural resources, evaluation/mitigation of environmental degradation, etc.

6. ADDITIONAL INFORMATION

6.1 Complementary Information: Attendance of courses in other (e.g. exchange) educational institutions is not required.
Internships at professional organizations are not required

6.2 Additional Information Sources:

- a) Webpage of the PG Programme «Exploration and Sustainable Exploitation of Mineral Resources » (<https://minexplo.geol.uoa.gr>)
- b) Webpage of the Department of Geology and Geoenvironment, <https://www.geol.uoa.gr/index.php?&lang=el?&lang=el>)
- c) Webpage of the National and Kapodistrian University of Athens, <https://www.uoa.gr/>
- d) Webpages of the Ministry of Education, <https://www.minedu.gov.gr/aei-9/to-thema-te> and <https://www.minedu.gov.gr/aei-9/metaptixiaka-menu>

7. CERTIFICATION OF THE SUPPLEMENT

7.1 Date:

7.2 Name and Signature:

7.3 Capacity:

7.4 Official stamp or seal:

¹ Course is successfully completed if a student secures an overall grade equal to, or higher than 6/10

² A Postgraduate Dissertation (Thesis) is successfully defended if it secures an overall grade equal to, or higher than 6/10.

³ C – Compulsory Course, E – Elective Course.

8. INFORMATION ON THE GREEK NATIONAL HIGHER EDUCATION SYSTEM

Undergraduate Studies

According to the Constitution of Hellas (article 16, paragraph 5) University education is provided exclusively by the State in institutions, which are fully self-administered legal entities of public law. The Minister of National Education and Religious Affairs exercises state supervision. The general objective of the courses in University departments is to provide a high level of theoretical and all-round training to the country's future professionals, scholars, scientists and academics. University courses emphasize the documentation, production, development and transmission of knowledge, science and technology, on pure and applied research and on the development of modern postgraduate studies. The ultimate goal of University education is to equip graduates with the ability to adapt to the ever-changing and constantly growing demands of life. In Hellas there are twenty-three (23) Universities.

The Universities consist of Schools, Departments and Sections. The Schools comprise a group of broadly related scientific disciplines. Each discipline is curated by a relevant Department. The main function of a School is to coordinate the interaction between Departments in teaching and research. Departments are the basic academic units that curate the field of knowledge of a scientific discipline and offer courses that lead to a single degree. Each Department can award one or more specializations. Departments comprise Divisions, which coordinate the teaching of specializations within the field of knowledge of a scientific discipline. The Universities may also establish Independent Departments without the scope of existing Schools. Departments and Sections may include Laboratories and Clinics. Every University operates an academic library, which is an independent and decentralized service consisting of a Main and Departmental Libraries.

Admission

Students are admitted to higher education institutes according to their performance at national-level examinations taking place at the second and third grade of *Lykeio*. For admission to certain faculties (such as physical education, science, foreign languages and literature, military schools, etc.), candidates are examined additionally in special courses or sports.

Fees – Financial support for students

Admission to Universities is free. Textbooks are distributed free of charge. Meals and housing are also provided, depending on the student's economic status. Students are also entitled to medical care and to a reduced fare in public mass transportation media.

Academic year

The academic year begins on the 1st of September of a calendar year and ends on the 31st of August of the following year. Educational activities are organized in two semesters (autumn and spring), each comprising a minimum of 13 weeks of teaching and 2-3 weeks of examinations. The first (autumn) semester begins at the middle end of September, and the second (spring) semester ends at the end of the month of June of the following year.

Courses

The Studies Programme of a Department comprises a list of one-semester courses which may be compulsory, compulsory-elective or elective, their subject matter, the number of hours of classes per week, their associated number of ECTS Credits and all other information useful to a student. The Studies Programme is designed around the number of semesters required to qualify for a degree (with a minimum of 8).

Each one-semester course is associated with a number of ECTS Credits. One ECTS Credit corresponds to approximately 25 hours of any type of work required for the course (e.g. attendance, laboratory training, homework, etc.). The Studies Programme specifies the minimum number of ECTS Credits required for the degree.

Teaching generally includes lecturing, practical exercises, laboratory/ clinical exercises and other theoretical or practical training (e.g. seminars, invited lectures etc.). A Studies Programme may also include the compilation of an Undergraduate Diploma Thesis and optional or mandatory practical training in third-party professional organizations for a period of three to six months. Studying is supported by textbooks, teaching aids and online bibliographical databases provided free of charge.

Examinations – Student Evaluation

In each course, students are evaluated and graded by sitting in oral or written examinations, or by submitting a specified number of essays. The exact method of student evaluation in a course lies in the discretion of the teaching staff of the course. If a student fails a compulsory course, he/she is obliged to repeat it in a subsequent semester. If a student fails an elective course, he/she will either repeat the course in a subsequent semester or select another elective course. Students complete their studies and receive their degree when they have passed the required number of courses and have accumulated the required number of ECTS credits.

Post-graduate Studies

Postgraduate Study Programmes (PSP) lead to Postgraduate Specialization Degrees (PSD) and/or Doctorate Degrees. The organization and operation of PSPs is a responsibility of University Departments, with the Ministry of National Education granting final approval. Candidates are admitted to a PSP either by a selection process or by examinations, as specified in a PSP's Regulation. A Prerequisite for admission to doctoral study programmes is for the candidate to hold a PSD. The duration of a PSP cannot be less than one calendar year. The syllabus of a PSP is compiled by the relevant Department and approved by the Senate of the University. The requirement for a doctoral degree is the completion and conduction of original academic or applied research and compilation of a relevant Thesis, which is expected to contribute to the advancement of knowledge. Research is conducted under the supervision of a three-member advisory committee appointed by the relevant Department.

Appendix III

Regulations governing the student complaints and appeals management procedure

REGULATIONS FOR THE MANAGEMENT OF COMPLAINTS AND APPEALS OF THE MSc PROGRAMME “EXPLORATION AND SUSTAINABLE EXPLOITATION OF MINERAL RESOURCES”

Article 1. Definitions – General Principles

To strengthen the student-centered educational process and the principles of transparency and accountability, the “Regulations for the Management of Complaints and Appeals” of postgraduate students in the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” of the Department of Geology and Geoenvironment, School of Science, NKUA, have been adopted and must be observed. This procedure applies to all complaints concerning the quality of the educational services provided by the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” of the School of Science.

A complaint/appeal is defined as a concern or issue causing dissatisfaction that relates to the quality of the services provided by the MSc Programme and whose resolution is not covered by other regulations and procedures.

The MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” recognizes that complaints/appeals may arise from time to time and must be appropriately addressed and managed. The Programme seeks to create an environment in which: (i) submitting complaints/appeals is fully accepted; (ii) the person submitting the complaint/appeal knows that doing so will not result in any adverse consequence; (iii) complaints/appeals receive the necessary attention; (iv) where a member of the Programme is involved, that person has an opportunity to respond; and (v) all parties involved are informed promptly about the handling of the complaint/appeal once the process has been completed.

Article 2. Purpose

The purpose of these Regulations is to provide a systematic and consistent framework that promotes the fair and timely resolution of any issues raised by students. This systematic approach promotes accountability while also helping to remedy deficient services where necessary, prevent the recurrence of identified problems, and continuously improve the quality of studies and the learning experience.

The complaints-management policy is addressed to active students of the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” and is intended to resolve disagreements or problems such as:

- Disagreement concerning studies and attendance
- Improper conduct by a member of the academic or administrative staff
- Insufficient guidance of students by a member of the academic staff
- Insufficient guidance of students by a member of the administrative staff

Article 3. Resolution Procedures

A complaint/appeal may be addressed through two principal categories of procedure: (i) direct resolution and (ii) submission of a complaint/appeal.

(I) Direct resolution

The MSc Programme encourages students to try to resolve any complaint or appeal promptly and directly with the member(s) of the Programme (faculty, laboratory teaching staff, special technical laboratory staff, associate or Secretariat) involved in the matter that caused the dissatisfaction.

This makes it possible to remedy any error, misunderstanding or omission as quickly as possible. Where a student is dissatisfied with the direct-resolution process, does not know whom to approach, or has reservations about approaching the person involved directly, the student may contact either the Director of the MSc Programme or their Academic Advisor for support and guidance aimed at resolving the issue promptly.

(II) Submission of a complaint/appeal

Where, after completion of the direct-resolution process, the student objects to the proposed solution or the situation remains problematic, the student may submit the complaint in writing.

The procedure is described below:

For recording complaints and appeals by students of the MSc Programme, a “Complaint Submission Form” is available electronically on the website of the MSc Programme “Exploration and Sustainable Exploitation of Mineral

Resources” (minexplo.geol.uoa.gr). The ⁹student completes the form and submits it to the Programme Secretariat. The Secretariat ensures that the request is registered immediately and communicated both to the student concerned and to their Academic Advisor (see Appendix IV—ACADEMIC ADVISOR).

After examining the complaint, the Academic Advisor takes all necessary action and informs the governing bodies of the MSc Programme.

Academic Advisors may propose solutions and act as mediators, in direct consultation with the student, for all parties involved. To this end, the Academic Advisor may, at their discretion, contact other members of the Programme Coordinating Committee to request their assistance in resolving the problem, as their duties require. The student may follow the same procedure where cooperation with the Academic Advisor does not resolve the problem/appeal.

In every case, the Postgraduate Education Committee of the School of Science may also be activated upon request; students may contact it regarding any problems encountered during their studies. An issue affecting a student should initially be resolved by the Academic Advisor and/or the instructor of the course concerned. Where the proposed solution does not satisfy the student, the student has the right to contact the Programme Directorate, which will decide whether the opinion of the Coordinating Committee is required. Where the decision of the Director does not satisfy the student, the student may lodge a complaint/appeal, and the final decision will be taken by the Assembly of the Department of Geology and Geoenvironment. The decision of the Department Assembly is final.

Depending on the nature and urgency of the matter, the student is duly informed within a reasonable period of the outcome of the actions taken and the decisions made concerning the matter.

Article 4. Protection of Personal Data

To protect students’ personal data, the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” archives and manages information arising from any appeal/complaint in accordance with applicable legislation and under no circumstances discloses their personal data (contact details, grade records or other data of a personal nature).

Article 5. Evaluation of the Implementation of the Complaint and Appeal Resolution Procedure

It is advisable to implement measures that will help optimize the complaint and appeal resolution process. Complaints and appeals submitted through the written/formal procedure should be recorded and classified electronically so that the outcomes of their resolution can be measured, evaluated and compared both qualitatively and quantitatively (SEE COMPLAINT SUBMISSION FORM).

⁹ The site is under construction

NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS SCHOOL OF SCIENCE
DEPARTMENT OF GEOLOGY AND GEOENVIRONMENT

POSTGRADUATE STUDY PROGRAMME COMPLAINT SUBMISSION FORM

TO THE SECRETARIAT OF THE MSc PROGRAMME “EXPLORATION AND SUSTAINABLE
EXPLOITATION OF MINERAL RESOURCES”

FULL NAME:

FATHER’S NAME:

STUDENT REGISTRATION NO.:

Telephone / Mobile:

e-mail.....

DESCRIBE YOUR COMPLAINT

I hereby declare that I consent to the processing of my personal data by the Academic
Advisor of the MSc Programme for the purpose of handling
this complaint.

Athens

THE APPLICANT

**IF THE INFORMATION YOU PROVIDE IS INACCURATE, YOUR SUBMISSION WILL NOT BE
ACCEPTED.**

Appendix IV

Regulation of the Academic Advisor

REGULATION OF THE ACADEMIC ADVISOR FOR THE MSc PROGRAMME “EXPLORATION AND SUSTAINABLE EXPLOITATION OF MINERAL RESOURCES”

Article 1. Purpose of the System

Academic Advisors are members of the teaching staff who provide specialized information to students and graduates of the Department of Geology and Geoenvironment regarding postgraduate studies and career prospects.

The Regulations of the MSc Programme “Exploration and Sustainable Exploitation of Mineral Resources” provide for the rotation of Academic Advisor duties among instructors and regulate the relevant specific matters. Any instructor who is a faculty member of the Programme may serve as an Academic Advisor, irrespective of academic rank or position. Academic Advisors support the students assigned to them from the beginning until the completion of their studies. The Academic Advisors of each MSc Programme are coordinated by the Programme Director. The system is compulsory, as it is considered likely to contribute significantly to the successful completion of postgraduate students' studies. Information is provided by the Academic Advisor to the student during appointments arranged in advance between them.

Article 2. Allocation of Students

Depending on the number of postgraduate students, the Coordinating Committee may assign Academic Advisor duties not only to faculty members but also to laboratory teaching staff, special teaching staff, special technical laboratory staff, holders of doctoral degrees, and emeritus or retired faculty members, provided that they teach in the MSc Programme. Students are allocated to Academic Advisors by decision of the Coordinating Committee. An Academic Advisor may supervise more than one student. The Programme Secretariat informs students of the appointment of their Academic Advisor and provides the Advisor's contact details. The Academic Advisor works with the assigned students throughout their studies.

Article 3. Duties of Academic Advisors

When first meeting a student, the Academic Advisor should record the student's details and any other information considered important (e.g. whether the student has learning difficulties requiring an alternative form of assessment, or mobility difficulties requiring the recommendation of an easily accessible classroom, etc.). Each student's record is subject to the General Data Protection Regulation and is confidential. The Academic Advisor's role is advisory and supports students in their programme of study by guiding them towards achieving their objectives.

Students should feel free to discuss with their Academic Advisor any matter concerning their academic life, such as problems with courses, laboratories or practical training; matters relating to the Study Regulations; course selection; and even personal difficulties (family or health problems) that may affect their studies. The Academic Advisor will endeavor, as far as possible, to provide or suggest solutions to any problems that arise. The Academic Advisor is not, however, required to guarantee in advance that every problem can be resolved.

The Academic Advisor may also be the first person to contact a student at an instructor's request and advise the student about their performance (for example, where the student has absences or is not performing well in courses) or discuss any matter that may be creating difficulties in the student's studies, including issues involving an instructor (see also the REGULATIONS FOR COMPLAINTS AND APPEALS).

Depending on the student's interests and desired career path, the Academic Advisor may also advise the student on the subject of the Master's thesis. The Advisor may further assist the student and indicate possible career opportunities in the public or private sector, in self-employment, and even in positions abroad. The Advisor may also inform the student about services offered by the University to postgraduate students (International Relations Office, Erasmus+, student card, etc.).

Article 4. Change of Academic Advisor

A student retains the same Academic Advisor until completion of their studies. The Academic Advisor may be replaced only for very serious reasons, following a recommendation by the Coordinating Committee.

Appendix V

Course Outlines

First-semester courses

AY01. Mineral Deposits of Critical and Strategic Mineral Raw Materials

Instructors: Vasilatos, C., Voudouris, P., Papoutsas, A., Melfos, V., Mavrogonatos, K., Tombros, S.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	AY01	SEMESTER	1st
COURSE TITLE	ORE-DEPOSIT GEOLOGY OF CRITICAL AND STRATEGIC MINERAL RAW MATERIALS		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Compulsory, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Fundamental knowledge of Petrology, Geochemistry, Mineralogy and Ore-Deposit Geology		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL741/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the fundamental concepts, terminology, and importance of critical and strategic mineral raw materials for modern technological civilization. - Understand the stages of mineral exploration and ore deposit discovery. - Become familiar with the classification of mineral resources and reserves, geological deposit-genesis models, and the geotectonic settings in which deposits form. - Acquire knowledge of the geology and characteristics of important types of critical-metal deposits, as well as their availability and significance at international and national levels.	
Skills	
- Recognition and evaluation of ore-deposit genetic models for critical mineral raw materials. - Interpretation of geological and metallogenic information for selecting exploration target areas. - Skills in integrating principles of sustainable mineral-resource utilization, with emphasis on the use of mining waste, metal recycling and rational management of available resources.	- Independent work - Teamwork - Searching for, analyzing and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course examines critical and strategic mineral raw materials and their role in the modern technological and energy transition. It presents the general principles of ore-deposit geology, the classification of mineral resources and reserves, and the stages of exploration for their discovery. It analyses the principal genetic models and deposit types of important metals, such as rare earth elements, uranium and thorium, rechargeable-battery materials (lithium, cobalt, nickel, and graphite), platinum-group elements, copper, and other critical metals. It also examines secondary metal sources, recycling, anthropogenic deposits, and the occurrence of critical mineral raw materials in mining waste and in Greek deposits.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.												
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.												
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Total Course Workload	150 hours												
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.												

(5) RECOMMENDED BIBLIOGRAPHY

- Franco Pirajno, 2009, Hydrothermal Processes and Mineral Systems, [EUDOXUS Code: 73241410]
- Pohl, Economic Geology – Principles and Practice, Wiley - Blackwell 2011. [EUDOXUS Code: 80504203]
- Taylor R., Ore Textures, Springer Berlin 2009 [EUDOXUS Code: 73249091]
- John Ridley, Ore deposit geology, Cambridge University press 2013
- Melfos, B., and Voudouris, P., Deposits of Greece, Kallipos Open Academic Editions [EUDOXUS Code: 112701600], in GREEK

RELATED JOURNALS

Economic Geology Journal, Society of Economic Geologists, Mineralium Deposita-International Journal for Geology, Mineralogy and Geochemistry of Mineral Deposits, Ore Geology Reviews, Ore and Energy Resource Geology, Resource Geology

AY02. Applications of Remote Sensing in Mineral Raw Material Exploration – Introduction to Machine Learning

Instructors: Vasilakis, E., Sykioti, O., Koutroumbas, K., Papoutsas, A.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	AY02	SEMESTER	1st
COURSE TITLE	APPLICATIONS OF REMOTE SENSING IN MINERAL RAW MATERIAL EXPLORATION – INTRODUCTION TO MACHINE LEARNING		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Compulsory, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Ore-Deposit Geology, Petrology, and knowledge of the basic principles of remote sensing		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL742/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the fundamental principles of remote sensing and the interaction of electromagnetic radiation with minerals and rocks. - Become familiar with the spectral properties of geological materials and the capabilities of satellite and airborne Earth-observation systems. - Acquire fundamental knowledge of remote-sensing data-processing methods and the machine-learning principles applied to spectral-data analysis for geological and mining applications.	
Skills	
- Skills in processing and analyzing satellite and spectral data to detect and map minerals, rocks and hydrothermal alteration associated with metallogenic systems. - Application of remote-sensing image pre-processing and transformation techniques. - Use of basic machine-learning algorithms for the classification and spectral unmixing of geological materials. - Use of combined remote-sensing and imaging-spectroscopy data to support mineral-resource exploration and monitor the environmental impacts of mining activities.	- Independent work - Teamwork - Searching for, analyzing and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course presents the fundamental principles of remote sensing and its applications in mineral raw material exploration. It examines electromagnetic radiation, reflectance spectroscopy, and the spectral properties of minerals and rocks. Earth-observation platforms and sensors are presented, together with methods for pre-processing and analyzing remote-sensing data to detect and map geological formations and alteration associated with mineralization. The course also introduces fundamental machine-learning concepts and their combined use with spectral data for mineral-resource exploration and monitoring the environmental impacts of mining activities.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.												
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.												
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STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.												

(5) RECOMMENDED BIBLIOGRAPHY

- Astaras, T., 2010. Remote Sensing–Photointerpretation in the Geosciences, Gkiourdas Publications, pp. 484, in GREEK

RELATED JOURNALS

GIS and Remote Sensing Journal, International Journal of Remote Sensing, Remote Sensing of Environment, Journal of Remote Sensing, Journal of photogrammetry and Remote sensing

AY03. Mineral exploration mapping, sampling, and the use of modern portable equipment

Instructors: Papadopoulos, A., Stouraiti, C., Voudouris, P., Soukis, K., Papoutsas, A., Anastasatou, M., Vasilatos, C., Kydonakis, K., Megremi, I.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	AY03	SEMESTER	1st
COURSE TITLE	MINERAL EXPLORATION MAPPING, SAMPLING AND USE OF MODERN PORTABLE EQUIPMENT		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Compulsory, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Ore-Deposit Geology, Petrology, Mineralogy, Tectonics		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL743/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the fundamental principles of mineral exploration mapping and sampling in mining and geological settings. - Become familiar with sampling theory, drilling types and the basic statistical concepts relating to the reliability of geological data, such as accuracy, precision, and systematic errors. - Know the procedures for recording geological data. - Know the principles of quality assurance and quality control in the collection and evaluation of geological and geochemical information.	
Skills	
- Skills in designing and implementing sampling programmes in mineral exploration. - Ability to systematically map and record geological data in mines, quarries, and surface outcrops. - Collection of representative samples of minerals, rocks, ores and sediments, and description and sampling of drill cores. - Experience in the use of modern portable analytical equipment (e.g., XRF, LIBS and Vis-NIR-SWIR) for in-situ geochemical analyses.	- Evaluation of analytical results to support mineral-resource exploration and rational utilization. - Independent work - Teamwork - Searching for, analyzing and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course covers the fundamental principles of mapping and sampling in the context of mineral raw material exploration. It presents sampling theory and methods, drilling types, and principles of data quality assurance. It examines techniques for mapping and recording geological information in mines and quarries, as well as procedures for collecting and describing samples and drill cores. It also presents modern methods of in-situ geochemical analysis using portable spectroscopic instruments, together with the processing and evaluation of the data generated.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.												
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.												
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STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.												

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- Lozios, S., Soukis, K. & Antoniou, V., 2015, Geological Mapping and Field Exercises, Hellenic Academic Electronic Textbooks and Aids, Hellenic Academic Libraries Link, 280 pp. [EUDOXUS Code: 320091], in GREEK
- Bennison, M.G., Olver, A.P. & Moseley, A.K.C., 2011, Introduction to Geological Structures and Maps, 168 pp., Routledge.
- Coe, L. A. (ed), Argles, W. T., Rothery, A. D., Spicer, A. R., 2010, Geological Field Techniques, 323 pp., Wiley-Blackwell
- Mc Clay, K., 1991, The Mapping of Geological Structures, 168 pp., Wiley-Blackwell.
- Marjoribanks, R., 1997, Geological Methods in mineral exploration and mining, Springer.

RELATED JOURNALS

Economic Geology Journal, Society of Economic Geologists, Mineralium Deposita-International Journal for Geology, Mineralogy and Geochemistry of Mineral Deposits, Ore Geology Reviews, Ore and Energy Resource Geology, Resource Geology

AY04. Geochemical and Geophysical Survey Methods in Mineral Raw Materials Exploration

Instructors: Stouraiti, C., Alexopoulos, I., Dilalos, S., Sakellaris, G., Argyraki, A., Kelepertzis, S., Sakkas, V.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	AY04	SEMESTER	1st
COURSE TITLE	GEOCHEMICAL AND GEOPHYSICAL PROSPECTING METHODS IN MINERAL RAW MATERIAL EXPLORATION		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Compulsory, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Geochemistry, Geophysics, Ore-Deposit Geology		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL744/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the fundamental principles of the geochemical and geophysical methods used in mineral exploration. - Acquire knowledge of the geochemical cycle and primary and secondary geochemical environments. - Understand the concept of a geochemical anomaly and the importance of indicator elements in deposit exploration and discovery. - Know the operating principles of the principal geophysical methods for subsurface investigation and their application to the investigation of geological structures and deposits.	
Skills	
- Skills in designing geochemical and geophysical surveys for mineral-resource exploration. - Selection of appropriate sampling media and geophysical techniques according to the geological setting and stage of exploration. - Ability to correctly collect, prepare, manage, and evaluate geochemical samples, and to process and visualize geochemical data for the identification of geochemical anomalies. - Ability to process and interpret geophysical measurements and integrate geophysical–geological models for effective deposit investigation.	- Independent work - Teamwork - Searching for, analyzing and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course presents the principal geochemical and geophysical methods used in mineral raw material exploration. It examines the geochemical cycle, geochemical environments, and techniques for sampling and analysis in different media (rocks, soils, sediments, water, vegetation, and gases). It also presents the fundamental principles of geochemical-survey design, the processing and mapping of geochemical data, and the interpretation of geochemical anomalies. In parallel, it analyses the main geophysical methods for subsurface investigation, including electrical and electromagnetic methods, magnetotellurics, ground-penetrating radar and seismic methods, and their applications to the investigation of metallic-mineral deposits and energy resources.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.												
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.												
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STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.												

(5) RECOMMENDED BIBLIOGRAPHY

- Dentith, M., & Mudge, S.T., 2014, Geophysics for the Mineral Exploration Geoscientist, 454 pp., Cambridge University Press.
- Telford, W.M., Geldart, L.P., & Sheriff, R.E., 1990, Applied Geophysics, 792 pp., Cambridge University Press.
- Talapatra, A.K., 2020, Geochemical Exploration and Modelling of Concealed Mineral Deposits, 201 pp., Springer
- Govett, G.J.S. (ed.), 1983, Rock Geochemistry in Mineral Exploration, Handbook of Exploration Geochemistry, Vol. 3, 461 pp., Elsevier.
- Hawkes, H.E., & Webb, J.S., 2012, Geochemistry in Mineral Exploration: Harper's Geoscience Series, 430 pp., Literary Licensing, LLC.
- Misra, K.C., 2018, Introduction to Geochemistry: Principles and Applications, scientific editors: Argyraki, A., & Stouraiti, C.; translation: Oikonomou, M., Tartas, T., & Frangiadaki, C., 556 pp., Pedio Publications, in GREEK

RELATED JOURNALS

Geochemistry: Exploration, Environment, Analysis, Journal of Geochemical Exploration, Applied Geochemistry, Exploration Geophysics, Geophysical Prospecting, Geophysics

AE01. Digital mapping and GIS in mineral-deposit exploration

Instructors: Evelpidou, N., Vasilakis, E., Sakellaris, G., Roumpedakis, S., Karkani, A.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	AE01	SEMESTER	1st
COURSE TITLE	DIGITAL MAPPING AND GIS IN ORE-DEPOSIT EXPLORATION		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Elective, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Geological Mapping, Ore-Deposit Geology, Petrology, Tectonics		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL745/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: • Understand the fundamental principles of digital mapping and Geographic Information Systems (GIS), and their importance in ore-deposit exploration. • Know the types of geospatial data, coordinate reference systems, map georeferencing, and procedures for creating and managing geodatabases. • Have knowledge of tools for analyzing and visualizing geological data, as well as the capabilities for compiling thematic maps and three-dimensional visualization of geological information.	
Skills	
• Skills in collecting, processing, and managing geospatial data derived from fieldwork, remote sensing, and other geoscientific sources. • Ability to create and organize geodatabases and to digitize and vectorize maps. • Spatial analysis of geological, geochemical, and geophysical information in a GIS environment. • Ability to integrate different layers of geospatial information. • Use of spatial-analysis tools, digital elevation models, and data from modern technologies (e.g., UAV and LiDAR) to support mineral-resource exploration and evaluation.	• Independent work • Teamwork • Searching for, analyzing, and synthesizing data and information, including using the necessary technologies. • Promotion of free, creative, inductive, and critical thinking • Respect for the natural environment • Project planning and management • Decision-making

(3) COURSE CONTENT

The course introduces the fundamental concepts and applications of digital mapping and GIS in ore-deposit exploration. It presents the types of geospatial data, map base layers, coordinate reference systems, and map georeferencing and digitization procedures. It examines techniques for collecting and processing digital field data and applications of modern technologies such as UAV and LiDAR. It also presents tools for spatial analysis, geodatabase creation, geological data processing, and compilation of thematic maps and three-dimensional models in a GIS environment to support ore-deposit exploration.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.												
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.												
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Literature study	60 hours												
Field exercises	15 hours												
Total Course Workload	150 hours												
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.												

(5) RECOMMENDED BIBLIOGRAPHY

- Evelpidou, N., Tzouxanioti, M., Karkani, A., 2023. Geographic Information Systems from Theory to Practice: Using ArcGIS Pro. Kallipos, Open Academic Editions. <https://dx.doi.org/10.57713/kallipos-367> [EUDOXUS Code: 127532912] in GREEK
- Evelpidou, N., Tzouxanioti, M., Karkani, A., 2022, Geographic Information Systems, [EUDOXUS Code: 102072040] in GREEK
- Evelpidou, N., Antoniou, V., 2015. Geographic Information Systems. ISBN: 978-960-603-164-9, 158 pp. (e-book: PDF, e-pub) [EUDOXUS Code: 320066] in GREEK

RELATED JOURNALS

Remote Sensing, GIS and Remote Sensing Journal, Journal of Geographic Information System, Transactions in GIS.

AE02. Applications of Microscopy in the Exploration and Evaluation of Mineral Raw Materials

Instructors: Papoutsas, A., Georgatou, A., Voudouris, P., Vasilatos, C., Mavrogonatos, K., Pomonis, P., Papadopoulos, A.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	AE02	SEMESTER	1st
COURSE TITLE	APPLICATIONS OF MICROSCOPY IN THE EXPLORATION AND EVALUATION OF MINERAL RAW MATERIALS		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Elective, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Knowledge of Mineralogy, Petrology and Ore-Deposit Geology		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL746/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the fundamental principles and capabilities of optical and electron microscopy in the study of ores and minerals. - Know the mineralogical and textural characteristics of different deposit types and their importance for interpreting the geological processes that led to their formation. - Have knowledge of the relationships between ore and rock-forming minerals and of alteration zones. - Understand how the conditions of deposit formation are investigated through the study of fluid inclusions.	
Skills	
- Skills in microscopic identification and characterization of metallic and non-metallic minerals in thin and polished sections. - Use of electron-microscopy and microanalysis techniques. - Interpretation of the mineralogical and textural characteristics of ores to identify deposit-forming processes and evaluate the quality and technological behavior of mineral raw materials. - Ability to relate ore mineralogy and texture to issues of exploitation, metallurgical processing, and environmental management.	- Independent work - Teamwork - Searching for, analyzing and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course presents applications of optical and electron microscopy in the study and evaluation of mineral raw materials. It examines the mineralogical and textural characteristics of ores and their importance for understanding deposit-genesis models in different geological settings, including magmatic, hydrothermal, sedimentary, metamorphic, and metasomatic systems. It also presents methods for studying fluid inclusions and the relationships between ore and rock-forming minerals, as well as the importance of mineralogy and textural characteristics in mining utilization, metallurgical processing, and environmental evaluation of mineral raw materials.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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Literature study	60 hours										
Total Course Workload	150 hours										
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.										

(5) RECOMMENDED BIBLIOGRAPHY

- Nesse, W.D., 2013, Introduction to Optical Mineralogy, 4th ed., 361 pp., New York, Oxford University Press.
- Taylor, R.G., 2009, Ore Textures: Recognition and Interpretation, 282 pp., Dordrecht–Heidelberg–London–New York, Springer-Verlag Berlin Heidelberg.

RELATED JOURNALS

Economic Geology Journal, Society of Economic Geologists, Mineralium Deposita-International Journal for Geology, Mineralogy and Geochemistry of Mineral Deposits, Ore Geology Reviews, Ore and Energy Resource Geology, Resource Geology

AE03. Mining Activity and Sustainability

Instructors: Megremi, I., Papadopoulos, A., Vasilatos, C., Anastasatou, M., Laskaridis, K., Kydonakis, K., Papoutsas, A.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	AE03	SEMESTER	1st
COURSE TITLE	MINING ACTIVITY AND SUSTAINABILITY		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Elective, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Ore-Deposit Geology, General Geology		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL747/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the fundamental principles of sustainable development and their relationship to mining activity and mineral raw material management. - Know the United Nations Sustainable Development Goals, the challenges of climate change and strategies for protecting biodiversity. - Have knowledge of the environmental impacts of mining and metallurgical activities and of circular-economy principles. - Have knowledge of the institutional and regulatory framework governing mining-waste management and the sustainable development of the mining sector.	
Skills	
- Skills in evaluating the environmental and social impacts of mining projects and applying tools for the sustainable management of mineral resources. - Use of methods such as mining-activity life-cycle assessment and preparation of environmental impact assessments. - Skills in characterizing, sampling, and evaluating mining waste and selecting appropriate management technologies. - Practical skills in material stabilization and reuse. - Integration of circular-economy principles into resource and waste management.	- Independent work - Teamwork - Searching for, analyzing and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course examines the relationship between mining activity and sustainable development and natural resource management. It presents the principles of sustainable development, the United Nations Sustainable Development Goals, and issues of climate change, biodiversity protection and environmental governance. It examines the environmental impacts of extraction, beneficiation, and metallurgy, as well as principles of sustainable mining-waste management. It also presents technologies for waste management and utilization, methods for material stabilization and recycling, and the European and national regulatory framework governing mining activity and environmental protection.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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Lectures	25 hours										
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Literature study	60 hours										
Total Course Workload	150 hours										
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.										

(5) RECOMMENDED BIBLIOGRAPHY

- Lodhia, S.K. (ed.), 2020, Mining and Sustainable Development: Current Issues, 1st ed., 274 pp., London, Routledge.
- Biggs, T., 2025, Mining: Why It's Essential for a Sustainable Future, 1st ed., 224 pp., Cambridge, Polity Press.
- Gorai, A.K., & Nimaje, D.S. (eds.), 2017, Sustainable Mining Practices, 260 pp., New Delhi, Narosa Publishing House.
- UNDP & UN Environment, 2018, *Managing Mining for Sustainable Development: A Sourcebook*, 230 pp., Bangkok, United Nations Development Programme.

RELATED JOURNALS

Journal of Sustainable Mining; International Journal of Mining, Reclamation and Environment; Mining (MDPI); Mining, Metallurgy & Exploration; Journal of Mining and Environment; Journal of Sustainable Mining and Industry; Sustainability (MDPI).

Second-semester courses

BY01. Introduction to Mining Project Management – Health and Safety in Exploration and Mining

Instructors: Pavloudakis, F., Roumpos, C., Vasilatos, C., Roumpedakis

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	BY01	SEMESTER	2nd
COURSE TITLE	INTRODUCTION TO MINING PROJECT MANAGEMENT – HEALTH AND SAFETY IN EXPLORATION AND EXTRACTION		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Compulsory, general background, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Ore-Deposit Geology		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL748/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: • Understand the structure and operation of mining projects from the exploration stage through production and the operation of mining facilities. • Know the fundamental concepts of mining data management, investment appraisal, and the economic organization of mining projects. • Have knowledge of health and safety principles in mining activity, the relevant legislation, and risk-management procedures during mineral raw material exploration, extraction, and processing.	
Skills	
• Skills in the basic design and evaluation of mining projects, including analysis of economic parameters, assessment of investment viability, and preparation of business plans in the mining sector. • Ability to identify and evaluate risks associated with mining activities and apply procedures for occupational-risk prevention and management. • Ability to apply health, safety and environmental-protection rules when designing and implementing mineral-resource exploration and exploitation activities.	• Independent work • Teamwork • Searching for, analyzing and synthesizing data and information, including using the necessary technologies. • Promotion of free, creative, inductive, and critical thinking • Respect for the natural environment • Project planning and management • Decision-making

(3) COURSE CONTENT

The course introduces the fundamental principles of mining project management and the operating procedures of mining facilities from exploration through production. It presents concepts such as the distinction between ore and waste rock, determination of the cut-off grade and mining reconciliation. It also examines fundamental principles of business planning, investment appraisal and the organization of mining enterprises. In parallel, it analyses the principles of risk management, health and safety legislation in mining activity, and procedures for preventing and addressing occupational risks during mineral raw material exploration, extraction, and processing.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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Exercises/Assignments	65 hours										
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Total Course Workload	150 hours										
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.										

(5) RECOMMENDED BIBLIOGRAPHY

- Darling, P. (ed.), 2011, SME Mining Engineering Handbook, 3rd ed., 2 volumes, 1,984 pp., Englewood, Colorado, Society for Mining, Metallurgy & Exploration.
- You, G.G., 2024, Mining Project Value Optimization, 1st ed., 194 pp., Singapore, Springer Singapore.
- Ministry of Environment, Energy and Climate Change, 2011, Regulation on Mining and Quarrying Operations (KMLE), Ministerial Decision D7/A/oik. 12050/2223/2011, Government Gazette 1227/B/14-06-2011, Athens, National Printing Office, in GREEK
- Karmis, M. (ed.), 2001, Mine Health and Safety Management, 452 pp., Littleton, Colorado, Society for Mining, Metallurgy, and Exploration (SME).

RELATED JOURNALS

Mining (MDPI); Health and Safety in Mining; Canadian Mining Journal; International Journal of Project Management.

BY02. Introduction to Geostatistics – Applications of Geostatistics in mineral exploration, resource estimation and resource management

Instructors: Kapageridis, I., Roumpedakis, Sakellaris, G., Kydonakis, K.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	BY02	SEMESTER	2nd
COURSE TITLE	INTRODUCTION TO GEOSTATISTICS – APPLICATIONS OF GEOSTATISTICS IN MINERAL EXPLORATION, RESOURCE ESTIMATION AND RESERVE MANAGEMENT		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Compulsory, general background, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Ore-Deposit Geology, Mathematics, Introduction to Statistics, Digital Mapping, Ore-Deposit Geology of Critical and Strategic Mineral Raw Materials		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL749/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the fundamental principles of statistics and geostatistics and their importance in geological data analysis and deposit evaluation. - Are familiar with concepts such as probability distributions, correlation, and regression, as well as the fundamental principles of spatial variability and structural analysis using variograms. - Possess knowledge of the principal methods for grade estimation and resource calculation, as well as three-dimensional geological modelling of deposits.	
Skills	
- Skills in processing and evaluating geological and drilling data (geochemical, geophysical, lithological, and technical) using statistical and geostatistical methods. - Structural analysis of spatial data, construction, and fitting of variogram models, and application of estimation methods such as kriging to calculate grades and resources. - Creation of three-dimensional geological deposit models, estimation of mineral reserves, and use of geostatistical tools to support the design and optimal management of mining projects.	- Independent work - Teamwork - Searching for, analyzing, and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course presents the fundamental principles of statistics and geostatistics and their applications to mineral exploration and resource estimation. It examines concepts of probability and descriptive statistics, as well as methods for analyzing spatial variability, including variograms and variogram models. It presents grade-estimation methods such as kriging, together with techniques of multivariate analysis and geostatistical simulation. It also examines procedures for processing drilling data, three-dimensional geological deposit modelling and calculation of mineral reserves in grid and block models, as well as fundamental principles of mine design in accordance with international reporting standards.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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(5) RECOMMENDED BIBLIOGRAPHY

- Kapageridis, I.K., 2006, Introduction to Geostatistics, 238 pp., Athens, Ion Publications, in GREEK
- Goovaerts, P., 1997, Geostatistics for Natural Resources Evaluation, Applied Geostatistics Series, 496 pp., Oxford University Press.
- Yarus, J.M., & Chambers, R.L. (eds.), 1994, Stochastic Modeling and Geostatistics: Principles, Methods, and Case Studies, AAPG Computer Applications in Geology, Vol. 3, 379 pp., American Association of Petroleum Geologists.
- Isaaks, E.H., & Srivastava, R.M., 1989, An Introduction to Applied Geostatistics, 561 pp., Oxford University Press.
- McKillup, S., & Dyar, M.D., 2010, Geostatistics Explained: An Introductory Guide for Earth Scientists, xvi + 396 pp., Cambridge–New York, Cambridge University Press.
- Emery, X., & Séguret, S.A., 2020, Geostatistics for the Mining Industry: Applications to Porphyry Copper Deposits, 1st ed., 272 pp., Boca Raton–London–New York, CRC Press/Taylor & Francis.

RELATED JOURNALS

Geostatistics; Journal of Geovisualization and Spatial Analysis

BY03. Hydrocarbon reservoirs and geological storage of CO₂

Instructors: Kontakiotis, G., Antonarakou, A., Kati, M., Koutsovitis, P., Kalaitzidis, S.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	BY03	SEMESTER	2nd
COURSE TITLE	HYDROCARBON RESERVOIRS AND GEOLOGICAL STORAGE OF CO ₂		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Compulsory, general background, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Sedimentary-Rock Petrology, Geochemistry, Geophysics, Tectonics, Mineralogy		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL755/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: • Understand the role of Carbon Capture and Storage (CCS) in the energy transition and the reduction of greenhouse-gas emissions. • Know the fundamental components of petroleum systems, the characteristics of geological reservoirs and cap rocks, and the geological structures that act as traps for gas storage. • Have knowledge of reservoir petrophysical properties and of the geochemical processes occurring during the storage of CO₂ and other gases. • Know the regulatory framework governing improved geological storage.	
Skills	
• Skills in evaluating geological formations as potential sites for underground storage of CO₂ or/ and other gases, considering the geological, petrophysical and geochemical characteristics of the reservoirs. • Interpretation of data relating to structure, porosity, permeability, and behavior of rocks under storage conditions. • Ability to use simulations to estimate the long-term stability and safety of geological-storage systems.	• Independent work • Teamwork • Searching for, analyzing, and synthesizing data and information, including using the necessary technologies. • Promotion of free, creative, inductive, and critical thinking • Respect for the natural environment • Project planning and management • Decision-making

(3) COURSE CONTENT

The course examines the role of carbon capture and geological storage (CCS) in the energy transition. It presents the fundamental components of petroleum systems, the characteristics of geological reservoirs and cap rocks, and the types of geological traps that permit the underground storage of CO₂, natural gas or/and hydrogen. The course examines the petrophysical properties of the reservoirs, the geochemical interactions between rocks and gases, and aqueous phases and the formation of new mineral phases. It also presents alternative methods of geological storage, simulations of CO₂ storage systems, and the relevant legal and regulatory framework.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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Lectures	25 hours										
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Literature study	60 hours										
Total Course Workload	150 hours										
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.										

(5) RECOMMENDED BIBLIOGRAPHY

- Ktenas, D., Kosmidou, V., & Spinos, S., 2020, Underground Geological Storage of CO₂ and Natural Gas in the in Greece, technical report, 71 pp., Hellenic Hydrocarbon Resources Management — HHRM. in GREEK
- Ahmed, T., 2010, Reservoir Engineering Handbook, 4th ed., 1.472 pp., Gulf Professional Publishing/Elsevier.
- Jahn, F., Cook, M., & Graham, M., 2008, Hydrocarbon Exploration and Production, 2nd ed., Developments in Petroleum Science, Vol. 55, 456 pp., Elsevier Science.
- Lee, K.S., Cho, J., & Lee, J.H., 2020, CO₂ Storage Coupled with Enhanced Oil Recovery, 1st ed., 111 pp., Springer.
- Surdam, R.C. (ed.), 2013, Geological CO₂ Storage Characterization: The Key to Deploying Clean Fossil Energy Technology, 1st ed., 301 pp., New York, Springer.
- Saini, D., 2017, Engineering Aspects of Geologic CO₂ Storage: Synergy between Enhanced Oil Recovery and Storage, Springer Briefs in Petroleum Geoscience & Engineering, 1st ed., 73 pp., Springer.

RELATED JOURNALS

Energy and Fuels; International Journal of Greenhouse Gas Control; Journal of Petroleum Geology

BY04. Geotechnical assessment of open excavations and underground works

Instructors: Papadopoulos, A., Stavropoulou, M., Roumpos, C., Pavloudakis, Roumpedakis, S., Exadaktylos, G.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	BY04	SEMESTER	2nd
COURSE TITLE	GEOTECHNICAL ASSESSMENT OF OPEN EXCAVATIONS AND UNDERGROUND WORKS		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Compulsory, general background, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Engineering Geology, Ore-Deposit Geology		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL750/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the fundamental principles of engineering geology and geotechnical engineering relating to the design and operation of extractive projects. - Know the classification of geotechnical soil and rock-mass types, their properties and behavior during excavation and exploitation. - Acquire knowledge of the principal open-pit and underground mining methods, mining-project design parameters, and failure and stability mechanisms in slopes and underground excavations.	
Skills	
- Skills in evaluating the geotechnical parameters that affect the design and safety of extractive projects. - Use of laboratory and in-situ tests to characterize soils and rock masses, analyses the stability of slopes and underground excavations, and design stabilization measures. - Abilities in the design and scheduling of open-pit and underground operations and in selecting appropriate extraction methods. - Ability to monitor geotechnical hazards, contributing to the safe and efficient utilization of mineral resources.	- Independent work - Teamwork - Searching for, analyzing and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course examines the geotechnical parameters affecting the design and operation of extractive projects. It presents the classification of geotechnical soil and rock-mass types, laboratory and in-situ characterization tests, and the assessment of geological hazards in mining projects. It analyses the principal open-pit and underground mining methods, the design and scheduling of extraction operations, and the factors affecting the selection of mining methods. It also presents methods for analyzing and assessing the stability of slopes and underground excavations, techniques for supporting and stabilizing rock masses, and measures for addressing geotechnical hazards such as landslides and groundwater inflows.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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Lectures	25 hours										
Exercises/Assignments	65 hours										
Literature study	60 hours										
Total Course Workload	150 hours										
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.										

(5) RECOMMENDED BIBLIOGRAPHY

- Komodromos, E.M., 2006, Construction and Mechanics of Tunnels and Underground Works, 124 pp., Chania, University of Thessaly. Ahmed, T., 2010, Reservoir Engineering Handbook, 4th ed., 1,472 pp., Gulf Professional Publishing/Elsevier, in GREEK
- Tatiya, R.R., 2013, Surface and Underground Excavations: Methods, Techniques and Equipment, 2nd ed., 886 pp., Boca Raton–London–New York, CRC Press/Taylor & Francis.
- Stacey, T.R., & Swart, A.H., 2001, Practical Rock Engineering Practice for Shallow and Opencast Mines, 65 pp., Johannesburg, The Safety in Mines Research Advisory Committee (SIMRAC).

RELATED JOURNALS

International Journal of Rock Mechanics and Mining Sciences; Rock Mechanics and Rock Engineering; Journal of Rock Mechanics and Geotechnical Engineering; Engineering Geology; Bulletin of Engineering Geology and the Environment; Mining Geotechnics; Geotechnics

BE01. Mining Project Permitting and Environmental Management

Instructors: Vasilatos, C., Stouraiti, C., Zachariadis, P., Xynogalou, S., Lampou, D., Varvitsioti, E., Stavropoulos, X.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	BE01	SEMESTER	2nd
COURSE TITLE	MINING PROJECT PERMITTING AND ENVIRONMENTAL MANAGEMENT		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Elective, general background, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Ore-Deposit Geology, Engineering Geology, Geochemistry		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL751/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the institutional, administrative, and economic framework governing the development and operation of mining projects. - Know the Mining Code, permitting procedures, and the fundamental principles of environmental management in the extractive sector. - Acquire knowledge of the fundamental principles of economic investment appraisal, business planning and project management. - Have knowledge of risk-assessment and risk-management procedures in mining activities.	
Skills	
- Application of permitting and regulatory-compliance procedures for mining projects. - Analysis of the technical, economic, and environmental parameters affecting the viability of extractive investments, and evaluation of investment projects using fundamental economic indicators and risk analyses. - Ability to integrate environmental, social and governance (ESG) parameters into the planning of mining activities. - Application of risk-management and occupational-safety procedures in the mining sector.	- Independent work - Teamwork - Searching for, analyzing, and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course presents the institutional, technical, and economic framework governing the permitting and operation of mining projects. It examines the historical development and importance of the mineral-resources industry, the factors affecting mineral availability, and the principal provisions of the Mining Code concerning exploration and exploitation rights. It also presents fundamental principles of business planning, economic investment appraisal and project management in the mining sector, as well as procedures for preparing technical and economic reports in accordance with international standards. In parallel, it analyses environmental management, risk management and occupational safety, together with regulatory requirements for protecting workers, the environment, and local communities.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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Total Course Workload	150 hours										
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.										

(5) RECOMMENDED BIBLIOGRAPHY

- Guide for Conducting Environmental Inspections, Ministry of Environment and Energy, Athens, 2018. in GREEK
- Code of Professional Ethics, National Transparency Authority, July 2022. in GREEK
- National Plan and Programmes for Regular Environmental Inspections, Ministry of Environment and Energy, Athens, 2017. in GREEK
- The practical implementation and operation of the European policies on preventing and combating Environmental Crime, Council of the European Union
- Manual of Permitting Procedures for Projects of Common Interest, Ministry of Economy, Development and Tourism, 2016. in GREEK
- Galanis, P., Environmental Assessment and Permitting, Nomiki Bibliothiki AEETE, 2022. in GREEK
- Kougkoulos, A., Karathanasis, S., Environmental Impact Assessment, Tziolas Publications, 2021. in GREEK

RELATED JOURNALS

Environment & Law, Nomiki Bibliothiki.; Resources Policy, Elsevier; Resources, MDPI; Journal of Sustainable Mining, Central Mining Institute – National Research Institute; Sustainable Mining, Springer Nature

BE02. Industrial Minerals and Sustainable Development

Instructors: Vasilatos, C., Megremi, I., Gianni, E., Laskaridis, K., Anastasatou, M., Gkontelitsas, A., Roulia, M.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	BE02	SEMESTER	2nd
COURSE TITLE	INDUSTRIAL MINERALS AND SUSTAINABLE DEVELOPMENT		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Elective, general background, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Mineralogy, Petrology, Ore-Deposit Geology of Critical and Strategic Mineral Raw Materials		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL752/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: - Understand the role of industrial minerals and rocks in modern industry and their contribution to economic development and the energy transition. - Know the main categories of industrial minerals, their properties, and their principal applications in different industrial sectors. - Acquire knowledge of methods for identifying and evaluating industrial-mineral deposits, their processing and beneficiation procedures, and the environmental and regulatory parameters associated with their utilization.	
Skills	
- Evaluation of the quality and suitability of industrial minerals and rocks for specific industrial applications. - Correlation of the physicochemical and mineralogical characteristics of materials with the requirements of different technological uses and processing methods. - Ability to evaluate technical and environmental parameters during industrial-mineral exploration and exploitation. - Investigation of opportunities for utilizing mining by-products and developing secondary uses within the circular economy.	- Independent work - Teamwork - Searching for, analyzing, and synthesizing data and information, including using the necessary technologies. - Promotion of free, creative, inductive, and critical thinking - Respect for the natural environment - Project planning and management - Decision-making

(3) COURSE CONTENT

The course examines the importance and modern uses of industrial minerals and rocks in the twenty-first century, as well as their contribution to sustainable development and addressing climate change. It presents methods for identifying and evaluating deposits, extraction processes (onshore and offshore), and techniques for processing and beneficiating industrial minerals. It also examines their applications in different industrial sectors, including the production of cement, ceramics, glass, plastics, and other materials, as well as environmental applications and opportunities for utilizing mining by-products. Finally, it presents the development prospects of the industrial minerals and rocks sector in Greece.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment), which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.										

(5) RECOMMENDED BIBLIOGRAPHY

- Ciullo A.P., 1996, Industrial minerals and their uses. A Handbook & Formulary, 647 pages, Elsevier.
- I.G.M.E., 2011, Greece's Mineral Wealth – New Development Opportunities for Sustainable and Productive Investments. in GREEK
- Tsirambidis, A., 2005, The Mineral Wealth of Greece. Giachoudi I.K.E. Publications. in GREEK

RELATED JOURNALS

Industrial Minerals; Sustainability (MDPI); Waste and biomass valorisation; Cement and concrete composites; International Journal of Mineral Processing; Resources, Conservation & Recycling; Recycling (MDPI)

BE03. Tectonics in the Exploration and Exploitation of Mineral Raw Materials

Instructors: Soukis, K., Laskari, S., Moustaka, E., Roumpedakis, S., Koutsovitis, P.

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	BE03	SEMESTER	2nd
COURSE TITLE	TECTONICS IN MINERAL RAW MATERIAL EXPLORATION AND EXPLOITATION		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
		3	6
COURSE TYPE	Elective, general background, specialized general knowledge, skills development		
PREREQUISITE COURSES:	Tectonics, Ore-Deposit Geology		
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	YES, in English		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL753/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: • Understand the role of tectonics in the genesis, distribution, and discovery of mineral raw material deposits. • Understand the relationship between geotectonic settings and metallogenesis, and the principal tectonic structures associated with the formation and control of deposits. • Acquire knowledge of the principal methods of tectonic analysis and the importance of structural data in interpreting geological processes and investigating metallogenic systems.	
Skills	
• Recognition and mapping of tectonic structures associated with deposit genesis and discovery. • Collection and analysis of structural data in the field, and measurement and interpretation of structural elements in geological sections and drill cores. • Statistical processing and visualization of structural data. • Ability to use tectonic information to identify potential metallogenic targets and support geological mineral-resource exploration.	• Independent work • Teamwork • Searching for, analyzing, and synthesizing data and information, including using the necessary technologies. • Promotion of free, creative, inductive, and critical thinking • Respect for the natural environment • Project planning and management • Decision-making

(3) COURSE CONTENT

The course examines the role of tectonic processes and structures in the genesis and distribution of mineral raw material deposits. It presents the relationship of deposit types to different geotectonic settings and analyses tectonic structures associated with metallogenic systems, such as fault zones, volcanic structures, and metamorphic core complexes. It also examines tectonic structures controlling the emplacement and crystallization of magmatic bodies and their importance in hydrothermal and sedimentary systems. Methods for measuring and analyzing structural elements in the field and in drill cores are presented, together with techniques for statistical processing and visualization of structural data.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	• Face-to-face lectures. • Computer-based data-processing exercises. • Use of the NKUA e-Class platform to disseminate additional information, distribute material, resolve problems, and answer questions, etc.										
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	In Teaching: PowerPoint presentations (posted on the course page in NKUA e-Class and incorporating educational videos related to lecture content). In Practical Exercises: ○ PowerPoint presentations for the tutorial component of the Practical Exercises (posted on the course page in NKUA e-Class). They incorporate educational videos related to the lecture content. Communication with students: In addition to personal contact, the communication and blogging functions of NKUA e-Class are used for communication, distribution of material, answering questions, etc.										
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Total Course Workload	150 hours										
STUDENT ASSESSMENT	Assessment is conducted in Greek or English (for international students or Erasmus students). Assessment includes short individual exercises during the semester (formative assessment, 30%) and an end-of-semester examination (summative assessment) which includes • an oral presentation (20%) and • a written assignment (50%) on a subject related to the course.										

(5) RECOMMENDED BIBLIOGRAPHY

- Julie V. Rowland, David A. Rhys (Eds), Applied Structural Geology of Ore-Forming Hydrothermal Systems, 2020, Reviews in Economic Geology, Vol. 2, Society of Economic Geologists
- Rod Holcombe, 2017, Mapping and Structural Geology in Mineral Exploration
- Roger Marjoribanks, 2010, Geological Methods in Mineral Exploration and Mining, Springer Science & Business Media
- David Pollard, Fundamentals of Structural Geology, Cambridge University Press, 2005
- Soumyajit Mukherjee, Atlas of Structural Geology, Elsevier Science Publishing Co Inc, 2020

RELATED JOURNALS

Economic Geology Journal, Society of Economic Geologists ; Mineralium Deposita ; International Journal for Geology ; Mineralogy and Geochemistry of Mineral Deposits; Ore Geology Reviews ; Resource Geology; Geology of Ore Deposits; Springer Nature; Journal of Structural Geology, Elsevier; Tectonics, AGU

Third-semester courses

MT – Master's Thesis

COURSE OUTLINE

(1) GENERAL

SCHOOL	SCIENCE		
DEPARTMENT	GEOLOGY AND GEOENVIRONMENT		
LEVEL OF STUDIES	7		
COURSE CODE	BE03	SEMESTER	3rd
COURSE TITLE	MASTER'S THESIS		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	ECTS CREDITS
			30
COURSE TYPE	Compulsory, specialized general knowledge, skills development		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION AND EXAMINATION:	Greek/English		
THE COURSE IS OFFERED TO ERASMUS STUDENTS ERASMUS	No		
COURSE WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL754/		

(2) LEARNING OUTCOMES AND SKILLS

Learning Outcomes	
Upon completion of the course, students: • Have studied in depth a specific subject within the scientific fields covered by the MSc Programme; • Have applied the relevant knowledge acquired during their studies and developed their capacity for synthesis. • Have learned to locate appropriate scientific information in the relevant scientific literature. • Have acquired skills in writing a scientific text; and • Have acquired skills in organizing and orally presenting the subject of the thesis.	
Skills	
• Searching for, analyzing, and synthesizing data and information using the necessary technologies and literature. • Independent work • Work in an interdisciplinary environment • Promotion of free, creative, and inductive thinking • Understanding of specialized topics • Preparation and oral presentation of the thesis	• Respect for the natural environment • Project planning and management • Decision-making

(3) COURSE CONTENT

Formulation of a research question; research design; literature search and review; structuring the methodology; data collection and implementation of the methodology; processing of results; writing the thesis; oral presentation of the thesis.

(4) TEACHING AND LEARNING METHODS – ASSESSMENT METHODS

MODE OF DELIVERY	Individual meetings between the supervisor and the student. Primarily independent work organized and monitored by the supervisor.														
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Use of the internet, electronic libraries and databases, reference-management software, and other specialized software depending on the research subject.														
TEACHING ORGANISATION	<table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Supervised study</td><td>150 hours</td></tr><tr><td>Independent study</td><td>300 hours</td></tr><tr><td>Laboratory and computational research</td><td>200 hours</td></tr><tr><td>Thesis writing</td><td>70 hours</td></tr><tr><td>Presentation preparation</td><td>30 hours</td></tr><tr><td>Total Course Workload</td><td>750 hours</td></tr></table>	Activity	Semester Workload	Supervised study	150 hours	Independent study	300 hours	Laboratory and computational research	200 hours	Thesis writing	70 hours	Presentation preparation	30 hours	Total Course Workload	750 hours
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Supervised study	150 hours														
Independent study	300 hours														
Laboratory and computational research	200 hours														
Thesis writing	70 hours														
Presentation preparation	30 hours														
Total Course Workload	750 hours														
STUDENT ASSESSMENT	The student presents the thesis in a public presentation and submits its written text to the three-member examination committee. The final assessment is determined by the three-member committee.														

(5) RECOMMENDED BIBLIOGRAPHY

The recommended bibliography is determined by the research subject of the Master's thesis in consultation with the supervisor.