Ek.1

Top 50 World Universities

1. Massachusetts Institute of Technology (MIT)
2. University of Cambridge
3. Harvard University
4. UCL (University College London)
5. University of Oxford
6. Imperial College London
7. Yale University
8. University of Chicago
9. Princeton University
10. California Institute of Technology (Caltech)
11. Columbia University
12. University of Pennsylvania (UPenn)
13. ETH Zurich (Swiss Federal Institute of Technology)
14. Cornell University
15. Stanford University
16. Johns Hopkins University
17. University of Michigan
18. McGill University
19. University of Toronto
20. Duke University
21. University of Edinburgh
22. University of California, Berkeley (UCB)
23. University of Hong Kong (HKU)
24. Australian National University (ANU)
25. National University of Singapore (NUS)
26. King's College London (University of London)
27. Northwestern University
28. University of Bristol
29. United Kingdom
30. EcolePolytechniqueFédérale de Lausanne (EPFL)
31. Switzerland
32. The University of Tokyo
33. University of California, Los Angeles (UCLA)
34. University of Manchester
35. Hong Kong University of Science and Technology (HKUST)
36. ÉcoleNormaleSupérieure de Paris (ENS Paris)
37. Kyoto University
38. University of Melbourne
39. Seoul National University (SNU)
40. University of Wisconsin-Madison
41. University of Sydney
42. Chinese University of Hong Kong (CUHK)
43. EcolePolytechnique
44. Brown University
45. New York University (NYU)
46. Peking University
47. University of British Columbia (UBC)
48. University of Queensland (UQ)
49. Nanyang Technological University (NTU)
50. Tsinghua University

Ek.2

Top Graduate Schools in GeologicalEngineering

#1 University of Arizona
#1 University of Michigan—Ann Arbor
#3 Pennsylvania State University—University Park
#3 University of Texas—Austin
#5 Stanford University
#6 California Institute of Technology
#7 Massachusetts Institute of Technology
#8 University of Wisconsin—Madison
#9 University of California—Berkeley
#10 Harvard University
#10 University of Washington
#12 Cornell University
#12 University of California—Santa Barbara
#12 University of Minnesota—Twin Cities
#15 Columbia University
#16 University of California—Los Angeles
#17 Arizona State University
#17 Yale University

İTÜ Jeoloji Mühendisliği Lisansüstü Program Derslerinin Karşılaştırıldığı Üniversiteler

Komisyonumuz kendi arasında yapmış olduğu değerlendirmeler neticesinde İTÜ Jeoloji Mühendisliği Yüksek Lisans ve Doktora Programlarının aşağıda sıralanan dünyanın önde gelen üniversiteleri ile karşılaştırılmasını uygun bulmuştur. Ayrıca değerlendirmede ülkemizden de Ortadoğu Teknik Üniversitesinin göz önünde tutulmasında yarar olacağı düşünülmüştür. Tablo 5 de özetlenen karşılaştırmada son sütunda, İTÜ FBE Jeoloji Mühendisliği Programlarında olmayıp, İTÜ genelinde diğer programlarda bulunan dersler belirtilmiştir.

- Colorado School of Mines (CSM)
- ZürihTeknikÜniversitesi (ETH)
- Penn State University (PSU)
- University of Wisconsin UM
- University of Arizona (UA)
- OrtaDoğuTeknikÜniversitesi (METU)
- İstanbul TeknikÜniversitesi Diğer Programlar (İTÜ)

Ek. 3

Çeşitli üniversitelerin Jeoloji Mühendisliği Yüksek Lisans ve Doktora Programları Dersleri ve Ders İçerikleri

Colorado School of Mines (CSM)

Ders Adı	İTÜ deki muadili
GEGN503. INTEGRATED EXPLORATION AND DEVELOPMENT. 3.0 Hours. (I) Students work alone and in teams to study reservoirs from fluvial-deltaic and valley fill depositional environments. This is a multidisciplinary course that shows students how to characterize and model subsurface reservoir performance by integrating data, methods and concepts from geology, geophysics and petroleum engineering. Activities include field trips, computer modeling, written exercises and oral team presentations. Prerequisite: Consent of instructor. 2 hours lecture, 3 hours lab; 3 semester hours. Offered fall semester, odd years.	**Yok**
GEGN504. INTEGRATED EXPLORATION AND DEVELOPMENT. 3.0 Hours. (I) Students work in multidisciplinary teams to study practical problems and case studies in integrated subsurface exploration and development. The course addresses emerging technologies and timely topics with a general focus on carbonate reservoirs. Activities include field trips, 3D computer modeling, written exercises and oral team presentation. Prerequisite: Consent of instructor. 3 hours lecture and seminar; 3 semester hours. Offered fall semester, even years.	**Yok**
GEGN509. INTRODUCTION TO AQUEOUS GEOCHEMISTRY. 3.0 Hours. (I) Analytical, graphical and interpretive methods applied to aqueous systems. Thermodynamic properties of water and aqueous solutions. Calculations and graphical expression of acid-base, redox and solution-mineral equilibria. Effect of temperature and kinetics on natural aqueous systems. Adsorption and ion exchange equilibria between clays and oxide phases. Behavior of trace elements and complexation in aqueous systems. Application of organic geochemistry to natural aqueous systems. Light stable and unstable isotopic studies applied to aqueous systems. Prerequisite: DCGN209 or equivalent, or consent of instructor. 3 hours lecture; 3 semester hours.	**UYJ503E Kısmen**
GEGN520. INDUSTRIAL MINERALS AND ROCKS. 3.0 Hours. Introduction to the Industrial Minerals industry via appreciation of geologic occurrence, physical and chemical material properties, mining and processing considerations, and marketing of various commodities. Development of skills in preparation of commodity surveys, reserves and resources classifications, and project appraisals. Required field trips to operational sites and trip reports. Mid-term and final exams. Individual student commodity term project and presentation. Prerequisite: Senior or graduate status in earth resources field or consent of instructor. 3 hours lecture/seminar; 3 semester hours. Offered alternate years when student demand is sufficient.	**UYJ519**
GEGN527. ORGANIC GEOCHEMISTRY OF FOSSIL FUELS AND ORE DEPOSITS. 3.0 Hours. (II) A study of organic carbonaceous materials in relation to the genesis and modification of fossil fuel and ore deposits. The biological origin of the organic matter will be discussed with emphasis on contributions of microorganisms to the nature of these deposits. Biochemical and thermal changes which convert the organic compounds into petroleum, oil shale, tar sand, coal, and other carbonaceous matter will be studied. Principal analytical techniques used for the characterization of organic matter in the geosphere and for evaluation of oil and gas source potential will be discussed. Laboratory exercises will emphasize source rock evaluation, and oil-source rock and oil-oil correlation methods. Prerequisite: CHGN221, GEGN438, or consent of instructor. 2 hours lecture; 3 hours lab; 3 semester hours. Offered alternate years.	**JEO630E**

GEGN530. CLAY CHARACTERIZATION. 1.0 Hour. (I) Clay mineral structure, chemistry and classification, physical properties (flocculation and swelling, cation exchange capacity, surface area and charge), geological occurrence, controls on their stabilities. Principles of X-ray diffraction, including sample preparation techniques, data collection and interpretation, and clay separation and treatment methods. The use of scanning electron microscopy to investigate clay distribution and morphology. Methods of measuring cation exchange capacity and surface area. Prerequisite: GEGN206 or equivalent, or consent of instructor. 1 hour lecture, 2 hours lab; 1 semester hour.	**UYJ544**
GEGN532. GEOLOGICAL DATA ANALYSIS. 3.0 Hours. (I or II) Techniques and strategy of data analysis in geology and geological engineering: basic statistics review, analysis of data sequences, mapping, sampling and sample representativity, univariate and multivariate statistics, geostatistics, and geographic information systems (GIS). Practical experience with geological applications via supplied software and data sets from case histories. Prerequisites: Introductory statistics course (MATH323 or MATH530 equivalent) or permission of instructor. 2 hours lecture/discussion; 3 hours lab; 3 semester hours.	**UYJ506**
GEGN570. CASE HISTORIES IN GEOLOGICAL ENGINEERING AND HYDROGEOLOGY. 3.0 Hours. (I) Case histories in geological and geotechnical engineering, ground water, and waste management problems. Students are assigned problems and must recommend solutions and/or prepare defendable work plans. Discussions center on the role of the geological engineer in working with government regulators, private-sector clients, other consultants, and other special interest groups. Prerequisite: GEGN467, GEGN468, GEGN469, GEGN470 or consent of instructor. 3 hours lecture; 3 semester hours.	**JEO603**
GEGN571. ADVANCED ENGINEERING GEOLOGY. 3.0 Hours. (I) Emphasis will be on engineering geology mapping methods, and geologic hazards assessment applied to site selection and site assessment for a variety of human activities. Prerequisite: GEGN468 or equivalent. 2 hours lecture, 3 hours lab; 3 semester hours. Offered alternate years.	**UYJ504E**
GEGN573. GEOLOGICAL ENGINEERING SITE INVESTIGATION. 3.0 Hours. (II) Methods of field investigation, testing, and monitoring for geotechnical and hazardous waste sites, including: drilling and sampling methods, sample logging, field testing methods, instrumentation, trench logging, foundation inspection, engineering stratigraphic column and engineering soils map construction. Projects will include technical writing for investigations (reports, memos, proposals, workplans). Class will culminate in practice conducting simulated investigations (using a computer simulator). 3 hours lecture; 3 semester hours.	**UYJ 505**
GEGN575. APPLICATIONS OF GEOGRAPHIC INFORMATION SYSTEMS. 3.0 Hours. (II) An introduction to Geographic Information Systems (GIS) and their applications to all areas of geology and geological engineering. Lecture topics include: principles of GIS, data structures, digital elevation models, data input and verification, data analysis and spatial modeling, data quality and error propagation, methods of GIS evaluation and selection. Laboratories will use Macintosh and DOS-based personal computer systems for GIS projects, as well as video-presentations. Visits to local GIS laboratories, and field studies will be required. 2 hours lecture, 3 hours lab; 3 semester hours.	**Yok**
GEGN578. GIS PROJECT DESIGN. 1-3 Hour. (I, II) Project implementation of GIS analysis. Projects may be undertaken by individual students, or small student teams. Documentation of all project design stages, including user needs assessment, implementation procedures, hardware and software selection, data sources and acquisition, and project success assessment. Various GIS software may be used;	**Yok**

projects may involve 2-dimensional GIS, 3-dimensional subsurface models, or multi-dimensional time-series analysis. Prerequisite: Consent of instructor. Variable credit, 1-3 semester hours, depending on project. Offered on demand.	
GEGN581. ANALYTICAL HYDROLOGY. 3.0 Hours. (I) Lectures, assigned readings, and discussions concerning the theory, measurement, and estimation of ground water param eters, fractured-rock flow, new or specialized methods of well hydraulics and pump tests, tracer methods. Prerequisite: GEGN467 or consent of instructor. 3 hours lecture; 3 semester hours.	**UYJ501E**
GEGN582. INTEGRATED SURFACE WATER HYDROLOGY. 3.0 Hours. (I) This course provides a quantitative, integrated view of the hydrologic cycle. The movement and behavior of water in the atmosphere (including boundary layer dynamics and precipitation mechanisms), fluxes of water between the atmosphere and land surface (including evaporation, transpiration, precipitation, interception and through fall) and connections between the water and energy balances (including radiation and temperature) are discussed at a range of spatial and temporal scales. Additionally, movement of water along the land surface (overland flow and snow dynamics) and in the subsurface (saturated and unsaturated flow) as well as surface-subsurface exchanges and runoff generation are also covered. Finally, integration and connections within the hydrologic cycle and scaling of river systems are discussed. Prerequisites: Groundwater Engineering (GEGN466/GEGN467), Fluid Mechanics (GEGN351/ EGGN351), math up to differential equations, or equivalent classes as determined by the instructor. 3 hours lecture; 3 semester hours.	**UYJ501E**
GEGN583. MATHEMATICAL MODELING OF GROUNDWATER SYSTEMS. 3.0 Hours. (II) Lectures, assigned readings, and direct computer experience concerning the fundamentals and applications of finite-difference and finite-element numerical methods and analytical solutions to ground water flow and mass transport problems. Prerequisite: A knowledge of FORTRAN programming, mathematics through differential and integral calculus, and GEGN467 or consent of instructor. 3 hours lecture; 3 semester hours.	**UYJ 501E**
GEGN584. FIELD METHODS IN HYDROLOGY. 3.0 Hours. (I) Design and implementation of tests that characterize surface and subsurface hydrologic systems, including data logger programming, sensor calibration, pumping tests, slug tests, infiltration tests, stream gauging and dilution measurements, and geophysical (EM, resistivity, and/or SP) surveys. Prerequisites: Groundwater Engineering (GEGN466/GEGN467, Surface Water Hydrology (ESGN582) or equivalent classes as determined by the instructor. 2 hours lecture; 5 hours lab and field exercises one day of the week. Days TBD by instructor; 3 semester hours.	**Yok**
GEGN598. SEMINAR IN GEOLOGY OR GEOLOGICAL ENGINEERING. 1-3 Hour. (I, II) Special topics classes, taught on a one-time basis. May include lecture, laboratory and field trip activities. Prerequisite: Approval of instructor and department head. Variable credit; 1 to 3 semester hours. Repeatable for credit under different topics.	**UYJ596**
GEGN599. INDEPENDENT STUDY IN ENGINEERING GEOLOGY OR ENGINEERING HYDROGEOLOGY. 1-6 Hour. (I, II) Individual special studies, laboratory and/or field problems in geological engineering or engineering hydrogeology. Prerequisite: Approval of instructor and department head. Variable credit; 1 to 6 credit hours. Repeatable for credit.	**Tezsiz Program**
GEGN669. ADVANCED TOPICS IN ENGINEERING HYDROGEOLOGY. 1-2 Hour. (I, II) Review of current literature and research regarding selected topics in hydrogeology. Group discussion and individual participation. Guest speakers and field trips may be incorporated into the course. Prerequisite: Consent of instructor. 1 to 2 semester hours; may be repeated for credit with consent of instructor.	**JEO603**
GEGN670. ADVANCED TOPICS IN GEOLOGICAL ENGINEERING. 3.0 Hours.	**JEO 603**

(I, II) Review of current literature and research regarding selected topics in engineering geology. Group discussion and individual participation. Guest speakers and field trips may be incorporated into the course. Prerequisite: Consent of instructor. 3 hours lecture; 3 semester hours. Repeatable for credit under different topics.	
GEGN671. LANDSLIDES: INVESTIGATION, ANALYSIS & MITIGATION. 3.0 Hours. (I) Geological investigation, analysis, and design of natural rock and soil slopes and mitigation of unstable slopes. Topics include landslide types and processes, triggering mechanisms, mechanics of movements, landslide investigation and characterization, monitoring and instrumentation, soil slope stability analysis, rock slope stability analysis, rock fall analysis, stabilization and risk reduction measures. Prerequisites: GEGN468, EGGN361, MNGN321, (or equivalents) or consent of instructor. 3 hours lecture; 3 semester hours.	**Yok**
GEGN672. ADVANCED GEOTECHNICS. 3.0 Hours. Practical analysis and application of techniques in weak rock engineering, ground-water control in construction, fluvial stabilization and control, earthquake hazard assessment, engineering geology in construction, engineering geology in dam investigation, and other current topics in geotechnics practice. Prerequisite: GEGN468, CEEN312, CEEN312L and MNGN321. 3 hours lecture; 3 semester hours. Offered alternate years.	**Yok**
GEGN673. ADVANCED GEOLOGICAL ENGINEERING DESIGN. 3.0 Hours. (II) Application of geological principles and analytical techniques to solve complex engineering problems related to geology, such as mitigation of natural hazards, stabilization of earth materials, and optimization of construction options. Design tools to be covered will include problem solving techniques, optimization, reliability, maintainability, and economic analysis. Students will complete independent and group design projects, as well as a case analysis of a design failure. 3 hours lecture; 3 semester hours. Offered alternate years.	**UYJ 508**
GEGN681. VADOSE ZONE HYDROLOGY. 3.0 Hours. (II) Study of the physics of unsaturated groundwater flow and contaminant transport. Fundamental processes and data collection methods will be presented. The emphasis will be on analytic solutions to the unsaturated flow equations and analysis of field data. Application to non-miscible fluids, such as gasoline, will be made. The fate of leaks from underground tanks will be analyzed. Prerequisites: GEGN467 or equivalent; Math through Differential Equations; or consent of instructor. 3 hours lecture; 3 semester hours.	**Yok**
GEGN682. FLOW AND TRANSPORT IN FRACTURED ROCK. 3.0 Hours. (I) Explores the application of hydrologic and engineering principles to flow and transport in fractured rock. Emphasis is on analysis of field data and the differences between flow and transport in porous media and fractured rock. Teams work together throughout the semester to solve problems using field data, collect and analyze field data, and do independent research in flow and transport in fractured rock. Prerequisites: GEGN581 or consent of instructor. 3 hours lecture; 3 credit hours. Offered alternate years.	**Yok**
GEGN683. ADVANCED GROUND WATER MODELING. 3.0 Hours. (II) Flow and solute transport modeling including: 1) advanced analytical modeling methods; 2) finite elements, random-walk, and method of characteristics numerical methods; 3) discussion of alternative computer codes for modeling and presentation of the essential features of a number of codes; 4) study of selection of appropriate computer codes for specific modeling problems; 5) application of models to ground water problems; and 6) study of completed modeling projects through literature review, reading and discussion. Prerequisite: GEGN509/CHGC509 or GEGN583, or consent of instructor. 2 hours lecture, 3 hours lab; 3 semester hours.	**UYJ538**
GEGN707. GRADUATE THESIS / DISSERTATION RESEARCH CREDIT. 1-15 Hour. (I, II, S) Research credit hours required for completion of a Masters-level thesis or Doctoral dissertation. Research must be carried out under the direct supervision of the student's faculty advisor. Variable class and semester hours. Repeatable for credit.	**UYJ000**

GEGX571. GEOCHEMICAL EXPLORATION. 3.0 Hours. (I) Dispersion of trace metals from mineral deposits and their discovery. Laboratory consists of analysis and statistical interpretation of data of soils, stream sediments, vegetation, and rock in connection with field problems. Term report required. Prerequisite: Consent of instructor. 2 hours lecture, 3 hours lab; 3 semester hours.	**UYJ513E**
GEOL501. APPLIED STRATIGRAPHY. 4.0 Hours. (I) Review of basic concepts in siliciclastic and carbonate sedimentology and stratigraphy. Introduction to advanced concepts and their application to exploration and development of fossil fuels and stratiform mineral deposits. Modern facies models and sequence-stratigraphic concepts applied to solving stratigraphic problems in field and subsurface settings. Prerequisites: GEOL314 or equivalent or consent of instructor. 3 hours lecture, 4 hours lab; 4 semester hours.	**Yok**
GEOL502. STRUCTURAL METHODS FOR SEISMIC INTERPRETATION. 3.0 Hours. (I) A practical course that covers the wide variety of structural methods and techniques that are essential to produce a valid and coherent interpretation of 2D and 3D seismic reflection data in structurally complex areas. Topics covered include: Extensional tectonics, fold and thrust belts, salt tectonics, inversion tectonics and strike-slip fault systems. Laboratory exercises are based on seismic datasets from a wide variety of structural regimes from across the globe. The course includes a 4 day field trip to SE Utah. Prerequisite: GEOL309 and GEOL314 or GEOL315, or equivalents, or consent of instructor. 3 hours lecture/lab; 3 semester hours.	**Yok**
GEOL505. ADVANCED STRUCTURAL GEOLOGY. 3.0 Hours. (I) Advanced Structural Geology builds on basic undergraduate Structural Geology. Structures such as folds, faults, foliations, lineations and shear zones will be considered in detail. The course focuses on microstructures, complex geometries and multiple generations of deformation. The laboratory consists of microscopy, in-class problems, and some field-based problems. Prerequisites: GEGN307, GEOL309, GEGN316, GEOL321, or equivalents. 2 hours lecture, 2 hours lab, and field exercise; 3 semester hours.	**Yok**
GEOL507. GRADUATE SEMINAR. 1.0 Hour. (II) Recent geologic ideas and literature reviewed. Preparation and oral presentation of short papers. 1 hour seminar; 1 semester hour. Required of all geology candidates for advanced degrees during their enrollment on campus.	**UYJ596**
GEOL512. MINERALOGY AND CRYSTAL CHEMISTRY. 3.0 Hours. (I) Relationships among mineral chemistry, structure, crystallography, and physical properties. Systematic treatments of structural representation, defects, mineral stability and phase transitions, solid solutions, substitution mechanisms, and advanced methods of mineral identification and characterization. Applications of principles using petrological and environmental examples. Prerequisites: GEOL321, DCGN209 or equivalent or consent of instructor. 2 hours lecture, 3 hours lab; 3 semester hours. Offered alternate years.	**UYJ520**
GEOL513. HYDROTHERMAL GEOCHEMISTRY. 3.0 Hours. (II) Geochemistry of high-temperature aqueous systems. Examines fundamental phase relationships in model systems at elevated temperatures and pressures. Major and trace element behavior during fluid-rock interaction. Theory and application of stable isotopes as applied to hydrothermal mineral deposits. Review of the origin of hydrothermal fluids and mechanisms of transport and deposition of ore minerals. Includes the study of the geochemistry of magmatic aqueous systems, geothermal systems, and submarine hydrothermal vents. Prerequisites: GEGN401 or consent of instructor. 2 hours lecture, 3 hours lab; 3 semester hours.	**UYJ503E**
GEOL514. BUSINESS OF ECONOMIC GEOLOGY. 3.0 Hours. Examines the business side of mineral exploration including company structure, fundraising,	**Yok**

stock market rules and regulations, and legal environment. Reviews the types of minerals exploration companies, differences between mineral sectors, rules and practices of listing a minerals company on a stock exchange, and legal requirements of listing and presenting data to stockholders. The course is centered on lectures by industry representatives from the Denver area. Includes participation in a technical conference in Vancouver or Toronto and meetings with lawyers, stockbrokers, and geoscientists working in the mineral industry. Prerequisites: GEGN401 or consent of instructor. 3 hours lecture and seminar; 3 semester hours. Offered alternate years when student demand is sufficient.	
GEOL515. ADVANCED MINERAL DEPOSITS. 3.0 Hours. (I) Geology of mineral systems at a deposit, district, and regional scale formed by magmatic-hydrothermal, sedimentary/basinal, and metamorphic processes. Emphasis will be placed on a systems approach to evaluating metal and sulfur sources, transportation paths, and traps. Systems examined will vary by year and interest of the class. Involves a team-oriented research project that includes review of current literature and laboratory research. Prerequisites: GEGN401 or consent of instructor. 1 hour lecture, 5 hours lab; 3 semester hours. Repeatable for credit.	**UYJ527**
GEOL517. FIELD METHODS FOR ECONOMIC GEOLOGY. 3.0 Hours. (II) Methods of field practices related to mineral exploration and mining. Lithology, structural geology, alteration, and mineralization vein-type precious metal deposits. Mapping is conducted both underground at the Edgar Test Mine and above ground in the Idaho Springs area. Drill core and rock chips from different deposit types are utilized. Technical reports are prepared for each of four projects. Class is run on Saturday (9 am-4 pm) throughout the semester. Prerequisites: GEGN401 or consent of instructor. 6 hours lab and seminar; 3 semester hours. Offered alternate years when student demand is sufficient.	**Yok**
GEOL518. MINERAL EXPLORATION. 3.0 Hours. (II) Mineral industry overview, deposit economics, target selection, deposit modeling, exploration technology, international exploration, environmental issues, program planning, proposal development. Team development and presentation of an exploration proposal. Prerequisite: GEOL515, GEOL520, or equivalent. 2 hours lecture/seminar, 3 hours lab; 3 semester hours. Offered when student demand is sufficient.	**UYJ527**
GEOL519. ABITIBI GEOLOGY AND EXPLORATION FIELD SCHOOL. 3.0 Hours. (II, S) Methods of field practices related to mineral exploration and mining. Regional and deposit-scale geology of Archean mineral deposits, including lode gold deposits and volcanic-hosted massive sulfide deposits. Includes mineral prospect evaluation, structural geology, physical volcanology, deposit definition, alteration mapping, mining methods, ore processing, and metallurgy. Core logging, underground stope mapping, open pit mapping, lithogeochemical sampling, and field-analytical techniques. Course involves a seminar in the spring semester that focuses on the geology and deposit types in the area to be visited. An intense 14-day field trip is run in the summer semester. Each day includes up to 4 hours of instruction in the field and 4 hours of team-oriented field exercises. Prerequisites: Consent of instructor. 6 hours lab and seminar; 2 semester hours in spring, 1 semester hour in summer. Offered alternate years when student demand is sufficient.	**Yok**
GEOL520. NEW DEVELOPMENTS IN THE GEOLOGY AND EXPLORATION OF ORE DEPOSITS. 3.0 Hours. (I, II) Each topic unique and focused on a specific mineral deposit type or timely aspects of economic geology. Review of the geological and geographic setting of a specific magmatic, hydrothermal, or sedimentary mineral deposit type. Detailed study of the physical and chemical characteristics of selected deposits and mining districts. Theory and application of geological field methods and geochemical investigations. Includes a discussion of genetic models, exploration strategies, and mining methods. Prerequistes: GEGN401 or consent of instructor. 2 hours lecture; 2 semester hours. Repeatable for credit.	**Yok**
GEOL521. FIELD AND ORE DEPOSIT GEOLOGY. 3.0 Hours.	**Yok**

(I, S) Field study of major mineral deposit districts inside and outside of the USA. Examines regional and deposit-scale geology. Underground and open pit mine visits and regional traverses. Topics addressed include deposit definition, structural geology, alteration mapping, mining methods, and ore processing. Course involves a seminar in the spring semester that focuses on the geology and deposit types in the area to be visited. An intense 10-14 day field trip is run in the summer semester. Prerequisites: Consent of instructor. 6 hours lab and seminar; 2 semester hours in spring, 1 semester hour in summer. Offered alternate years when student demand is sufficient. Repeatable for credit.	
GEOL522. TECTONICS AND SEDIMENTATION. 3.0 Hours. (II) Application and integration of advanced sedimentologic and stratigraphic concepts to understand crustal deformation at a wide range of spatial- and time-scales. Key concepts include: growth-strata analysis, interpretation of detrital composition (conglomerate unroofing sequences and sandstone provenance trends), paleocurrent deflection and thinning trends, tectonic control on facies distribution and basic detrital zircon and fission track analysis. Students will read a wide range of literature to explore the utility and limitation of traditional "tectonic signatures" in stratigraphy, and will work on outcrop and subsurface datasets to master these concepts. Special attention is paid to fold-thrust belt, extensional and salt-related deformation. The course has important applications in Petroleum Geology, Geologic Hazards, and Hydrogeology. Required: 2-3 fieldtrips, class presentations, and a final paper that is written in a peer-reviewed journal format. Prerequisites: GEOL314 or equivalent, and GEOL309 or equivalent. 3 hours lecture and seminar; 3 semester hours. Offered even years.	**UYJ533**
GEOL523. REFLECTED LIGHT AND ELECTRON MICROSCOPY. 3.0 Hours. (I) Theoretical and practical aspects of reflected light and electron microscopy. Emphasis will be placed on applications to ore deposit exploration and research. Lecture and discussion topics will highlight both standard and new techniques and instrumentation including SEM and QEMSCAN, as well as key questions in mineral deposit genesis which can be addressed using reflected light and electron microscopy. Includes detailed study of a selected suite of samples, with emphasis on mineral identification, textural relationships, paragenetic sequences, and mineral chemistry. Course culminates in a project. Prerequisites: GEGN401 or consent of instructor. 2 hours lecture, 2 hours lab; 3 semester hours.	**JEO 624**
GEOL525. TECTONOTHERMAL EVOLUTION OF THE CONTINENTS. 3.0 Hours. (I) Evolution of the continental crust with a specific focus on processes occurring at collisional margins. Emphasis will be on the application of metamorphic processes and concepts., including integration of major, trace, and isotopic geochemistry of rocks and minerals to interpreting and understanding the tectonic and thermal evolution of the crust through space and time. Laboratory emphasizes the interpretation of metamorphic textures and assemblages within the context of geochemistry and deformation, and the application of thermodynamic principles to the understanding of the thermal history of rocks and terrains. Prerequiste: Appropriate undergraduate optical mineralogy and petrology coursework (GEOL321 and GEGN307, or equivalent) or consent of instructor. 2 hours lecture and seminar, 3 hours lab: 3 semester hours. Offered alternate years.	**JEO 612E Kısmen**
GEOL530. CLAY CHARACTERIZATION. 1.0 Hour. (I) Clay mineral structure, chemistry and classification, physical properties (flocculation and swelling, cation exchange capacity, surface area and charge), geological occurrence, controls on their stabilities. Principles of X-ray diffraction, including sample preparation techniques, data collection and interpretation, and clay separation and treatment methods. The use of scanning electron microscopy to investigate clay distribution and morphology. Methods of measuring cation exchange capacity and surface area. Prerequisite: GEGN206 or equivalent, or consent of instructor. 1 hour lecture, 2 hours lab; 1 semester hour.	**UYJ544**
GEOL550. INTEGRATED BASIN MODELING. 3.0 Hours. (I) This course introduces students to principal methods in computer-based basin modeling: structural modeling and tectonic restoration; thermal modeling and hydrocarbon generation; and stratigraphic modeling. Students apply techniques to real data set that includes seismic and well data and learn to integrate results from multiple approaches in interpreting a basin's	**Yok**

history. The course is primarily a lab course. Prerequisite: Consent of instructor. A course background in structural geology, sedimentology/stratigraphy or organic geochemistry will be helpful. 1 hour lecture, 5 hours labs; 3 semester hours.	
GEOL551. APPLIED PETROLEUM GEOLOGY. 3.0 Hours. (II) Subjects to be covered include computer subsurface mapping and cross sections, petrophysical analysis of well data, digitizing well logs, analyzing production decline curves, creating hydrocarbon- porosity-thickness maps, volumetric calculations, seismic structural and stratigraphic mapping techniques, and basin modeling of hydrocarbon generation. Students are exposed to three software packages used extensively by the oil and gas industry. Prerequisite: GEGN438 or GEOL609 or consent of instructor. 3 hours lecture; 3 semester hours.	**Yok**
GEOL552. UNCONVENTIONAL PETROLEUM SYSTEMS. 3.0 Hours. (II) Unconventional petroleum systems have emerged as a critical and indispensable part of current US production and potential future reserves. Each of the 5 unconventional oil and 4 unconventional gas systems will be discussed: what are they, world wide examples, required technology to evaluate and produce, environmental issues, and production/resource numbers. The oil part of the course will be followed by looking at cores from these systems. The gas part of the course will include a field trip to the Denver, Eagle, and Piceance Basins in Colorado to see outstanding outcrops of actual producing units. Prerequisites: GEGN438 or GEOL609, GEGN527 or consent of instructor. 3 hours lecture; 3 semester hours. Offered alternate years.	**Yok**
GEOL553. GEOLOGY AND SEISMIC SIGNATURES OF RESERVOIR SYSTEMS. 3.0 Hours. (II) This course is a comprehensive look at the depositional models, log signatures, characteristics, and seismic signatures for all the main reservoirs we explore for and produce from in the subsurface. The first half is devoted to the clastic reservoirs (12 in all); the second part to the carbonate reservoirs (7 total). The course will utilize many hands-on exercises using actual seismic lines for the various reservoir types. Prerequisites: GEOL501 or GEOL314. 3 hours lecture; 3 semester hours. Offered alternate years.	**Yok**
GEOL570. APPLICATIONS OF SATELLITE REMOTE SENSING. 3.0 Hours. (II) An introduction to geoscience applications of satellite remote sensing of the Earth and planets. The lectures provide background on satellites, sensors, methodology, and diverse applications. Topics include visible, near infrared, and thermal infrared passive sensing, active microwave and radio sensing, and geodetic remote sensing. Lectures and labs involve use of data from a variety of instruments, as several applications to problems in the Earth and planetary sciences are presented. Students will complete independent term projects that are presented both written and orally at the end of the term. Prerequisites: PHGN200 and MATH225 or consent of instructor. 2 hours lecture, 2 hours lab; 3 semester hours.	**Yok**
GEOL580. INDUCED SEISMICITY. 3.0 Hours. (II) Earthquakes are sometimes caused by the activities of man. These activities include mining and quarrying, petroleum and geothermal energy production, building water reservoirs and dams, and underground nuclear testing. This course will help students understand the characteristics and physical causes of man-made earthquakes and seismicity induced in various situations. Students will read published reports and objectively analyze the seismological and ancillary data therein to decide if the causative agent was man or natural processes. Prerequisites: Undergraduate geology and physics. 3 hours lecture; 3 semester hours. Offered spring semester, odd years.	**Yok**
GEOL597. SPECIAL SUMMER COURSE	**Yok**
GEOL598. SEMINAR IN GEOLOGY OR GEOLOGICAL ENGINEERING. 1-3 Hour. (I, II) Special topics classes, taught on a one-time basis. May include lecture, laboratory and field trip activities. Prerequisite: Approval of instructor and department head. Variable credit; 1 to 3 semester hours. Repeatable for credit under different topics.	**UYJ 596**

GEOL599. INDEPENDENT STUDY IN GEOLOGY. 1-3 Hour. (I, II) Individual special studies, laboratory and/or field problems in geology. Prerequisite: Approval of instructor and department. Variable credit; 1 to 3 semester hours. Repeatable for credit.	**UYJ 596**
GEOL601. FIELD STRATIGRAPHY. 1.0 Hour. (II) Keynote lectures and a seminar series on select topics in stratigraphy, linked to a field trip. Specific topics vary yearly depending on course participant's interests. Seminar discussions based on reading journal papers. Field trip consists of series of projects/exercises focused on making field observations and deducing interpretations, based on multiple hypotheses. Field trip includes specific observations and recognition criteria for depositional processes and environments, as well as for regional climatic and tectonic controls. Presentation required. Prerequisite: GEOL501. 3-4 seminars, 3 hours each, over the course of the semester, and a field trip; 1 semester hour.	**Yok**
GEOL608. HISTORY OF GEOLOGICAL CONCEPTS. 3.0 Hours. (II) Lectures and seminars concerning the history and philosophy of the science of geology; emphasis on the historical development of basic geologic concepts. 3 hours lecture and seminar; 3 semester hours. Required of all doctoral candidates in department. Offered alternate years.	**Yok**
GEOL609. ADVANCED PETROLEUM GEOLOGY. 3.0 Hours. (II) Subjects to be covered involve consideration of basic chemical, physical, biological and geological processes and their relation to modern concepts of oil/gas generation (including source rock deposition and maturation), and migration/accumulation (including that occurring under hydrodynamic conditions). Concepts will be applied to the historic and predictive occurrence of oil/gas to specific Rocky Mountain areas. In addition to lecture attendance, course work involves review of topical papers and solution of typical problems. Prerequisite: GEGN438 or consent of instructor. 3 hours lecture; 3 semester hours.	**Yok**
GEOL610. ADVANCED SEDIMENTOLOGY. 3.0 Hours. (I) Keynote lectures, mixed with discussions, in-class exercises, core and field observations in a seminar series on sedimentology. Introduction to current hot topics in sedimentology, and discussions on fundamental principles. Specific topics vary yearly depending on most recent advancements and course participant's interests. Quantitative sedimentology. Applications of sedimentology. All seminars are based on reading and discussing journal papers. Field trip to a modern environment. Essays and presentations required. Prerequisite: GEOL501. Acceptable to take GEOL610 at the same time, as GEOL501. 3 hours lecture and seminar; 3 semester hours. Offered alternate years.	**JEO 604E**
GEOL611. SEQUENCE STRATIGRAPHY IN SEISMIC, WELL LOGS, AND OUTCROP. 3.0 Hours. (I) Keynote lectures and a seminar series on the sequence stratigraphy of depositional systems, including both siliciclastics and carbonates and how they behave in changing sea-level, tectonic subsidence, and sediment supply conditions. Application of sequence stratigraphy concepts to reflection seismic, well-log, and outcrop datasets. Field trip and report required. Prerequisite: GEOL501. 3 hours lecture and seminar; 3 semester hours.	**Yok**
GEOL613. GEOLOGIC RESERVOIR CHARACTERIZATION. 3.0 Hours. (I, II) Principles and practice of characterizing petro leum reservoirs using geologic and engineering data, including well logs, sample descriptions, routine and special core analysis and well tests. Emphasis is placed on practical analysis of such data sets from a variety of clastic petroleum reservoirs worldwide. These data sets are integrated into detailed characterizations, which then are used to solve practical oil and gas field problems. Prerequisites: GEGN438, GEOL501, GEOL505 or equivalents. 3 hours lecture; 3 semester hours.	**Yok**

GEOL617. THERMODYNAMICS AND MINERAL PHASE EQUILIBRIA. 3.0 Hours. (I) Basic thermodynamics applied to natural geologic systems. Evaluation of mineral-vapor mineral solution, mineral-melt, and solid solution equilibria with special emphasis on oxide, sulfide, and silicate systems. Experimental and theoretical derivation, use, and application of phase diagrams relevant to natural rock systems. An emphasis will be placed on problem solving rather than basic theory. Prerequisite: DCGN209 or equivalent or consent of instructor. 3 hours lecture; 3 semester hours. Offered alternate years.	**Yok**
GEOL621. PETROLOGY OF DETRITAL ROCKS. 3.0 Hours. (II) Compositions and textures of sandstones, siltstones, and mudrocks. Relationship of compositions and textures of provenance, environment of deposition, and burial history. Development of porosity and permeability. Laboratory exercises emphasize use of petrographic thin sections, x-ray diffraction analysis, and scanning electron microscopy to examine detrital rocks. A term project is required, involving petrographic analysis of samples selected by student. Pre-requisites: GEGN206 , GEOL321 or equivalent or consent of instructor. 2 hours lecture and seminar, 3 hours lab; 3 semester hours. Offered on demand.	**UYJ 522** **UYJ 532**
GEOL624. CARBONATE SEDIMENTOLOGY AND PETROLOGY. 3.0 Hours. (II) Processes involved in the deposition of carbonate sediments with an emphasis on Recent environments as analogs for ancient carbonate sequences. Carbonate facies recognition through bio- and lithofacies analysis, three-dimensional geometries, sedimentary dynamics, sedimentary structures, and facies associations. Laboratory stresses identification of Recent carbonate sediments and thin section analysis of carbonate classification, textures, non-skeletal and biogenic constituents, diagenesis, and porosity evolution. Prerequisite: GEOL321 and GEOL314 or consent of instructor. 2 hours lecture/seminar, 2 hours lab; 3 semester hours.	**JEO 631**
GEOL628. ADVANCED IGNEOUS PETROLOGY. 3.0 Hours. (I) Igneous processes and concepts, emphasizing the genesis, evolution, and emplacement of tectonically and geochemically diverse volcanic and plutonic occurrences. Tectonic controls on igneous activity and petrochemistry. Petrographic study of igneous suites, mineralized and non-mineralized, from diverse tectonic settings. Prerequisites: GEOL321, GEGN206. 2 hours lecture, 3 hours lab; 3 semester hours. Offered alternate years.	**JEO 522**
GEOL642. FIELD GEOLOGY. 1-3 Hour. (S) Field program operated concurrently with GEGN316 field camp to familiarize the student with basic field technique, geologic principles, and regional geology of Rocky Mountains. Prerequisite: Undergraduate degree in geology and GEGN316 or equivalent. During summer field session; 1 to 3 semester hours.	**Yok**
GEOL643. GRADUATE FIELD SEMINARS. 1-3 Hour. (I, II, S) Special advanced field programs emphasizing detailed study of some aspects of geology. Normally conducted away from the Golden campus. Prerequisite: Restricted to Ph.D. or advanced M.S. candidates. Usually taken after at least one year of graduate residence. Background requirements vary according to nature of field study. Consent of instructor and department head is required. Fees are assessed for field and living expenses and transportation. 1 to 3 semester hours; may be repeated for credit with consent of instructor.	**Yok**
GEOL645. VOLCANOLOGY. 3.0 Hours. (II) Assigned readings and seminar discussions on volcanic processes and products. Principal topics include pyroclastic rocks, craters and calderas, caldron subsidence, diatremes, volcanic domes, origin and evolution of volcanic magmas, and relation of volcanism to alteration and mineralization. Petrographic study of selected suites of lava and pyroclastic rocks in the laboratory. Prerequisite: Consent of instructor. 1 hour seminar, 6 hours lab; 3 semester hours.	**Yok**
GEOL653. CARBONATE DIAGENESIS AND GEOCHEMISTRY. 3.0 Hours. (II) Petrologic, geochemical, and isotopic approaches to the study of diagenetic changes in	**UYJ 536**

carbonate sediments and rocks. Topics covered include major near-surface diagenetic environments, subaerial exposure, dolomitization, burial diagenesis, carbonate aqueous equilibria, and the carbonate geochemistry of trace elements and stable isotopes. Laboratory stresses thin section recognition of diagenetic textures and fabrics, x-ray diffraction, and geochemical/isotopic approaches to diagenetic problems. Prerequisite: GEOL624 or equivalent or consent of instructor. 4 to 6 hours lecture/ seminar/lab; 3 semester hours.	
GEOL699. INDEPENDENT STUDY IN GEOLOGY. 1-3 Hour. (I, II). Individual special studies, laboratory and/or field problems in geology. Prerequisite: Approval of instructor and department. Variable credit; 1 to 3 semester hours. Repeatable for credit.	**UYJ 596**
GEOL707. GRADUATE THESIS / DISSERTATION RESEARCH CREDIT. 1-15 Hour. (I, II, S) Research credit hours required for completion of a Masters-level thesis or Doctoral dissertation. Research must be carried out under the direct supervision of the student's faculty advisor. Variable class and semester hours. Repeatable for credit.	**UYJ 000** **JEO 000**

Zürih Teknik Üniversitesi (ETH)

Module Engineering Geology Fundamentals **Autumn Semester** Compulsory courses	**İTÜ'deki Eşdeğeri**
Groundwater I Introduction to groundwater problems. Concepts to quantify properties of aquifers. 2. Flow equation. The generalized Darcy law. 3. The water balance equation. 4. Boundary conditions. Formulation of flow problems. 5. Analytical solutions to flow problems I 6. Analytical solutions to flow problems II 7. Finitie difference solution to flow problems. 8. Numerical solution to flow problems using a code. 9. Case studies for flow problems. 10. Concepts of transport modelling. Mass balance equation for contaminants. 11. Boundary conditons. Formulation of contaminant transport problems in groundwater. 12. Analytical solutions to transport problems I. 13. Analytical solutions to transport problems II 14. Numerical solution to simple transport problems using particle tracking technique.	**Kısmen UYJ 501E**
Rock Mechanics and Rock Engineering This course focusses on the principles (fundamentals) and basic concepts of rock mechanics and generic rock engineering. The behavior of different rock types is studied with laboratory investigations which are linked to the theoretical aspects discussed in lectures and applied in exercises. The course is compulsory for the MSc Eng Geol. The applications of rock mechanical principles and rock engineering methods are extensively covered in subsequent courses.	**UYJ 508**
Soil Mechanics and Foundation Engineering Soil Mechanics: Fundamental concepts of strength and deformation of different soils. Introduction to geotechnical calculationsSignificance of (Ground-)Water.Geotechnical Engineering in Soils: Evaluation of geotechnical scenarios, handling of forecast uncertainities. Relation of soil propertities and soil composition, Interactions between soil and building,Standard construction methods in soils (foundations, slopes, damms and levees)Requirements for the geotechnical prognosis	**yok**
Autumn Semester Compulsory courses	
Geological Site Investigations The methods that are routinely employed in site investigations will be described focusing on their applicability in different geologic environments. The limitations of the data in constraining the parameters of interest will be addressed together with problems of interpretation and cost-versus-information value. Specific topics addressed include drilling, coring, borehole testing, satellite and ground-based surface and displacement monitoring (LIDAR and Radar), and in-situ deformation measurement methods. In-situ stress measurement methods are covered in the course Rock Mechanics and Rock Engineering.	**UYJ 505**
Spring Semester Compulsory courses	
Hydrogeological Field Course Covered methods are - Aquifer and well tests (constant pressure, constant flow, step pumping tests, drawdown and build-up, single hole and crosshole, double packer and open hole),- Slug & bail tests (pneumatic and bailer techniques, double packer intervals and open hole).- Hydraulic head profiling (natural conditions).- Fluid logging (basic and	**Yok**

typical techniques like fluid conductivity).- Groundwater sampling (including measurement of physico-chemical properties).- Tracer dilution test.	
Engineering Geological Field Course I (Soils) The course starts with an introduction lecture on soil classification (USCS and Swiss standards), field testing and sampling techniques, borehole logging, mapping techniques and Quaternary geology of Zurich. The main part is an extensive field course which includes a quarry mapping exercise, borhole logging and field maping by geomorphlogical features. Student teams get a mandate for geotechnical investigations on a certain question and have to write a report about their findings. Teaching in the field will primarily consist in guiding the students in their mapping work. Subsequently, the field and laboratory data is analyzed by the students	**yok**
Engineering Geological Field Course II (Rocks)	**yok**
Spring Semester Compulsory courses	
Landfilling, Contaminated Sites and Radioactive Waste Repositories This lecture course comprises of lectures with exercises (2/3) and a guided case study in the last 4 weeks. - A short overview of the principles of environmental protection in waste management and how this is applied in legislation.- A overview of the chemistry underlying the leaching of contaminants from the landfilled/contaminated material/radioactive waste repository focusing on processes that control redox state and pH buffer capacity; mobility of heavy metals and organic compounds- Technical barrier design and function. Clay as a barrier. - Contaminated site remediation: Site evaluation, remediation technologies- Concepts and safety in radioactive waste management- Role of the geological and engineered barriers and radionuclide transport in geological media.	**yok**
Landslide Analysis The major types of landslides are introduced in face-to-face lectures. For every landslide type a case study is introduced which illustrates typical tasks and approaches of professionals working in the field of landslide hazard analysis and mitigation. All case studies include field visits focussing on geological conditions, morphological features, geotechnical properties and field measurements. In the lab we discuss appropriate geological and kinematic models, triggers, stability, failure processes and mitigation mechanisms. The results of the case studies are documented in reports which are the basis for the course evaluation.	**yok**
Engineering Geology of Underground Excavations Major Tasks of Engineering Geologist in Underground Constructions, Project Phases and Logistic Constraints of Various Types Underground Constructions, Ground Behaviour in Underground Constructions (Rock and Soil), Groundwater and Environmental Impacts of Underground Constructions; Exploration Methods. Case Study Lötschberg Base Tunnel.	**Kısmen UYJ 508**
Excursions Module Integration (Engineering Geology) This course includes 4 days of specialized engineering geologic excursions that are offered by the chair of engineering geology. Topics include visits to landslides and to ongoing construction sites (tunnels, hydropower systems, foundations, roads, geological waste disposal). Increase the amount of field exposure and field experience in applied engineering geology.	**yok**
Module Industry Practical Das Industriepraktikum wird von der Industrie und der ETH betreut und umfasst anspruchsvolle technische und wissenschaftliche Arbeit im Bereich der Ingenieurgeologie. Die Dauer des Praktikums beschränkt sich auf 2.5 Monate. Das Praktikum wird im Voraus mit einem Arbeitsplan definiert und mit einem schriftlichen Bericht abgeschlossen.	**yok**
ENGINEERING GEOLOGICAL SEMINAR	**UYJ 596**

The Engineering Geological Seminar is mandatory for students majoring in Engineering Geology. The seminar includes external guest lectures, literature study and the preparation of a research plan for the MSc project. Preparation of a research plan requires understanding of research methods, concepts and tools. In addition students will make contacts with researchers and practitioners, and get an understanding of the international engineering geology community.	
Module Analytical Methods in Earth Sciences **Autumn Semester** Microscopy Courses	
Microscopy of Metamorphic Rocks - Kurze Repetition der wichtigsten optischen Eigenschaften und der mikroskopischen Methoden zur Identifikation der gesteinsbildenden Minerale. Im Besonderen: Auswertung der Interferenzfiguren im konoskopischen Strahlengang. - Mikroskopieren von Dünnschliffen der typischen metamorphen Gesteine.- Studium und Beschreibung des metamorphen Mineralbestands und des Gefüges. Bestimmung der zeitlichen Abfolge von Kristallisations- und Deformationsprozessen.- Abschätzung von Metamorphosegrad anhand der Paragenesen. - Mengenbestimmung, Angabe der Prozentanteile von Komponenten- Wissenschaftliche Dokumentation dieser Information: Beschreibungen, Zeichnungen, Mikrophotographie mit verschiedenen Beleuchtungsarten und mit linear- oder zirkularpolarisiertem Licht.	**Kısmen UYJ 532E**
Microscopy of Magmatic Rocks Dieses Praktikum baut auf dem Kurs 'Microscopy of metamorphic rocks' (P. Nievergelt) auf, der unmittelbar vor diesem Kurs durchgeführt wird und wo die Grundlagen der optischen Mineralogie und die Benutzung eines Polarisationsmikroskops erlernt werden. In diesem Praktikum werden die wichtigsten magmatischen Mineralien und Gesteine in Gesteinsdünnschliffen vermittelt. Mineralparagenesen, Gefüge, Texturen und Kristallisationsabfolgen werden bestimmt und dazu verwendet die Genese, Differentiation und Platznahme magmatischer Gesteine zu verstehen. Dazu werden auch die Kenntnisse in Phasendiagrammen aus anderen Vorlesungen (z. Bsp. Magmatismus und Vulkane) vertieft und auf natürliche Gesteine angewandt um qualitative Aussagen über Stammmagmen und Kristallisationsbedingungen abzuleiten.Das Spektrum der untersuchten Gesteine umfasst Mantelgesteinen, tholeiitische, kalk-alkalische und alkalische Plutonite und Vulkanite, die die wichtigsten magmatischen Mineralien enthalten.	**UYJ 522**
Reflected Light Microscopy and Ore Deposits Practical Introduction to reflected light microscopy as a petrographic technique. Leaning main diagnstic criteria. Study of small selection of important and characteristic minerals. Interpreting polished (thin) sections as exercise	**JEO 624**
Sedimentary Petrography and Microscopy Mikroskopie von Karbonat- und siliziklastischen Gesteinen, kieseligen Gesteinen und Phosphatgesteinen, ihren Ursprung und die Klassifikation. Diagenetische Prozesse	**Yok**
Analytical Methods Courses	
Geographic Information Systems Theoretical introduction to the architecture, modules, spatial data types and spatial data handling functions of geographic information systems (GIS). Application of data modeling principles and geoprocessing capabilities using ArcGIS: Data design and modeling, data acquisition, data integration, spatial analysis of vector and raster data, particular functions for digital terrain modeling and hydrology, map generation and 3D-visualization.	**yok**
Analytical Methods in Petrology and Geology Introduction to analytical chemistry and atom physics.X-ray diffraction (XRD), X-ray fluorescence analysis (XRF), Electron Probe Microanalysis (EPMA), Laser ablation inductively coupled plasma mass spectroscopy (LA-ICP-MS), Mass spectroscopy for light isotopes.	**Kısmen UYJ 544**
X-ray Powder Diffraction Fundamental principles of X-ray diffractionSetup and operation of X-ray diffractometersInterpretation of powder diffraction dataDetermination of crystallographic	**UYJ544**

parameters from powder patternsQualitative and quantitative phase analysis of crystalline powders (e.g. with Rietveld analysis)	
Sediment Analysis Färben von Dünnschliffen auf Feldspat und Karbonat, Lackabzüge von Karbonatgesteinen, Modalanalyse von Sandsteinen (gleiches Prinzip anwendbar für Mikrofazies von Karbonatgesteinen), Calcimetrie und organischer Kohlenstoff von pelitischen Gesteinen, Schwermineral-Analyse, "kalte" Kathodenlumineszenz von Karbonatgesteinen, einfache Separation von Tonmineralen, Exoskopie von Quarzkörnern.	**yok**
Spring Semester Analytical Methods Courses	
Analysis of Rock Textures	
Module Structural Geology **Autumn Semester** Courses of choice	
Numerical Modelling of Rock Deformation Learning and understanding the continuum mechanics equations that describe the deformation of rocks.Mathematical equations describing rock rheology: elasticity and viscosity.Applying numerical methods to investigate rock deformation.Programming and using the finite element method.	**Yok JEO 627 ?**
Microstructures 1) Terminology: grain, grain shape, grain boundaries, cracks, cleavages. Classification of cleavages. 2) Recall Foliation mechanisms and their microstructures: a. passive rotation (examples of mica in marbles) b. dissolution and precipitation (+Q and M domains in schists) c. nucleation and growth (metamorphism, e.g. low grade schists) d. crystal plastic deformation (e.g. calcite, quartz) e. recrystallization (dynamic) (e.g. calcite) 3) Deformation mechanisms, their microstructures and LPO a. Cataclastic deformation (cataclastic flow, trails of fluid inclusions, interaction with fluids and melt, pseudotackylytes, breccias)4) Deformation mechanisms, their microstructures and LPO b. Intracrystalline plasticity (monomineralic calcite, olivine, quartz. microstructures and LPO, progressive deformation in simple and pure shear)5) Deformation mechanisms, their microstructures and LPO c. Diffusive mass transfer in presence of fluids (pressure solution) d. Solid state e. Grain boundary sliding and superplastic flow (calcite)6) Deformation mechanisms, their microstructures and LPO f. Dynamic recrystallization (eg. Calcite and olivine): rotation Rxx and GB migration Rxx.7) Deformation mechanisms, their microstructures and LPO g. Twinning (calcite, as thermometer; plagioclase) h. Recovery and static recrystallization 8) Deformation mechanisms, their microstructures and LPO i. Deformation of polymineralic rocks (e.g. quartzofeldspatic and schists) 9) Microstructures in Fault rocks a. Fault gouge b. Mylonites (evolution of microstructures and LPO with progressive strain. Natural examples and the experimental results from torsion testing: calcite and olivine). c. Sense of shear: Matrix, Porphiroclasts etc. 10) Techniques for determination of SPO and LPO. Examples using image analysis tools and U-stage.	**yok**
Rock Physics The course will consists of regular classes, with a small number of laboratory demonstrations made on an ad-hoc basis (depending on equipment and research objective schedules at the Rock Deformation Laboratory). The course will cover measurements of physical properties of rock such as density, porosity, permeability and elastic wave velocity, and will introduce the concept of seismic seismic anisotropy etc. Later we will cover rock deformation in the brittle field, earthquake physics and triggering. Finally we will discuss scale effects as we move from small scale laboratory environment to the scale of the geophysical investigation.	**yok**

Spring Semester Compulsory Courses	
Structural Geology with Field Course The first half of the course consist of lectures and practical exercises in more advanced aspects of structural geology, including finite strain theory, finite strain measurement, kinematics, mechanical instability (e.g. folds and boudins), the behaviour of rigid particles in flow, perturbation flow, flanking structures, strain localization and fluid-rock interaction. The second half of the course is a 4-day filed mapping exercise in a complexly deformed terrain, with the production of a map and a ca. 10-15 page report. The mark from the written exam at the end of the theory part and the mark for the field report are equally weighted in determining the final result.	**Yok**
Field Course IV: Non Alpine Field Course Geological mapping in small groups at a scale of ca. 1:35'000 in Neoproterozoic and Palaeozoic sediments and igneous rocks ; distinguishing mappable formations and their description; sedimentologic and structural analysis; presentation and discussion of literature material related to the working area; reconstruction of the history of the area; writing up final group reports.	**yok**
Courses of choice	
Analysis of Rock Textures **-----??????????????**	
Experimental Rock Deformation 1) Experimental deformation apparatus - Gas apparatus - Fluid apparatus - Solid medium apparatus 2) Main parts of apparatus - Mechanical, hydraulic - Heating systems - Sensors and data logging 3) Calibration of apparatus - Distortion of the rig - Calibration of transducers 4) Different type of tests - Axial deformation - Diagonal cut and torsion deformation - Constant strain rate tests - Creep tests - Stepping tests (strain rate, temperature, stress) 5) Testing on natural rocks (e.g. Carrara marble) - Room temperature: brittle failure - High temperature: plastic deformation (on the Paterson apparatus) - Data processing 6) Experimental rheology - Deformation mechanisms - Flow laws - Deformation mechanism maps 7) Microstructures - Analysis - Comparison with nature	**yok**
Anisotropical Behaviour and Rheology of Rocks Description of physical properties (seismic, thermal and electrical conductivity, permeability etc.)Elasticity in isotropic media.Microscopic aspects of anisotropy.Elasticity and seismic velocities in crystals.Elasticity in polyphase rocks. Exercises with software (Mainprice) to calculate seismic properties.Methods for the measurements of seismic properties of rocks in Laboratory. Practice on the bench with the oscilloscope.Anisotropy at different scales. Rheology and deformation mechanism: from single phase to polyphase rocks (solid state).Measurements and elaboration of LPO, SPO using OIM, Beartex, Surfor and Paror software.Introduction to rheology and flow laws.Deformation mechanism maps, crustal strength profiles and extrapolation from experiment to nature .Experimental rock deformation techniques (stress-strain curves etc.).Experimental deformation in Laboratory. Practice using uniaxial experimental set-up. Example in the brittle field.Experimental deformation practical in the Paterson gas rig.	**yok**
Tectonic Geomorphology Course includes a lecture component (in second half-semester) and a 9 day fieldtrip.	**yok**

Students should register for both components. Fieldtrip will involve collecting field data from active structures in the Northern Apennines. Lecture component will include theoretical background and analysis of data collected during fieldtrip.	
Module Sedimentology **Autumn Semester** Compulsory courses	
Sedimentology I: Physical Processes and Sedimentary Systems **Kurzbeschreibung** Sediments preserved a record of past landscapes. This courses focuses on understanding the processes that modify sedimentary landscapes with time and how we can read this changes in the sedimentary record. **Lernziel** The students learn basic concepts of modern sedimentology and stratigraphy in the context of sequence stratigraphy and sea level change. They discuss the advantages and pitfalls of the method and look beyond. In particular we pay attention to introducing the importance of considering entire sediment routing systems and understanding their functionning.	**JEO 604E**
Courses of choice	
Sedimentology II: Biological and Chemical Processes in Lacustrine and Marine Systems -carbonates,: chemistry, mineralogy, biology-carbonate sedimentation from the shelf to the deep sea-carbonate facies-cool-water and warm-water carbonates-organic-carbon and black shales -C-cycle, carbonates, Corg : CO2 sources and sink-Carbonates: their geochemical proxies for environmental change: stable isotopes, Mg/Ca, Sr-marine sediments thorugh geological time-carbonates and evaporites-lacustrine carbonates-economic aspects of limestone	**JEO 604E**
X-ray Powder Diffraction Fundamental principles of X-ray diffractionSetup and operation of X-ray diffractometersInterpretation of powder diffraction dataDetermination of crystallographic parameters from powder patternsQualitative and quantitative phase analysis of crystalline powders (e.g. with Rietveld analysis)	**UYJ 544**
Quaternary Dating Methods Introduction: Time scales for the Quaternary, Isotopes and decay 2. Radiocarbon dating: principles and applications 3. Cosmogenic nuclides: 3He,10Be, 14C, 21Ne, 26Cl, 36Cl4. U-series disequilibrium dating5. Luminescence dating5. K/Ar and Ar/Ar dating of lava flows and ash layers6. Cs-137 and Pb-210 (soil, sediments, ice core)7. Summary and comparison of results from several dating methods at specific sites	**yok**
Spring Semester Compulsory courses	
Sedimentary Rocks in the Field Students will be trained in the field analysis of sedimentary rocks. They will learn how to measure sections, they will combine facies analysis with analysis of sedimentary structures in the field. The area of study selected for this course changes from year to year. The students will learn how to analyze sedimentary rocks in the field. The field course will include investigations of marine carbonates and siliciclastics in an alpine setting.	**Yok**

Courses of choice	
Stratigraphy and Time Analytische Methoden und Konzepte zur Konstruktion des geologischen Zeitrahmens: Global Standard Section and Point (GSSP), Biostratigraphische Korrelationen, eustatische Meeresspiegelschwankungen, Datierung mit Radioisotopen, kosmogenen Isotopen, stabile Isotopen- und geochemische Korrelationen, paläomagnetische Stratigraphie und Kohlenstoffdatierung.	**Yok**
Organic Geochemistry and the Global Carbon Cycle The carbon cycle connects different reservoirs of C, including life on Earth, atmospheric CO2, and economically important geological reserves of C. Much of this C is in reduced (organic) form, and is composed of complex chemical structures that reflect diverse biological activity, processes and transformations	**Kısmen UYJ 511E**
Provenance Analysis - Evaluation of rock types in hinterland by thin-section framework grain analysis and heavy minerals- Clay minerals as indicator of prevailing palaeoclimate and tectonic relief- Evaluating the age of source rocks and/or recycling by U/Pb laser ablation dating and geochemistry of detrital zircons and other minerals- Exhumation history of detrital sources by fission-track dating of detrital zircons, apatites etc.- Source-to-sink relation: sediment transport and dispersion and the impact of these processes on the detrital composition of sediments and on their geochronologic signal	**yok**
Clay Mineralogy -Origin of clays;-Clay mineral structure, classification and identification-Properties of clay materials, characterisation and quantification (rheology, plasticity, shearing, swelling, permeability, retardation and diffusion)-Application of clays-Clay Minerals in Geotechnics (e.g. soil mechanics, barriers, slurry walls)	**UYJ544 ?**
Fluvial Sedimentology - Kennenlernen der Grundlagen für die Beschreibung von fluvialen Sedimenten, inklusive geophysikalische Methoden, Schwergewicht: grobkörnige Kiese, Konglomerate- Faziesanalyse (Korngrössenverteilungen, Sortierungen, Sedimenttexturen und Strukturen) von fluvialen Sedimenten - Prozesse des Sedimenttransportes, Ablagerung, und Sortierung, Rolle der Turbulenz- Erkennen der Zusammenhänge zwischen geologischen Archiven und rezenten Flusssystemen, Einfluss der Dynamik von Flusssystemen auf das Erhaltungspotential von Sedimentstrukturen-Landschaftsgestaltende Prozesse, Ereignisse-Ökologische Aspekte der fluvialen Sedimentologie-Aktuelle Fragen der Sedimentologie-aktuelle Entwicklungen Untersuchungsmethoden	**JEO 604**
Tectonic Geomorphology Course includes a lecture component (in second half-semester) and a 9 day fieldtrip. Students should register for both components. Fieldtrip will involve collecting field data from active structures in the Northern Apennines. Lecture component will include theoretical background and analysis of data collected during fieldtrip.	**yok**
Quaternary Geology and Geomorphology of the Alps The Quaternary period; development of the theory of Ice AgesPre-Quaternary landscape in the Alps and forelandsDeckenschotter glaciationsMiddle and late Pleistocene glaciations, Hoch- and NiederterrassenThe Last Glacial Maximum across the Alps Post-LGM landscape modification; fluvial and hillslope processes Lateglacial and Holocene glacier variationsLong-term uplift and denudation in the AlpsAdditional relevant research topics of interest	**yok**
Major in Mineralogy & Geochemistry **Module Mineralogy and Petrology**	

Autumn Semester Compulsory courses	
Physical Properties of Minerals **Physical properties of minerals, e.g. electrical properties, elasticitcal properties are discussed. The effect of the crystal symmetry on the symmetry of physical properties as well as the mathematical formulation of the physical properties are major topics.**	**yok**
Thermodynamics Applied to Earth Materials Elementary concepts (1st and 2nd Laws; composition, state and extent); stability criteria; Legendre transforms; Maxwell relations and other manipulations of thermodynamic functions; calculation of Gibbs energy for a pure solid; simple solution models; order-disorder solution models; reciprocal solution models; equations of state for molecular fluids; free energy minimization. This course is neither an introduction to computer methods for calculating petrological phase equilibria nor an introduction to phase diagram methods, students interested in such methods should consider the courses "Computational techniques in petrology" (651-4098-00L) given by M. J. Caddick and "Phase petrology" (651-4223-00L) given by A.B. Thompson.	**yok**
X-ray Powder Diffraction Fundamental principles of X-ray diffractionSetup and operation of X-ray diffractometersInterpretation of powder diffraction dataDetermination of crystallographic parameters from powder patternsQualitative and quantitative phase analysis of crystalline powders (e.g. with Rietveld analysis)	**UYJ 544**
Applied Mineralogy and Non-Metallic Resources I Der Unterricht beinhaltet neben Vorlesungen auch Fallbeispiele und Exkursionen (Industirie, rohstoffverarbeitende Betriebe). Herbstsemester -> Applied mineralogy and non-metallic ressources I:Vorkommen, Gewinnung und Anwendung mineralischer Rohstoffe - klassische und unkonventionelle Rohstoffe. Neue Technologien. Industrielle Anwendungen. Weltmarktsituation, Rohstoffländer. Vorräte, mögliche Verknappung. Umweltaspekte (inkl. Belastungen) durch Abbau und Anwendung. Lektionen/Rohstoffgruppen: Kohle und Kohlenstoff (Kohle, Graphit, Diamant); Erdöl, Erdgas (Oelsande; Teerschiefer); Phosphate/Nitrate (Dünger); Aluminium (Bauxit, Korund); Steinsalz; Kalziumkarbonate; Titanoxide; Borminerale; Tone und Tonminerale; Schwefel; Anhydrit/Gips; Baryt; Fluorit; Asbest; Talk; Glimmer; seltene Erden. Frühlingssemester -> Applied mineralogy and non-metallic ressources II:Steine und Erden (Kies, Sand, Splitt), Natursteine, Zementrohstoffe. Lektionen/Rohstoffgruppen: Fallbeispiele in angewandter Mineralogie (Sanierungen, Projektplanung, reaktive Bohrpfähle); Natursteine (Definitionen, Steinbrüche, Industrie, Produkte und Anforderungen); Zement und Beton (Rohstoffe, Prospektion, Herstellung, Umwelt); Gebrochene Festgesteine (Planung/Umwelt, Langzeitsicherung, Rohstoffpolitik, veränderte Wahrnehmung von Rohstoffen); Exkursion(en).	**yok**
Phase Petrology 1) mıneral reactıons and chemıcal equılıbrıum2) mıneral modes and norms3) recalculatıon of rock and mıneral analyses 4) akfm and progressıve metamorphısm of pelıtıc metasedıments5) p-t-x(femg-1) relatıons for metapelıtes 6) thermodynamıc calculatıons of p-t-xfemg-1reactıon loops 7) coupled substıtutıons and phase relatıons ın complex mınerals (e.g. al2fem-1si-1 tschermak) 8) mıneral reactıons and metamorphıc facıes ınvolvıng non-ıdeal crystallıne solutıons (kna) 9) metamorphısm of mafıc rocks: an ıntroductıon10) complex rock systems and	**Yok**

buffer reactıons ın metamorphıc and magmatıc rocks 11) what happens ıf we don't ıgnore accessory mınerals	
Spring Semester Courses of choice	
Crystalline Geology of the Alps Geographical overview; tectonic units and their relationship; deformation; metamorphosis; deep structure; evolution and geological history from Permian to Oligocene based on observation at three localities: Valmalenco, Cimalunga unit, Bergell intrusion.	**yok**
Clay Mineralogy -Origin of clays;-Clay mineral structure, classification and identification-Properties of clay materials, characterisation and quantification (rheology, plasticity, shearing, swelling, permeability, retardation and diffusion)-Application of clays-Clay Minerals in Geotechnics (e.g. soil mechanics, barriers, slurry walls)	**UYJ 544**
Mineral Physics of the Earth's Mantle and Core Some of the topics that will be covered include:1) Introduction to Mineral physics2) Exploring the composition of the deep Earth: link between geophysical observation and mineral physics.3) Deep Earth models (seismological, thermal, geochemical and mineralogical models)4) Review in elasticity and rheology of minerals - Theory5) Review in elasticity and rheology of minerals - experimental approaches6) Structure of minerals - X-ray diffraction and equations of state7) Transport properties (diffusion, viscosity, electrical/thermal conductivity)8) Chemistry and mineralogy of the core (light elements, anisotropy)9) Core-Mantle boundary (CMB) (Perovskite/post-Perovskite transition, D'', melting, Ultra-low velocity zones)10) Lower mantle: lateral sesmic anomalies11) Upper mantle: structure and composition12) Water in the mantle and subduction zones	**yok**
Module Palaeoclimatology **Autumn Semester** Compulsory Courses	
Climate History and Paleoclimatology Climate system and earth history - climate forcing factors, response mechanismof bisophereGeological time: stratigraphy, resolution of geological archivesClimate archives, paleoclimate proxiesClimate through geological time: "lessons from the past"Little Ice Age -history and geology. Lakes as archivesThe Holcocene: varved lake records from the EngadineExtreme and rapid climate events: the younger DryasIce age: marine climate curves and continental ice age modelsPliocene and El NinoNeogene Ice Age vs Paleogene warm timeGlobal carbon cycle: methane and volcanism as climate frocing factorsPETM: methane or fossil wildfires?Cretaceous greenhouse: paleotemperature proxies, pCO2, C-isotope curvesClimate and ocean chemistry: Greenhouse and biocalcification crisesJurassic: high or low pCO2 ?Climate and the biosphere: self-regulation and the role of biocalcificationPaleozoic climate and changing weathering patternsSnowball Earth	**yok**
Courses of choice	
Biochronology and Diversity **----????**	**yok**
Sedimentology II: Biological and Chemical Processes in Lacustrine and Marine Systems -carbonates,: chemistry, mineralogy, biology-carbonate sedimentation from the shelf to the deep sea-carbonate facies-cool-water and warm-water carbonates-organic-carbon and black shales -C-cycle, carbonates, Corg : CO2 sources and sink-Carbonates: their geochemical proxies for environmental change: stable isotopes, Mg/Ca, Sr-marine	**JEO 604E**

sediments thorugh geological time-carbonates and evaporites-lacustrine carbonates-economic aspects of limestone	
Basics of Paleobotany **----????**	**yok**
Spring Semester Compulsory Courses	
Organic Geochemistry and the Global Carbon Cycle The carbon cycle connects different reservoirs of C, including life on Earth, atmospheric CO2, and economically important geological reserves of C. Much of this C is in reduced (organic) form, and is composed of complex chemical structures that reflect diverse biological activity, processes and transformations.	**UYJ 511E**
Courses of choice	
Stratigraphy and Time Analytische Methoden und Konzepte zur Konstruktion des geologischen Zeitrahmens: Global Standard Section and Point (GSSP), Biostratigraphische Korrelationen, eustatische Meeresspiegelschwankungen, Datierung mit Radioisotopen, kosmogenen Isotopen, stabile Isotopen- und geochemische Korrelationen, paläomagnetische Stratigraphie und Kohlenstoffdatierung.	**Yok**
Micropalaeontology Lectures will introduce the various microfossil groups and detail their utility as important indicators of past environments by examining the ecology of living microplankton taxa and extrapolating this to the fossil record (paleoecology, paleoceanography). The applicability of different microfossil groups in providing both relative timescales (through zonal schemes) and biostratigraphic correlation will be detailed, as will the role of certain microfossils in understanding evolutionary processes. Microplankton as agents of global environmental change will also be investigated, especially with regard to fluxes of CaCO3 and C and hence to CO2 in the atmosphere. The microfossil groups which will be studied in the above context are those which form mineralised skeletons (calcareous, siliceous, phosphatic) and the organic-walled microfossils (known as palynomorphs).	**Yok**
Limnogeology Content of the course:Introduction - Lakes, the small oceansHistory of Limnogeology.Limnogeologic campaignsLarge open perialpine lakes.The water column: Aquatic physics (currents, waves, oscillations, etc.).Sediments caught in the water: sediment trapsLaminations in lake sediments: Clastic vs. biochemical varves.Hydrologically closed lake systemsChronostratigraphic dating of lake sedimentsLake sediments as proxies for climate changeLake sediments as recorder of anthropogenic impact The class includes a 1- or 2-day field practica on Lake Lucerne.Introduction to themes of Lake Lucerne field course.Limnogeological methods on the lake and in the laboratory: various sampling and surveying techniques (water analysis, seismic surveying, sediment coring, laboratory analyses).Fieldcourse follow-up:Seismic-core correlation and interpretation	**yok**

PEN State Universitesi (PSU)

Ders Adı	İTÜ de Muadili
GEOSC 500 **Issues in Geosciences (3)** Introduction of first year graduate students to issues in geosciences. Effective: Summer 2003 Prerequisite: admission to the Geosciences Graduate Program	Yok
GEOSC 502 **Evolution of the Biosphere (4)** The geologic history of the co-evolution of life and the surface environment is examined from a systems perspective. Effective: Spring 1999 Prerequisite: undergraduate-level coursework in biology and geology	Yok
GEOSC 505 **Quantitative Physical Sedimentology (3)** Principles of fluid mechanics and mathematical modeling; their use in describing sediment transport, sedimentary structures, and sedimentary environments. Effective: Summer 1996	Yok
GEOSC 508 **Mechanics of Earthquakes and Faulting (3)** An in-depth treatment of fundamental concepts in brittle faulting and earthquake mechanics with emphasis on physical processes. Effective: Spring 2005 Prerequisite: GEOSC 465, GEOSC 489, MATH 251	Yok
GEOSC 511B (MATSE 511B) **Transmission Electron Microscopy (1)** Principles and practice of transmission electron microscope operation. Students undertake individual projects. Effective: Spring 2005	Yok
GEOSC 512 (MATSE 512**)** **Principles of Crystal Chemistry (3)** Relation of structure to ionic size and nature; influence of pressure and temperature on structure; chemical-structural defects, crystalline solutions, phase-transitions. Effective: Spring 2003	Yok
GEOSC 514 **Data Inversion in the Earth Sciences (3)** This course focuses on how one finds theoretical parameters to explain observed data using discrete inverse theory. Effective: Spring 1999 Prerequisite: MATH 220	Yok
GEOSC 518 **Stable Isotope Geochemistry (3)** Theory of isotope fractionation mechanisms; its application to a wide range of problems in the earth and planetary sciences. Effective: Fall 1989	Var JEO628E
GEOSC 519	Kısmi UYJ520

Mineral Equilibria (3) A thermodynamic treatment of minerals and their reactions under geochemically important conditions of temperature and pressure. Effective: Summer 2007 Prerequisite: CHEM 450	
GEOSC 521 **Thermal State of the Earth (2-3)** Analytical and numerical solutions to earth-related heat conduction and convection problems; geothermal energy; earth's heat flow and temperature. Effective: Spring 1998	Kısmi UYJ503E
GEOSC 522 **Geochemistry of Aqueous Systems (2-3)** Ionic and molecular equilibria related to stabilities and solubilities of minerals, with applications to ground water, sea water, and hydrothermal fluids. Effective: Summer 2007 Prerequisite: CHEM 450, CHEM 452	Kısmi UYJ503E UYJ520
GEOSC 523 **Sedimentary Geochemistry (2)** Kinetics and thermodynamics of low-temperature processes in sediments. Applications to weathering processes, natural waters, deposition of sediments, and diagenesis. Effective: Summer 1996	Yok
GEOSC 529 **Paleontology (1-6 per semester/maximum of 9)** Morphology and distribution of significant fossil groups; sampling, preparation, and applications to biostatigraphy, evolution, paleoecology, sedimentation, and petrography. Effective: Fall 1989	Yok
GEOSC 533 **Principles of Geochemistry (3)** A comprehensive treatment of the principles of geochemistry applied to a wide variety of geologic settings and scales. Effective: Summer 2007 Prerequisite: CHEM 450	Kısmi UYJ513E
GEOSC 540 **Ore Deposits I (3)** Geochemistry and geology of ore deposits formed by igneous and high-temperature hydrothermal processes. Effective: Fall 1989 Prerequisite: GEOSC 451	Kısmi UYJ527 JEO629
GEOSC 541 **Ore Deposits II (3)** Geochemistry and geology of ore deposits formed by low-temperature hydrothermal, sedimentary, and metamorphic processes; continuation of GEOSC 540. Effective: Fall 1989 Prerequisite: GEOSC 540	Kısmi UYJ527 JEO629
GEOSC 542 **Quantitative Methods in Hydrogeology (1-4)** Investigation of groundwater systems and resources, emphasizing both the practical use and limitations of modeling techniques. Effective: Fall 1989	Kısmi UYJ501E UYJ601E

Prerequisite: GEOSC 452	
GEOSC 545 **Glacial Geology (3)** Glaciers: their characteristics, causes, deposits, landforms, effects in periglacial regions. Effective: Fall 1989	Yok
GEOSC 548 **Surface Processes (3)** Principles, application, and interpretation of Quaternary geochronology, surface process studies, and landscape evolution. Effective: Spring 1999 Prerequisite: GEOSC 340	Yok
GEOSC 555 **Advanced Structure and Petrofabrics (1-3)** Macroscopic and mesoscopic recognition, measurement, and interpretation of small-scale rock structures and mineral orientation patterns in deformed rocks. Effective: Fall 1989	Yok
GEOSC 558 **Multi-channel Seismic Processing and Interpretation (4)** This course covers the basics of seismic energy propagation, modern 2- and 3-D multi-channel seismic data acquisition methods, and data processing. Effective: Spring 1999 Prerequisite: GEOSC 454	Yok
GEOSC 559 **Seismology II (3)** Rigorously covers the methods of computing wave fields for point and distributed seismic sources in vertically inhomogeneous elastic media. Effective: Spring 2005 Prerequisite: E MCH 524A, E MCH 524B orMATH 405, MATH 406	Yok
GEOSC 560 **Kinetics of Geological Processes (3)** General development of the kinetic theory of crystal growth, diffusion, irreversible thermodynamics, and heterogeneous reactions needed for geosciences and related fields with applications to current problems. Effective: Summer 2007 Prerequisite: CHEM 450, GEOSC 519	Yok
GEOSC 561 **Mathematical Modeling in the Geosciences (4)** The process of transforming a conceptual geoscience model into a numerical model is presented; students create and solve numerical models. Effective: Spring 2000 Prerequisite: undergraduate-level calculus and geology coursework is required;experience in computer programming and coursework in differential equations is recommended; or consent of instructor.	Yok
GEOSC 565 **Tectonic Geomorphology (3)** Tectonic geomorphology examines interactions between tectonic and surface processes, paleosceismology, geodesy, structure, active deformation, and landform evolution. Effective: Summer 1998 Prerequisite: GEOSC 340, GEOSC 465	Kısmi JEO627

GEOSC 572 **Field Stratigraphy (1-2)** This course introduces students to field techniques used by stratigraphers, with the capstone experience being a field trip during May. Effective: Fall 2005 Prerequisite: GEOSC 439, GEOSC 472A, GEOSC 472B, GEOSC 479	Yok
GEOSC 584 **Clastic Depositional Environments (3)** Readings, group discussions, and field work on processes and sedimentary responses of common rock-forming environments. Effective: Fall 1989 Prerequisite: GEOSC 439	JEO 604E
GEOSC 585 **Sedimentary Geology (3)** An integrated approach to the study of modern and ancient sedimentary environments and their deposits. Effective: Spring 2000 Prerequisite: undergraduate coursework in sedimentology or consent of instructor.	Kısmi JEO610E JEO 604E
GEOSC 587 **Preparing for an Academic Career in the Geosciences (3)** The course focuses on successful strategies for the academic job market and for launching an academic career. Effective: Spring 2009 Prerequisite: Students must have passed their comprehensive exam and be withina year from receiving their Ph.D. degree.	Yok
GEOSC 589 **Seminar in Aqueous Geochemistry (1)** A seminar aimed at reading current articles in aqueous geochemistry and biogeochemistry. Effective: Fall 2001 Prerequisite: GEOSC 522	Var Seminer Dersi
GEOSC 590 **Colloquium (1-3)** Continuing seminars which consist of a series of individual lectures by faculty, students, or outside speakers. Effective: Spring 1989	Var FBE Seminer Dizisi
GEOSC 596 **Individual Studies (1-9)** Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses. Effective: Spring 1989	Var Uzmanlık Alan Dersi
GEOSC 597 **Special Topics (1-9)** Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester. Effective: Spring 1988	Var FBE Seminer Dizisi
GEOSC 597A **Paleobiology Seminar (1)** Discussion of foundational papers and current, including student, research in	Var Seminer Dersi

palebiology. Effective: Fall 2013 Ending: Fall 2013	
GEOSC 597A **Topics in Earth Systems Science (2)** EarthTalks is an interdisciplinary seminar series that meets weekly and seeks to examine complex environmental challenges facing our world today. Effective: Spring 2014 Ending: Spring 2014 Future: Spring 2014	Yok
GEOSC 597B **Multivariate Analysis in Geosciences (3)** Introduction of multivariate analytical methods with application to student research data. Effective: Fall 2013 Ending: Fall 2013	Kısmi UYJ505
GEOSC 597B **AAPG Imperial Barrel Award Competition (3)** A team of five graduate will compete in AAPG's annual Imperial Barrel Award competition. (IBA). This class provides practical hands-on experience for students. Effective: Spring 2014 Ending: Spring 2014 Future: Spring 2014	Yok
GEOSC 597C **Topics in Earth Systems Science (2)** EarthTalks is an interdisciplinary seminar series that meets weekly and seeks to examine complex environmental challenges facing our world today. Effective: Fall 2013 Ending: Fall 2013	Yok
GEOSC 597C **Graduate Seminar on Deep Time Biogeochemistry (1)** This class is focused on long term global biogeochemical cycles, and the models that describe them. Students will conduct round table discussions of the classic literature, and a carry out a final project devoted to constructing a computational model of an aspect of the Earth System which the student finds interesting. Effective: Spring 2014 Ending: Spring 2014 Future: Spring 2014	Var Seminer Dersi
GEOSC 597C **Topics in Earth Systems Science (2)** EarthTalks is an interdisciplinary seminar series that meets weekly and seeks to examine complex environmental challenges facing our world today. Effective: Fall 2014 Ending: Fall 2014 Future: Fall 2014	Yok
GEOSC 597D **Petroleum Geosystems (3)** Provides an understanding of all phases of hydrocarbon exploration and production through a combination of team-based problems, field trips, industry lectures and site-visits. Required for Petroleum Geosystems emphasis. Effective: Fall 2013 Ending: Fall 2013	Kısmi JEO604E
GEOSC 597D **Palebiology Seminar (1)** Discussion of foundational papers and current, including student, research in paleobiology. Effective: Spring 2014 Ending: Spring 2014 Future: Spring 2014	Var Seminer Dersi
GEOSC 597E **Topics in Biogeochemistry (2)** This seminar addresses chemical interactions between the biosphere and the physical environment over Earth's history and as impacted by humans.	Var JEO630E UYJ511E

Effective: Fall 2013 Ending: Fall 2013	
GEOSC 597E **Words to Live by: Writing Science (2)** This course will illustrate effective writing techniques, including syntax and organization, using selected readings and examples in papers and proposals. Effective: Spring 2014 Ending: Spring 2014 Future: Spring 2014	Yok
GEOSC 597E **Topics in Biogeochemistry (2)** This seminar addresses chemical interactions between the biosphere and the physical environment over Earth's history and as impacted by humans. Effective: Fall 2014 Ending: Fall 2014 Future: Fall 2014	Var JEO630E UYJ511E
GEOSC 597F **Advanced Crystallography (1)** We will review group theory, symmetry operations, and derive plane and space groups. Effective: Fall 2013 Ending: Fall 2013	Yok
GEOSC 597F **Advanced Crystallography II (1)** We will cover crystallography and diffraction processes at an advanced level, including reciprocal space, the metric tensor, the Laue equations and the Ewald sphere, and structure factor calculations. Effective: Spring 2014 Ending: Spring 2014 Future: Spring 2014	Yok
GEOSC 597G **Dynamics of Rivers and Floodplains, Past and Present (1)** Seminar aimed at exploring physical, chemical, and biological dynamics of modern and anicent rivers and floodplains. Effective: Fall 2013 Ending: Fall 2013	Yok
GEOSC 597I **Geomechanics Seminar (1)** Geomechanics seminar: graduate reading course covering current research topics in rock and fracture mechanics, poroelastic processes, and fluid flow. Effective: Fall 2013 Ending: Fall 2013	Var Seminer Dersi
GEOSC 597K **Microbial Biology Seminar (1)** Microbial Biology Seminar addresses interactions between microorganisms and the physical environment over Earth's history, including recent literature and novel methods for the analysis of microbial genes and biomarkers. Effective: Fall 2013 Ending: Fall 2013	Var Seminer Dersi
GEOSC 598 **Special Topics (1-9)** Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester. Effective: Fall 1999	Kısmi JEO603
GEOSC 600 **Thesis Research (1-15)** No description. Effective: Spring 1989	Var Uzmanlık Alan Dersi
GEOSC 601 **Ph.D. Dissertation Full-Time (0)** No description.	Var Uzmanlık Alan Dersi

Effective: Spring 1989	
GEOSC 602 **Supervised Experience in College Teaching (1-3 per semester/maximum of 6)** Supervised experience in teaching geosciences courses. Effective: Fall 1983	Var Uzmanlık Alan Dersi
GEOSC 610 **Thesis Research Off Campus (1-15)** No description. Effective: Spring 1989	Yok
GEOSC 611 **Ph.D. Dissertation Part-Time (0)** No description. Effective: Spring 1989	Var Uzmanlık Alan Dersi
GEOSC 897 **Special Topics (1-9)** Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester. Effective: Summer 2008	Kısmi JEO603

WISCONSIN Universitesi (UW)

UNIVERSITY of WISCONSIN, Geological Engineering Graduate Courses	
Ders Adı	**İTÜ deki muadili**
GLE 530 SEEPAGE AND SLOPES. 3.0 Hours. Practicalaspects of seepage effects and ground water flow. Stability of natural and man made slopesunder various loading conditions. Design and construction of earth dams a nd embankments. Flow net and its use; wells; filters; total and effective stress methods of slope analysis; selection of pertinent soil parameters. Prerequisite: Civ Eng. 330.	Yok
GLE 531 RETAINING STRUCTURES 3.0 Hours. Rigid and flexible earth retaining structures. Analysis and design of retaining walls, anchored bulk heads, braced cuts, tie back cuts, mechanically stabilized earth, and slurry trench walls. Latera l earth pressure due to soil, water, surcharge loads, etc., local and overall stability and the des ign of anchorage and bracing systems. Prerequisite: Civ Engr 330; Comp Sci 310 or cons inst	Yok
GLE 532 FOUNDATIONS 3.0 Hours. Shallow and deep foundations. Analysis and design of footings, mats, piers and piles, and related fill and excavation operations. Consolidation settlement, time rate of settlement, stress distribu tion, elastic (immediate) settlement, load bearing capacity; methods to reduce settlements a nd increase shear strength; the selection of a foundation system.Prerequisite:Civ Engr 330 & Comp Sci 310 or cons inst	Yok
GLE 533 WASTE GEOTECHNICS 3.0 Hours. The geotechnical aspects of waste disposal and storage. Critical aspects of geotechnical d esign, construction, and testing relevant to the performance of earthen structures used for the storage and disposal of wastes or the remediation of contaminated sites are discussed. Prereq uisite: Civ Engr 330 & 320 or cons inst.	Yok
GLE 535 REMEDIATION GEOTECHNICS 3.0 Hours. Geotechnical practice for remediation of sites containing contaminated soil and groundwater is discu ssed. Topics include non- invasive and invasive subsurface exploration techniques, methods to monitor for the presence of contaminants in the saturated and unsaturated zones, and geotechnically-oriented remedial action technologies. Prerequisite: Civ Engr 320 & 330	Yok
GLE 627 HYDROGEOLOGY 4.0 Hour.	JEO601E

Mathematical treatment of the physical principles governing the flow of groundwater; emphasis on we ll hydraulics and flow system analysis; problem sets and class projects. Prerequisite: Intro course in geol, Jr st & Math 221 or equiv	
GLE 629 CONTAMINANT HYDROGEOLOGY. 3.0 Hours. Physical and chemical processes governing the transport of solutes in groundwater; application of hydrogeologic and geochemical theory and practice to the protection of aquifers from contamination; problem sets and group projects. Prerequisites: Geoscience 627 and college level chemistry or cons insthours.	**UYJ538**
GLE 633 WASTE GEOTECHNICS. 3.0 Hours. The geotechnical aspects of waste disposal and storage. Critical aspects of geotechnical d esign, construction, and testing relevant to the performance of earthen structures used for the storage and disposal of wastes or the remediation of contaminated sites are discussed. Prerequisite: Civ Engr 330 & 320 or cons inst	**Yok**
GLE 635 REMEDIATION GEOTECHNICS. 3.0 Hours. Geotechnical practice for remediation of sites containing contaminated soil and groundwater is discu ssed. Topics include non- invasive and invasive subsurface exploration techniques, methods to monitor for the presence of contaminants in the saturated and unsaturated zones, and geotechnically-oriented remedial action technologies. Prerequisite: Civ Engr 320 & 330	**Yok**
GLE 705 ADVANCED ROCK MECHANICS. 3.0 Hours. Elastic, viscoelastic and plastic behavior of rock, crack phenomena and mechanisms of rock fr acture, finite element solutions, dynamic rock mechanics, engineering and geological applicati ons. Pre-requisites or Co-requisites : MS&E 474, 475, or equiv, or cons inst	**UYJ 508**
GLE 730 ENGINEERING PROPERTIES OF SOILS. 3.0 Hours. Determination and interpretation of soil properties for engineering purposes; physio-chemical properties of soil-water systems, permeability and capillarity, compression characteristics of soils, measurement of soil properties in the triaxial test, properties of frozen soils and permaf rost. Pre-requisites or Co-requisites : Civ Engr 330	Kısmen UYJ 505
GLE 731 PROPERTIES OF GEOSYNTHETICS 3.0 Hours Properties and behavior of geosynthetics (plastics sheets and geotextiles used in geotechnical and geo- environmental construction) are discussed and measured in a laboratory setting. Stude nts learn how to measure and quantify geomechanical and hydraulic behavior of geosynth etics which are used in design. Pre-requisites or Co-requisites :	Yok

Grad st & Civ Engr 330, or cons inst	
GLE 732 UNSATURATED SOIL ENGINEERING. 3.0 Hours. Engineering principles of unsaturated soils as they apply to geotechnical and geoenvironmental sys tems. Effect of soil water suction and stress on hydraulic conductivity, shear strength, and compressibility of soils in the context of geoengineering problems of flow and stability. Pre-requisites or Co-requisites : Grad st & Civ Engr/GLE 330 or cons inst	**Yok**
GLE 735 SOIL DYNAMICS. 3.0 Hours. Geotechnicalconsiderations of earthquake engineering and foundation vibrations. Seis mic surveying; ground motion during earthquakes; determination of soil properties for ground response analys is; dynamic properties of soils; soil structure interaction effects; soil liquifaction; dynamic a nalysis of earth dams; settlements resulting from earthquakes, lateral earth pressures during e arthquakes; foundation vibrations. Pre-requisites or Co-requisites : Civ Engr/EMA 530, EMA 545 or cons inst	Yok
GLE 801 SPECIAL TOPICS IN GEOLOGICAL ENGINEERING. 3.0 Hours. Special Topics in Geological Engineering. Pre-requisites or Co-requisites : Grad st	JEO 603

University of Arizona (UA), Geological Engineering and Geosciences

KODU	DERSİN ADI	İTÜ de muadili
502	PROBABILITY AND STATISTICAL CONCEPTS IN GEOLOGIC MEDIA	**UYJ 506**
510	FRACTAL THEORY AND APPLICATIONS IN GEO-ENGINEERING	**Yok**
515	ROCK EXCAVATION	**UYJ 508**
516	FIELD STUDIES IN GEOPHYSICS	**Yok**
524	FUNDAMENTALS OF GEOTECHNICS	**Yok**
526	HEALTH AND SAFETY IN MINING	**Yok**
527	GEOMECHANICS	**Kısmen UYJ 505 ve UYJ 508**
529	ROCK SLOPE ANALYSES AND DESIGN	**Yok**
546	GEOTECHNICAL EARTHQUAKE ENGINEERING	**Yok**
548	GEOPHYSICAL EXPLORATION AND ENGINEERING	**Yok**
580	THE MECHANICS OF FRACTURE IN ROCK AND OTHER BRITTLE MATERIALS	**Kısmen UYJ 505 ve UYJ 508**
587	APPLIED NEURAL NETWORK COMPUTING	**Yok**
599	INDEPENDENT STUDY	**UYJ 597**
696A	RESEARCH SEMINAR	**UYJ 596**
900	RESEARCH	**Yok**
910	THESIS	**UYJ 000**
500	INTRODUCTION TO GEOCHEMISTRY	**Yok**
501	EARTH SCIENCE TEACHING METHODS AND MATERIALS	**Yok**
502	ANALYTICAL AND NUMERICAL MODELING IN GEOSCIENCES	**Yok**
503	PHYSICS OF THE SOLAR SYSTEM	**Yok**
504B	LOWELL PROGRAM TOPICS IN ORE DEPOSITS MAPPING	**Yok**
504C	LOWELL PROGRAM TOPICS IN MINERAL DEPOSIT TYPES	**Yok**
508	TECTONIC PETROLOGY	**Yok**
509	ADVANCED PETROLOGY	**UYJ 522**
510	MICROBIAL BIOGEOCHEMISTRY AND GLOBAL CHANGE	**JEO 630E**
511	GEOLOGY AND GEOPHYSICS OF THE SOLAR SYSTEM	**Yok**
512A	GEOARCHAEOLOGY	**Yok**
513	ENSO: PAST, PRESENT, FUTURE	**Yok**
514	QUATERNARY GEOLOGY	**JEO 610E**
517	SEDIMENTARY BASIN ANALYSIS	**JEO 604E**
519	PHYSICS OF THE EARTH	**Yok**
520	METEORITES	**Yok**
522	CRITICAL ZONE SCIENCE & MANAGEMENT	**Yok**
523	REGIONAL STRUCTURAL GEOLOGY	**Yok**
524A	SPACE GEODESY	**Yok**
525	REGIONAL TECTONICS	**JEO 612E**
526A	RESEARCH METHODS IN AQUATIC SCIENCES	**Yok**
527	OROGENIC SYSTEMS	**JEO 612E Kısmen**
528	CRUSTAL DEFORMATION	**JEO 612E Kısmen**
529	OBJECTIVE ANALYSIS IN THE ATMOSPHERIC AND RELATED SCIENCES	**Yok**
530	THE CHEMICAL EVOLUTION OF EARTH	**Yok**
531	HYDROGEOLOGY	**UYJ 501E Kısmen**

532	INTRODUCTION TO SEISMOLOGY	**Yok**
533M	MINING GEOLOGY METHODS	**Yok**
534A	INTRODUCTION TO EXPLORATION SEISMOLOGY	**Yok**
535	ADVANCED SUBSURFACE HYDROLOGY	**UYJ 501E Kısmen**
538	BIOGEOGRAPHY	**Yok**
539A	INTRODUCTION TO DENDROCHRONOLOGY	**Yok**
540	GEODYNAMICS	**JEO 627**
541	ADVANCED SOIL GENESIS	**Yok**
542	MARS	**Yok**
543C	GEOLOGIC BEST PRACTICES AND PROJECT STAGES	**Yok**
544	ADVANCED PHYSICAL SEDIMENTOLOGY	**JEO 610E**
546	ECONOMIC MINERAL DEPOSITS	**UYJ 627**
547	GLOBAL AND REGIONAL CLIMATOLOGY	**Yok**
550	GEOMORPHOLOGY	**Yok**
551	REMOTE SENSING OF PLANETARY SURFACES	**Yok**
553	GLACIAL AND QUATERNARY GEOLOGY	**Yok**
554	EVOLUTION OF PLANETARY SURFACES	**Yok**
556	THRUST BELTS AND SYNOROGENIC SEDIMENTS	**Yok**
560	CHARACTERIZATION AND IDENTIFICATION OF MINERALS	**UYJ 544**
561	PALEOINDIAN ORIGINS	**Yok**
562	INTRODUCTION TO QUATERNARY ECOLOGY	**Yok**
563	ENVIRONMENTAL ISOTOPE HYDROLOGY AND LOW TEMPERATURE GEOCHEMISTRY	**UYJ 623E**
566	STABLE ISOTOPE GEOCHEMISTRY AND PALEOCLIMATE	**JEO 616, JEO 628E**
567	INVERSE PROBLEMS IN GEOPHYSICS	**Yok**
568	ADVANCED SEISMOLOGY	**Yok**
569	SEISMIC DATA PROCESSING	**Yok**
570L	VOLCANOLOGY: LABORATORY AND FIELD METHODS	**Yok**
570R	VOLCANOLOGY: PHYSICAL PROCESSES AND PETROLOGIC APPLICATIONS	**Yok**
571	TERRESTRIAL PLANETS	**Yok**
572	GLOBAL BIOGEOCHEMICAL CYCLES	**UYJ 511E**
573	EARTH SYSTEM MODELING	**Yok**
574A	GEOCHRONOLOGY AND THERMOCHRONOLOGY	**Yok**
577	ACTIVE TECTONICS	**Yok**
578	GLOBAL CHANGE	**Yok**
579	INTRODUCTION TO CLIMATE DYNAMICS	**Yok**
580	ISOTOPE TRACERS IN HYDROGEOLOGY	**UYJ 503E**
581	QUATERNARY PALYNOLOGY AND PLANT MACROFOSSILS	**Yok**
582	PALEOCLIMATOLOGY	**Yok**
583	THERMODYNAMICS IN EARTH AND PLANETARY SCIENCES	**Yok**
584	THE COEVOLUTION OF EARTH AND THE BIOSPHERE	**Yok**
585A	APPLIED TIME SERIES ANALYSIS	**Yok**
589	QUATERNARY GEOCHRONOLOGY	**Yok**
595A	TOPICS IN GEOSCIENCES	**JEO 603 Kısmen**
595E	TOPICS IN DENDROCHRONOLOGY	**Yok**
596A	MINERALOGY-PETROLOGY-GEOCHEMISTRY	**UYJ 522, UYJ 513E**
596B	ECONOMIC GEOLOGY	**Yok**
596C	GEOMORPHOLOGY-QUATERNARY GEOLOGY	**Yok**
596D	PALEONTOLOGY-SEDIMENTARY GEOLOGY	**Yok**

596E	STRUCTURE-TECTONICS	**JEO 612E kısmen**
596F	GEOPHYSICS	**Yok**
599	INDEPENDENT STUDY	**UYJ 596**
646A	ADVANCED ORE DEPOSIT GEOLOGY	**UYJ 527**
646B	ADVANCED ORE DEPOSITS II	**UYJ527**
650	FIELD STUDIES IN GEOMORPHOLOGY	**Yok**
696G	WATER-ROCK-MICROBIAL INTERACTIONS	**Yok**
900	RESEARCH	**Yok**
909	MASTER'S REPORT	**UYJ000**
910	THESIS	**JEO 000**

Orta Doğu Teknik Üniversitesi (METU)

DERSİN KODU	DERSİN ADI	İTÜ deki Muadili
GEOE500	M.S. THESIS	**UYJ 000, JEO 000**
GEOE501	GLOBAL TECTONICS	**JEO 612E Kısmen**
GEOE502	ADVANCED SEISMIC &ELECTRICAL METHODS	**Yok**
GEOE503	ADV. IGNEOUS &METAMORPHIC PETROLOGY	**UYJ 522, UYJ 532**
GEOE504	ADVANCED GRAVITY AND MAGNETIC METHODS	**Yok**
GEOE505	SEDIMENTARY PETROLOGY AND SEDIMENTATION	**JEO 604E**
GEOE506	ADVANCED PHOTOGEOLOGY	**UYJ 515**
GEOE508	GEOCHEMISTRY OF MINERAL DEPOSITS	**UYJ 527**
GEOE509	ADVANCED MINERALOGY	**Yok**
GEOE510	MINERAL ECONOMICS	**Yok**
GEOE512	PETROLEUM GEOCHEMISTRY	**JEO 608E**
GEOE513	STRATIGRAPHIC PALEONTOLOGY	**Yok**
GEOE514	ISOTOPE GEOLOGY	**JEO 616**
GEOE515	ADVANCED GEOCHEMISTRY	**UYJ 507E**
GEOE516	GEOCHRONOLOGY	**JEO 616 Kısmen**
GEOE517	ADVANCED GEOSTATISTICS	**UYJ 506**
GEOE519	ADVANCED STRATIGRAPHY I	**Yok**
GEOE520	ADVANCED STRATIGRAPHY II	**Yok**
GEOE522	INSTRUMENTAL GEOCHEMICAL ANALYSIS	**UYJ 513E**
GEOE523	METAMORPHIC PETROGENESIS	**UYJ 532**
GEOE524	ORE MICROSCOPY	**JEO 624**
GEOE525	BIOSTRATIGRAPHY	**Yok**
GEOE527	ELEMENTS OF SEISMOLOGY	**Yok**
GEOE528	REMOTE SENSING	**Yok, UYJ 515 Kısmen**
GEOE530	ECONOMICS OF ENERGY RESOURCES	**Yok**
GEOE531	CARBONATE PETROLOGY	**JEO 631**
GEOE532	SUBSURFACE GEOLOGY	**Yok**
GEOE533	MICROTECTONICS	**Yok**
GEOE534	GEOCHEMICAL PROSPECTING	**Yok**
GEOE535	SPECTRAL CLASSIFIC. OF SATELLITE IMAGES	**Yok**
GEOE537	FLOW THROUGH POROUS MEDIA	**UYJ 501E Kısmen**
GEOE538	GRANITE TECTONICS	**Yok**
GEOE540	CLAY MINERALOGY	**UYJ 544**
GEOE541	VOLCANOLOGY	**Yok**
GEOE542	MECHANICAL BEHAVIOUR OF EARTH MATERIALS	**UYJ 505 Kısmen**
GEOE543	MEDICAL GEOLOGY	**UYJ 516**
GEOE544	STABILITY OF SOIL SLOPES IN ENG.PRACTICE	**Yok**
GEOE545	APPLIED SEDIMENTOLOGY	**Yok**
GEOE547	HYDROCARBON SEISMOLOGY	**Yok**
GEOE548	WELL LOGGING	**Yok**
GEOE550	APPLIED GEOPHYSICS	**Yok**
GEOE551	GROUNDWATER MODELING TECHNIQUES	**UYJ 538**
GEOE552	GEOHYDROLOGY	**UYJ 501E Kısmen**
GEOE553	SITE INVESTIGATION	**UYJ 505**
GEOE554	ENGINEERING GEOLOGY CASE STUDIES	**JEO 603**
GEOE555	PRINCIPLES AND APP. OF IMAGING RADAR SYS.	**Yok**

GEOE556	ENHANCEMENT TECH.IN REMOTE SENSING	**Yok**
GEOE557	GEOGRAPHIC INFOR. SYS.IN EARTH SCIENCES	**Yok**
GEOE559	GIS MODELS IN NATURAL HAZARD ASSESSMENT	**Yok**
GEOE560	ROCKS&MINERALS IN ARCHAEOLOG. STUDIES	**Yok**
GEOE567	GROUNDWATER CONTAMINATION	**UYJ 538 Kısmen**
GEOE568	PALEOCLIMATOLOGY	**Yok**
GEOE590	GRADUATE SEMINAR	**UYJ 596**
GEOE593	ADVANCED FIELD MAPPING	**Yok**
GEOE600	PH.D. THESIS	**JEO 000**
GEOE605	BASIN ANALYSIS	**JEO 604E**
GEOE607	ADV. SEISMOLOGY & SEISMIC INSTRUMENT.	**Yok**
GEOE610	GEOLOGY OF CLAYS	**UYJ 544**
GEOE612	PETROFABRIC ANALYSIS	**Yok**
GEOE614	GROUNDWATER SYSTEMS PLAN.&MANAGEMENT	**Yok**
GEOE616	GEOCHEMISTRY OF NATURAL WATERS	**UYJ 516**
GEOE621	NEOTECTONICS	**Yok**
GEOE623	ADVANCED MICROPALEONTOLOGY	**Yok**
GEOE697	ADVANCED SEMINAR I (PH.D.)	**Yok**
GEOE698	ADVANCED SEMINAR II (PH.D.)	**Yok**
GEOE701	HYDROTHERMAL ALTERATION	**Yok**
GEOE702	SPECIAL TOPICS: HYDROCARBON SEISMOLOGY	**Yok**
GEOE705	LANDSCAPE ANALYSIS AND AERIAL PHOTOGRAPH	**UYJ 515**
GEOE706	MEDICAL GEOLOGY	**UYJ 516**
GEOE7xx	SPECIAL TOPICS IN GEOLOGICAL ENGINEERING	**JEO 603**

Ek.4.
Tablo 5. Diğer üniversitelerde olup İTÜ Jeoloji Mühendisliği programında olmayan derslerin toplu listesi

DERSİN ADI **CSM: Colorado School of Mines** **ETH : ZürihTeknikÜniversitesi** **PSU : Penn State University** **UM : University of Wisconsin** **UA : University of Arizona** **METU : OrtaDoğuTeknikÜniversitesi** **İTÜ: İstanbul TeknikÜniversitesi**	**KARŞILAŞTIRMA YAPILAN PROGRAMLAR**						
	CSM	ETH	PSU	UW	UA	METU	İTÜ
GEGN503. INTEGRATED EXPLORATION AND DEVELOPMENT	X						
GEGN504. INTEGRATED EXPLORATION AND DEVELOPMENT	X						
GEGN575. APPLICATIONS OF GEOGRAPHIC INFORMATION SYSTEMS	X	X					
GEGN578. GIS PROJECT DESIGN	X	X					GEO510E kısmen
GEGN584. FIELD METHODS IN HYDROLOGY	X						
GEGN599. INDEPENDENT STUDY IN ENGINEERING GEOLOGY OR ENGINEERING HYDROGEOLOGY	X TZP		X				
GEGN671. LANDSLIDES: INVESTIGATION, ANALYSIS & MITIGATION.	X	X			x		
GEGN672. ADVANCED GEOTECHNICS	X	x		X	x		ZMG501
GEGN681. VADOSE ZONE HYDROLOGY	X						Avrasya Kısmen
GEGN682. FLOW AND TRANSPORT IN FRACTURED ROCK	X						
GEOL501. APPLIED STRATIGRAPHY	X	X	X			X	Avrasya Kısmen
GEOL502. STRUCTURAL METHODS FOR SEISMIC INTERPRETATION	X	X				X	
GEOL505. ADVANCED STRUCTURAL GEOLOGY	X	X					
GEOL512. MINERALOGY AND CRYSTAL CHEMISTRY	X	X					Kısmen SRM506E
GEOL514. BUSINESS OF ECONOMIC GEOLOGY	X						Kısmen MAD512E
GEOL517. FIELD METHODS FOR ECONOMIC GEOLOGY	X						
GEOL519. **ABITIBI GEOLOGY AND EXPLORATION FIELD SCHOOL**	X						
GEOL520. NEW DEVELOPMENTS IN THE GEOLOGY AND EXPLORATION OF ORE DEPOSITS	X						
GEOL521. FIELD AND ORE DEPOSIT GEOLOGY	X						
GEOL550. INTEGRATED BASIN MODELING	X						
GEOL551. APPLIED PETROLEUM GEOLOGY	X		X				
GEOL552. UNCONVENTIONAL PETROLEUM SYSTEMS	X						
GEOL553. GEOLOGY AND SEISMIC SIGNATURES OF RESERVOIR SYSTEMS	X				X		
GEOL570. APPLICATIONS OF SATELLITE REMOTE SENSING	X					X	
GEOL580. INDUCED SEISMICITY	X						
GEOL597. SPECIAL SUMMER COURSE	X						

GEOL601. FIELD STRATIGRAPHY	X						
GEOL608. HISTORY OF GEOLOGICAL CONCEPTS	X						
GEOL609. ADVANCED PETROLEUM GEOLOGY	X						
GEOL611. SEQUENCE STRATIGRAPHY IN SEISMIC, WELL LOGS, AND OUTCROP	X						Avrasya Kısmen
GEOL613. GEOLOGIC RESERVOIR CHARACTERIZATION	X						
GEOL617. THERMODYNAMICS AND MINERAL PHASE EQUILIBRIA	X	x					
GEOL642. FIELD GEOLOGY	X						
GEOL645. VOLCANOLOGY	X					X	Avrasya Kısmen
GEOL643. GRADUATE FIELD SEMINARS	X						
GEOL707. GRADUATE THESIS / DISSERTATION RESEARCH CREDIT	X						
HYDROGEOLOGıCAL FIELD COURSE		X					
ENGİNEERİNG GEOLOGİCAL FİELD COURSE I (SOİLS)		X					
ENGİNEERİNG GEOLOGİCAL FİELD COURSE II (ROCKS)		X					
LANDFİLLİNG, CONTAMİNATED SİTES AND RADİOACTİVE WASTE REPOSİTORİES		X		X			
EXCURSİONS MODULE INTEGRATİON (ENGİNEERİNG GEOLOGY)		X					
MODULE INDUSTRY PRACTİCAL		X					
SEDİMENT ANALYSİS		X					
ANALYSİS OF ROCK TEXTURES		X					Avrasya Kısmen
MİCROSTRUCTURES		X	X				
ROCK PHYSİCS		X			X		
FİELD COURSE IV: NON ALPİNE FİELD COURSE		X					
ANİSOTROPİCAL BEHAVİOUR AND RHEOLOGY OF ROCKS		X					
EXPERİMENTAL ROCK DEFORMATİON		x					
QUATERNARY DATİNG METHODS		X	X				
SEDİMENTARY ROCKS İN THE FİELD		x					
PROVENANCE ANALYSİS		X					
TECTONİC GEOMORPHOLOGY		X	X		X		Avrasya Kısmen
QUATERNARY GEOLOGY AND GEOMORPHOLOGY OF THE ALPS		X					Avrasya Kısmen
PHYSİCAL PROPERTİES OF MİNERALS		X					
APPLİED MİNERALOGY AND NON-METALLİC RESOURCES I		X					
PHASE PETROLOGY		X					
CRYSTALLİNE GEOLOGY OF THE ALPS		x					
MİNERAL PHYSİCS OF THE EARTH'S MANTLE AND CORE		X					
CLİMATE HİSTORY AND PALEOCLİMATOLOGY		X					Avrasya Kısmen
MİCROPALAEONTOLOGY		X	X			X	Avrasya Kısmen
LİMNOGEOLOGY		X					Avrasya Kısmen

GEOSC 500. ISSUES IN GEOSCIENCES			X				
GEOSC 502. EVOLUTION OF THE BİOSPHERE			X				
GEOSC 505. QUANTITATIVE PHYSICAL SEDIMENTOLOGY			X				
GEOSC 508. MECHANICS OF EARTHQUAKES AND FAULTING			X				Avrasya Kısmen JFM513E
GEOSC 511B. TRANSMISSION ELECTRON MICROSCOPY			X				
GEOSC 514. DATA INVERSION IN THE EARTH SCIENCES			X				Avrasya Kısmen
GEOSC 523. SEDIMENTARY GEOCHEMISTRY			X				Avrasya Kısmen
GEOSC 545. GLACIAL GEOLOGY			X				
GEOSC 548. SURFACE PROCESSES			X				
GEOSC 555. ADVANCED STRUCTURE AND PETROFABRICS			X				
GEOSC 560. KINETICS OF GEOLOGICAL PROCESSES			X				
GEOSC 561. MATHEMATICAL MODELING IN THE GEOSCIENCES			X				
GEOSC 587. PREPARING FOR AN ACADEMIC CAREER IN THE GEOSCIENCES			X				
GEOSC 597A. TOPİCS IN EARTH SYSTEMS SCIENCE			X				Avrasya Kısmen
GEOSC 597B. AAPG IMPERIAL BARREL AWARD COMPETITION			X				
GEOSC 597E. WORDS TO LIVE BY: WRITING SCİENCE			X				
GEOSC 597F. ADVANCED CRYSTALLOGRAPHY			X				Kısmen SRM506E
GEOSC 597G. DYNAMICS OF RIVERS AND FLOODPLAINS, PAST AND PRESENT			X				
GEOSC 610. THESIS RESEARCH OFF CAMPUS			X				
GLE 530 SEEPAGE AND SLOPES				X			
GLE 531 RETAINING STRUCTURES				X			
GLE 535 REMEDIATION GEOTECHNICS				X			ZMG505
GLE 731 PROPERTIES OF GEOSYNTHETICS				X			
GLE 735 SOIL DYNAMICS				X	X		ZMG510
502FRACTAL THEORY AND APPLICATIONS İN GEO-ENGINEERING					X		
516FIELD STUDIES IN GEOPHYSICS					X		
526HEALTH AND SAFETY İN MINING					X		
548GEOPHYSICAL EXPLORATION AND ENGINEERING					X		
587APPLIED NEURAL NETWORK COMPUTING					X		
900RESEARCH					X		
500INTRODUCTION TO GEOCHEMISTRY					X		Avrasya Kısmen
501 EARTH SCIENCE TEACHING METHODS AND MATERIALS					X		
502ANALYTICAL AND NUMERICAL MODELING IN GEOSCIENCES					X		Avrasya Kısmen

503 PHYSICS OF THE SOLAR SYSTEM					X		
504C LOWELL PROGRAM TOPICS IN ORE DEPOSITS MAPPING					X		
508 TECTONIC PETROLOGY					X		Avrasya Kısmen
511 GEOLOGY AND GEOPHYSICS OF THE SOLAR SYSTEM					X		
512A GEOARCHAEOLOGY					X		
513 ENSO: PAST, PRESENT, FUTURE					X		
519 PHYSICS OF THE EARTH					X		
520METEORITES					X		
522 CRITICAL ZONE SCIENCE & MANAGEMENT					X		
523 REGIONAL STRUCTURAL GEOLOGY					X		Avrasya Kısmen
524A SPACE GEODESY					X		
526A RESEARCH METHODS IN AQUATIC SCIENCES					X		
529 OBJECTIVE ANALYSIS IN THE ATMOSPHERIC AND RELATED SCIENCES					X		
530 THE CHEMICAL EVOLUTION OF EARTH					X		
533MMINING GEOLOGY METHODS					X		Kısmen MAD502
538BIOGEOGRAPHY					X		Avrasya Kısmen
539AINTRODUCTION TO DENDROCHRONOLOGY					X		
541ADVANCED SOIL GENESIS					X		
542MARS					X		
543CGEOLOGIC BEST PRACTICES AND PROJECT STAGES					X		
547GLOBAL AND REGIONAL CLIMATOLOGY					X		Avrasya Kısmen
551REMOTE SENSING OF PLANETARY SURFACES					X		
553GLACIAL AND QUATERNARY GEOLOGY					X		
554EVOLUTION OF PLANETARY SURFACES					X		
556THRUST BELTS AND SYNOROGENIC SEDIMENTS					X		
561PALEOINDIAN ORIGINS					X		
562INTRODUCTION TO QUATERNARY ECOLOGY					X		Avrasya Kısmen
567INVERSE PROBLEMS IN GEOPHYSICS					X		
568ADVANCED SEISMOLOGY					X	X	JFM508E
569SEISMIC DATA PROCESSING					X		JFM517
570LVOLCANOLOGY: LABORATORY AND FIELD METHODS					X		Avrasya Kısmen
570RVOLCANOLOGY: PHYSICAL PROCESSES AND PETROLOGIC APPLICATIONS					X		
571 TERRESTRIAL PLANETS					X		Avrasya Kısmen
573 EARTH SYSTEM MODELING					X		Avrasya Kısmen
574A GEOCHRONOLOGY AND THERMOCHRONOLOGY					X		
577 ACTIVE TECTONICS					X		Avrasya

							Kısmen
578 GLOBAL CHANGE					X		
579 INTRODUCTION TO CLIMATE DYNAMICS					X		
581 QUATERNARY PALYNOLOGY AND PLANT MACROFOSSILS					X		
582 PALEOCLIMATOLOGY					X		
583 THERMODYNAMICS IN EARTH AND PLANETARY SCIENCES					X		Avrasya Kısmen
584 THE COEVOLUTION OF EARTH AND THE BIOSPHERE					X		
585A APPLIED TIME SERIES ANALYSIS					X		
589 QUATERNARY GEOCHRONOLOGY					X		Avrasya Kısmen
595E TOPICS IN DENDROCHRONOLOGY					X		
596BECONOMIC GEOLOGY					X		
596CGEOMORPHOLOGY-QUATERNARY GEOLOGY					X		Avrasya Kısmen
596DPALEONTOLOGY-SEDIMENTARY GEOLOGY					X		
596FGEOPHYSICS					X		
GEOE 504. ADVANCED GRAVITY AND MAGNETIC METHODS						x	JFM506
GEOE 506. ADVANCED PHOTOGEOLOGY						x	
GEOE 509. ADVANCED MINERALOGY						x	
GEOE 525. BIOSTRATIGRAPHY						x	Avrasya Kısmen
GEOE 528. REMOTE SENSING						x	GEO510E kısmen
GEOE 530. ECONOMICS OF ENERGY RESOURCES						x	
GEOE 535. SPECTRAL CLASSIFIC. OF SATELLITE IMAGES						x	Avrasya Kısmen
GEOE 538. GRANITE TECTONICS						x	
GEOE 545. APPLIED SEDIMENTOLOGY						x	
GEOE 547. HYDROCARBON SEISMOLOGY						x	
GEOE 548. WELL LOGGING						x	Kısmen PET 506 E
GEOE 550. APPLIED GEOPHYSICS						x	
GEOE 555. PRINCIPLES AND APP. OF IMAGING RADAR SYS.						x	
GEOE 557. GEOGRAPHIC INFOR. SYS.IN EARTH SCIENCES						x	
GEOE 559. GIS MODELS IN NATURAL HAZARD ASSESSMENT						x	
GEOE 560. ROCKS&MINERALS IN ARCHAEOLOG. STUDIES						x	
GEOE 568. PALEOCLIMATOLOGY						x	
GEOE 593. ADVANCED FIELD MAPPING						x	
GEOE 614. GROUNDWATER SYSTEMS PLAN.&MANAGEMENT						x	
GEOE 621. NEOTECTONICS						x	Avrasya Kısmen
GEOE 701. HYDROTHERMAL ALTERATION						x	
GEOE 705. LANDSCAPE ANALYSIS AND AERIAL PHOTOGRAPH						x	
GEOE 708. HEALTH GIS APPLICATIONS						x	

Ek.5 Tablo 6

İTÜ'de Jeoloji Mühendisliği Yüksek Lisans ve Doktora Programlarına Ait Dersler ve Yukarıdaki Programlarda Eş değerleri

Sıra	Kod	Dersin Adı	Eşdeğeri
1	**JFM501**	Mühendislik Matematiği (Engineering Mathematics), Türkçe, Zorunlu, Güz Dönemi	
2	**UYJ513E**	Geochemical Analysis Methods İngilizce, Zorunlu, Güz Dönemi	++++
3	**UYJ527**	Maden Yataklarını Oluşturan Ortamlar (Ore Deposits Forming Environments) Türkçe, Zorunlu, Güz Dönemi	+++++
4	**UYJ504E**	Engineering Geology for Planning and design of Projects İngilizce, Zorunlu, Güz Dönemi	+
5	**UYJ501E**	Evaluation of Groundwater İngilizce, Zorunlu, Güz Dönemi	+++++
6	**UYJ596**	Seminer (Kredisiz) Türkçe, Zorunlu, Güz ve Bahar Dönemi	++++++
7	**UYJ597**	Uzmanlık Alan Dersi (Kredisiz) Türkçe, Zorunlu, Güz ve Bahar Dönemi	+++
8	**UYJ533E**	Tektonik ve Çökel Havzalar Türkçe, Zorunlu, Bahar	+
9	**UYJ505**	Arazi Araştırması ve Ölçüm Teknikleri Türkçe, Zorunlu, Bahar	++++++
10	**UYJ544**	Kil Mineralojisi Türkçe, Zorunlu, Bahar	++++
1	UYJ535	Jeolojik Zaman Boyunca Karbonat Platformları ve Resifler Türkçe, Seçmeli, Güz	
2	UYJ539	Deniz Tabanında Jeolojik Haritalama Türkçe, Seçmeli, Güz	
3	UYJ541	Marmara Denizi ve Çevresinin Jeolojisi Türkçe, Seçmeli, Güz	
4	UYJ543	Uygulamalı Jeolojik Haritalama Teknikleri Türkçe, Seçmeli, Güz	
5	UYJ519	Doğal Hammaddelerde Kalite Kontrol Türkçe, Seçmeli, Güz	+
6	UYJ511E	Organic Biogeochemistry İngilizce, Seçmeli, Güz	++
7	UYJ523	Seramik ve Cam Hammaddeleri	
8	UYJ517	Süs Taşları (Gemoloji) ve Tasarımı Türkçe, Seçmeli, Güz	
9	UYJ503E	Geochemical Evaluation of Geothermal Systems and Utilization Techniques İngilizce, Seçmeli, Güz	+++
10	UYJ515	Hava Fotoğraflarının Yorumu Türkçe, Seçmeli, Güz	++
11	UYJ536	Çökel Kayalarda Diyajenez Türkçe, Seçmeli, Bahar	+
12	UYJ 506	Jeoistatistik Türkçe, Seçmeli, Bahar	+++
13	UYJ516	Jeokimya ve Sağlık Türkçe, Seçmeli, Bahar	+
14	UYJ520	Mineral Jeokimyası Türkçe, Seçmeli, Bahar	++
15	UYJ522	İleri Magmatik Petroloji (Advanced Igneous Petrology) Türkçe, Seçmeli, Bahar	++++
16	UYJ532	İleri Metamorfik Petroloji (Advanced Metamorphic Petrology)	+++

		Türkçe, Seçmeli, Bahar	
17	UYJ512	Doğal Afetler ve Yerbilimleri Türkçe, Seçmeli, Bahar	++
18	UYJ538	Yeraltısularının Modellenmesi Türkçe, Seçmeli, Bahar	+++
19	UYJ514	Jeoloji Mühendisliğinde Bilgisayar Destekli Tasarım Türkçe, Seçmeli, Bahar	+
20	UYJ508	KayaYapılarının Mekaniği, Tasarımı ve Projelendirmesi Türkçe, Seçmeli, Bahar	+++
1	**JEO631**	Karbonat Çökelme Ortamları Türkçe, Seçmeli, Güz	++
2	**JEO612E**	Regional Tectonics of Asia İngilizce, Seçmeli, Güz	++
3	**JEO623E**	Low-Temperature Geochemistry İngilizce, Seçmeli, Güz	+
4	**JEO610E**	Costal Sedimentary Environments and Processes İngilizce, Seçmeli, Güz	+
5	**JEO608E**	Marine Mineral and Hydrocarbon Resources İngilizce, Seçmeli, Güz	+
6	**JEO625E**	Special Topics in Marine Geology İngilizce, Seçmeli, Güz	
7	**JEO627**	Tektonik Deformasyonların Modellenmesi Türkçe, Seçmeli, Güz	+++
8	**JEO629**	Uygulamalı Maden Jeolojisi Türkçe, Seçmeli, Güz	+
9	**JEO613**	Magmatik Petrolojide Seçme Konular Türkçe, Seçmeli, Güz	
10	**JEO617**	Doğal Zeolitler Türkçe, Seçmeli, Güz	
11	**UYJ601E**	Groundwater Hydraulics İngilizce, Seçmeli, Güz	++
12	**JEO 603**	Mühendislik Jeolojisinde Özel Konular Türkçe, Seçmeli, Güz	++++++
13	**JEO 697**	Uzmanlık Alan Dersi Türkçe, Zorunlu, Güz/Bahar	
14	**JEO604E**	**Principles of Basin Analysis** İngilizce, Seçmeli, Bahar	++++++
15	**JEO616**	İzotop Jeolojisi ve Jeokronolojisi Türkçe, Seçmeli, Bahar	++
16	**JEO626E**	Ore Deposits Related to Plate Tectonics İngilizce, Seçmeli, Bahar	
17	**JEO618**	Radyoaktif Hammadeler Türkçe, Seçmeli, Bahar	
18	**JEO628E**	Stable Isotope Geochemistry	++
19	**JEO630E**	Biomineralization İngilizce, Seçmeli, Bahar	++
20	**JEO624**	Cevher Mikroskobisi Türkçe, Seçmeli, Bahar	++
21*	**UYJ507E**	Selected Topics in Geochemistry İngilizce, Seçmeli, Güz	+

21* Jeokimyada Seçme Konular (Selected Topics in Geochemistry) UYJ507E programda var Leskis kapsamında değerlendirilmemiş.

SONUÇLAR

Yukarıdaki programlar incelendiğinde aşağıdaki sonuçlara varılmıştır:

1) Aşağıdaki derslerin bazıları 4 Üniversitenin, birçoğu ise değerlendirilmede göz önünde tutulan en az 2 Üniversitenin Jeoloji Yüksek Lisans ve Doktora Programlarında bulunmaktadır. Bu dersler İTÜ FBE Jeoloji Mühendisliği programlarında bulunmamaktadır.

Applied or Advanced Stratigraphy
Advanced Structural Geology
Mineralogy & Crystal Chemistry
Advanced Geotechnics
Applications of Geographic Information Systems
Applied Petroleum Geology
Electron Microscopy
Quaternary Dating Methods
Sedimentary Rocks in the Field
Tectonic Geomorphology
Micropaleontology
Independent Study in Engineering Geology or Engineering Hydrogeology
GIS Project Design

Ayrıca, bazı dersler tek bir üniversitenin lisansüstü programlarında bulunmaktadır. Aşağıda sıralanan bu dersler İTÜ FBE Jeoloji Mühendisliği programlarında bulunmamaktadır. Bu dersler özetle şu konulardadır.

Seismology
Seismic & Electrical Methods
Sedimentology (Geochemical Sedimentology, Quantitative Physical Sedimentology)
TEM & SEM
Advanced Mineralogy
Groundwater Systems
Rocks, Minerals, Archaeology Studies
Remote Sensing

2) İTÜ FBE Jeoloji Mühendisliği Programındaki dersler 2010–2013 itibarıyla % 19–55 oranında açılmıştır. Mesela, 2012–2013 döneminde % 32 oranında açılmış. Bu oranlar, örneğin, Endüstri: % 65–100; Elektrik: % 60–75; Kimya: % 30–55; Malzeme: % 50–68; Gıda: % 40–65.

İTÜ FBE Jeoloji Mühendisliği Programına Başvurular genelde ilan edilen kontenjanın altında gerçekleşmiştir. Mesela, Biyomedical, Endüstri, Elektronik, İşletme,

Mekatronik, Isı Akışkanları, Konstrüksiyon gibi bölümlerde kontenjanın çok üstünde başvuru olmaktadır. Bu bölümler son derece yüksek bir başvuru potansiyeline sahiptir.

İTÜ FBE Jeoloji Mühendisliği Programındaki Son 3 Yıl (6 Yarıyıl) Kayıtlı öğrenci durumu şu şekildedir:

YL: 11 + 7 + 21 + 5 + 16 + 8 = 68
D: 4 +2 +1 +0 + 3 +2 = 12
Ortalama YL + D için 13 Öğrenci / Yarıyıl şeklindedir.

Öğretim Üyesi: 38 olup, yaklaşık her Öğretim Üyesine Yarıyıl bazında 0,3 öğrenci düşmektedir.

3) Öğretim Üyesi uzmanlık alanlarına, öğretim üyelerinin ürettikleri projelerden ve yayınlardan hareketle karar vermenin doğru olmayacağı düşünülmektedir. Hangi öğretim üyesi tarafından programda hangi ilave dersin açılabileceği hususunun özel bir "Bölüm Akademik Kurulu Toplantısında" ele alınmasında yarar vardır.

4) Bölümümüzün karşılaştırıldığı, yukarıda Ek.2 ve Ek.3 de sıralanan yüksek lisans programlarının dersleri incelenmiş, bölümümüze ait programlarda olmayan dersler Ek.4 (Tablo 5) de özetlenmiştir. Bu karşılaştırma sonucunda **aşağıda sıralanan derslerin bölümümüze ait lisansüstü ders programlarında bulunmasının yararlı olacağı** görülmüştür.

Elements of Seismology
Advanced Mineralogy/Advanced Microscopic Techniques
Advanced Stratigraphy
Advanced Geotechnics
Applied Petroleum Geology
Advanced Ore Deposits
Landslides: Investigation, Analysis & Mitigation.
Advanced Environmental Geology/Landfilling, Contaminated Sites and Radioactive Waste Repositories

Bu derslerden bazıları İTÜ Fen Bilimleri Enstitüsüne bağlı diğer programlarda bulunmaktadır. Bunlar;

JFM 508E İleri Sismoloji,
DEP 501E Mühendislik Sismolojisi
ZMG 501 Geoteknik Mühendisliğin de Özel Konular
ZMG 509E Advanced Foundation Engineering

Ayrıca bölümümüze ait programlarda olmayan bazı dersler tam veya kısmen örtüşür olarak Avrasya Enstitüsü ders planlarında bulunmaktadır.

5) Bölümümüzün Yüksek Lisans ve Doktora Programlarına ait derslerin tümü Ek.5 (Tablo 6) de sıralanmıştır. Bu derslerin karşılaştırma yapılan programlarda eşleniğinin olup olmadığı aynı tablonun son sütununda gösterilmiştir. Bu sütundaki + işaretinin sayısı incelenen programlarda bulunan eşdeğer nitelikteki derslerin sayısını göstermektedir.

Programımıza ait zorunlu derslerin belirlenmesinde Tablo 6 nın göz önünde tutulabileceği düşünülmektedir.

6) İTÜ Jeoloji Mühendisliği Yüksek Lisans Programında toplam 30 ders, Doktora Programında ise 20 ders bulunmaktadır. Bölümümüzün alt yapısı ve eski anabilim dallarının durumu göz önünde tutulduğunda, **seçmeli zorunlu yüksek lisans derslerinin sayısının arttırılabileceği ve özellikle Genel Jeoloji'nin zorunlu ders sayısının arttırılabileceği görülmüştür. Bu derslerin belirlenmesinde yukarıda 4 numaralı maddenin altında sıralanan dersler göz önünde bulundurulması önerilmektedir.**

7) Yüksek Lisans ve Doktora Programına son yıllarda başvuran aday sayılarının, genellikle bölümümüze ait kontenjanların yarısını geçmediği görülmektedir. **Bölümümüz akademik ve eğitim altyapısı dikkate alındığında, tüm alanlarda olmasa bile, tezsiz yüksek lisans programının açılması hususunun bölüm akademik kurulunda değerlendirilebileceği önerilmektedir.**

Durum bilgilerinize saygı ile sunulur.

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Prof. Dr. Fahri Esenli

Doç. Dr. Emin Çiftçi