دليل

كلية الهندسة

2020

قسم هندسة الجيولوجية

Geological Engineering Department

أولا:- قوائم مسميات المقررات الدراسية للمرحلة العامة :- The 1st: List of General courses

العلوم الإنسانية Humanities courses

Course No.	Course name	Pre request المتطلبات	Credits الوحدات	اسم المقرر	رقم المقرر
GH141	English I	Nil	3	اللغة الإنجليزية 1	ع إ 141
GH142	English II	GH141	3	اللغة الإنجليزية 2	ع إ 142
GH150	Arabic I	Nil	2	اللغة العربية 1	ع إ 150
GH151	Arabic II	GH150	1	اللغة العربية 2	ع إ 151
GH152	Technical Writing in Arabic	GH151	1	كتابا التقارير الفنية	ع إ 152
Total Credits			10	إجمالي عدد الوحدات	

العلوم الاساسية العامة General Science Courses

Course No.	Course name	Pre request المتطلبات	Credits الوحدات	اسم المقرر	رقم المقرر
GS101	Mathematics I	Nil	3	الرياضيات 1	ع ع 101
GS102	Mathematics II	GS101	4	الرياضيات 2	ع ع 102
GS111	Physics I	Nil	3	الفيزياء 1	ع ع 111
GS112	Physics II	GS111	3	الفيزياء 2	ع ع 112
GS112L	Physics Lab	GS111	1	فيزياء معمل	ع ع 112 م
GS115	Chemistry	Nil	3	الكيمياء العامة	ع ع 115
GS115L	Chemistry Lab	Nil	1	الكيمياء معمل	ع ع 115 م
GS200	Computer Programming	Nil	3	برمجة حاسوب	ع ع 200
GS203	Mathematics III	GS102	3	الرياضيات 3	ع ع 203
GS204	Mathematics IV	GS102	3	الرياضيات 4	ع ع 204
GS206	Probability & Statistics	Nil	3	الإحصاء والاحتمالات	ع ع 206
Total Credits			30	إجمالي عدد الوحدات	

General Engineering Courses العلوم الهندسية العامة

Course No.	Course name	Pre request المتطلبات	Credits الوحدات	اسم المقرر	رقم المقرر
GE121	Engineering Mechanics I	Nil	3	ميكانيكا هندسية 1	هـ ع121
GE125	Engineering Graphics	Nil	2	الهندسة الوصفية	هـ ع 125
GE127	Engineering Drawing	Nil	2	الرسم الهندسي	هـ ع 127
GE129	Workshop Technology	Nil	2	تقنية الورش	هـ ع 129
GE129 L	Workshop Technology Lab	Nil	1	معمل تقنية الورش	هـ ع 129 م
GE222	Engineering Mechanics II	GE121	3	ميكانيكا هندسية 2	هـ ع 222
Total Credits			13	إجمالي عدد الوحدات	

ثانيا :- قائمة مسميات المقررات الدراسية الملزمة لجميع طلبة القسم 2nd. List of departmental

Course No.	Course name	Pre request المتطلبات	Credits الوحدات	اسم المقرر	رقم المقرر
GeoE110	Physical Geology	GS 102, GE121 & GE222	3	جيولوجيا عامة	هـ جل 110
CHE211	Physical chemistry	GS115	3	كيمياء فيزيائية	CHE211
CHE211L	Physical chemistry Lab	CHE211	1	كيمياء فيزيائية معمل	CHE211L
GeoE220	Structural Geology	GeoE110, GS125	3	جيولوجيا تركيبية	هـ جل 220
GeoE230	Mineralogy and Petrology	GeoE110, GS115, GS112	4	صخور ومعادن	هـ جل 230
CE231	General Surveying	Nill	3	مساحة	CE231
GeoE240	Stratigraphy and Sedimentation	GeoE220, GeoE230	4	طبقات ورسوبيات	هـ جل 240
GeoE315	Fluid Mechanics	GS 102, GE121, GE222	3	ميكانيكا الموائع	هـ جل315
GeoE331	Geology of Libya	GeoE240, GeoE220	2	جيولوجيا ليبيا	هـ جل 331
GeoE350	Geomechanics I	GE121, GeoE220, GE122	3	ميكانيكا الصخور	هـ جل 350
Geo 351	Hydrology	GeoE315, GeoE240	3	علم المياه	هـ جل 351

GeoE 353	Geochemistry	CH211, GeoE230	3	جيوكيمياء	هـ جل353
GeoE354	Geomorphology	GeoE240, GeoE331	2	جيومورفولوجي	هـ جل 354
GeoE355	Numerical Analysis	GS203, GS104, GS200	3	تحليل عددي	هـ جل 355
GeoE360	Soil Mechanics	GS102, GeoE220, GE121, GE122	3	ميكانيكا تربة	هـ جل 360
GeoE361	Well Logging I	GeoE240	3	تسجيلات ابار 1	هـ جل 361
GeoE362	X-Ray	GS112, GeoE353, GeoE230	3	أشعة سينية	هـ جل 362
GeoE363	Economic Geology	GeoE230, GeoE220	3	جيولوجيا اقتصادية	هـ جل 363
GeoE364	Prop. of Construction Materials	GeoE230, GeoE350	3	خواص مواد بناء	هـ جل 364
GeoE365	Petroleum Geology I	GeoE240, GeoE315	3	جيولوجيا نفط 1	هـ جل 365
GeoE373	Drilling Technology	GE121, GE222, GeoE220,GeoE315	3	هندسة حفر	هـ جل 373
GeoE470	Geoengineering I	GeoE350, GeoE360	3	جيوهندسية 1	هـ جل 470
GeoE472	Applied Geophysics	GeoE240, GS112	3	جيوفيزياء	هـ جل 472
GeoE 473	Ground Water Flow	GeoE351, GeoE315	3	سريان المياه الجوفية	هـ جل 473
GeoE475	Computer Application	GeoE355, GS200	3	تطبيقات حاسب الي	هـ جل 475
GeoE477	Remote Sensing and Geological Applications	GeoE354, GeoE240	3	استشعار عن بعد	هـ جل 477
GeoE578	Filed Geology	GeoE331	1	دراسات حقلية	هـ جل 578
GeoE597	Special Topics	Nill	2	مختارات	هـ جل 597
GeoE598	Seminar	Nill	1	ندوة	هـ جل 598
GeoE599	B.Sc. Project	Min 130 credit	4	المشروع	هـ جل 599
Total Credits			84	المجمـــــــــوع	

ثالثا :- قوائم مسميات المقررات الدراسية الملزمة والاختيارية لكل شعبة 3rd . List of branches courses

أ- شعبة هندسة الثروات المعدنية A. Mineral Resources Engineering Branch

- قائمة مسميات المقررات الملزمة والخاصة بطلبة الشعبة فقط. List of courses

Course No.	Course name	Pre request المتطلبات	Credits الوحدات	اسم المقرر	رقم المقرر
GeoE575	Industrial Rocks and minerals	GeoE363	3	الصخور الصناعية والمعادن	هـ جل 575
GeoE577	Clay Minerals	GeoE362	3	المعادن الطينية	هـ جل 577
GeoE579	Exploration Methods	GeoE472	3	طرق الاستكشاف	هـ جل 579
GeoE584	Mining Geo-Engineering	GeoE579	3	جيوهندسية التعدين	هـ جل 584
GeoE585	Ore Evaluation	GeoE584	3	تقييم الخامات	هـ جل 585
Total Credits			15	إجمالي عدد الوحدات	

ب- شعبة الهندسة الموارد المائية B. Water Resources Engineering Branch

- قائمة مسميات المقررات الملزمة والخاصة بطلبة الشعبة فقط.. List of courses

Course No.	Course name	Pre request المتطلبات	Credits الوحدات	اسم المقرر	رقم المقرر
GeoE580	Water well hydraulics	GeoE355	3	هيدروليكا ابار المياه	هـ جل580
GeoE581	Groundwater geochemsirty	GeoE351-GeoE353	3	جيوكيمياء المياه الجوفية	هـ جل581
GeoE589	Principles of Ground Water Modelling	GeoE55-GeoE580	3	مبادئ نمذجة المياه الجوفية	هـ جل589
GeoE590	Water well design and maintenance	GeoE580	3	تصميم وصيانة ابار المياه الجوفية	هـ جل590
GeoE591	Water Resources management	GeoE589-GeoE580	3	ادارة المياه الجوفية	هـ جل591
Total Credits			15	إجمالي عدد الوحدات	

ج- شعبة الهندسة الجيوتقنية C. Geotechnical Engineering Branch

- قائمة مسميات المقررات الملزمة والخاصة بطلبة الشعبة فقط. List of courses

Course No.	Course name	Pre request المتطلبات	Credits الوحدات	اسم المقرر	رقم المقرر
GeoE582	Geoengineering II	GeoE470	3	جيوهندسية 2	هـ جل 582
GeoE583	Soil Mechanicals II	GeoE360	3	ميكانيكا تربة 2	هـ جل 583
GeoE592	Slope Stability	GeoE470, GeoE360, GeoE350	3	اتزان المنحدرات	هـ جل 592
GeoE593	Site Investigation	GeoE383, GeoE360	3	تحري موقعي	هـ جل 593
GeoE594	Geomechanicas II	GeoE350	3	ميكانيكا الصخور2	هـ جل 594
Total Credits			15	إجمالي عدد الوحدات	

د- شعبة هندسة البتروفيزياء D. Petrophysics Engineering Branch قائمة مسميات المقررات الملزمة والخاصة بطلبة الشعبة فقط. List of courses

Course No.	Course name	Pre request المتطلبات	Credits الوحدات	اسم المقرر	رقم المقرر
GeoE586	Well Logging II	GeoE361, GeoE365	3	تسجيلات آبار 2	هـ جل 586
GeoE587	Reservoir Rock Properties	GeoE365	3	خواص صخور المكامن	هـ جل 587
GeoE588	Petroleum Geology II	GeoE365	3	جيولوجيا نفط2	هـ جل 588
GeoE595	Petrophysics	GeoE365	3	بتروفيزياء	هـ جل 595
GeoE596	Basin Analysis	GeoE365, GeoE361	3	تحليل احواض	هـ جل 596
Total Credits			15	إجمالي عدد الوحدات	

ملخص عدد الوحدات المطلوبة للتخرج لجميع شعب القسم

القسم	الشعبة	العلوم الإنسانية		العلوم الاساسية العامة		العلوم الهندسية العامة		المقررات التخصصية الملزمة لجميع طلبة القسم		المقررات التخصصية الملزمة لطلبة الشعبة فقط		الإجمالي
		عدد الوحدات	النسبة المئوية من اجمالي عدد الوحدات الكلية	عدد الوحدات	النسبة المئوية من اجمالي عدد الوحدات الكلية	عدد الوحدات	النسبة المئوية من اجمالي عدد الوحدات الكلية	عدد الوحدات	النسبة المئوية من اجمالي عدد الوحدات الكلية	عدد الوحدات	النسبة المئوية من اجمالي عدد الوحدات الكلية	
الهندسة الجيولوجية	الثروات المعدنية الموارد المائية الجيوتقنية البتروفيزياء	10	6.6%	30	19.7%	13	8.6%	84	55.3%	15	9.9%	152

المحتوى العلمي للمقررات الدراسيةالملزمة لجميع طلبة القسم

CE231	General Surveying	3 Credits

Pre-requisite: CE231

Introduction; theory of measurements and errors, type of measurements, type of errors, error propagation, survey field notes , linear measurement , taping, EDM, leveling , curvature and refraction, instruments, differential leveling , trigonometric leveling , angles , bearing , azimuths, the compass survey, theodolite instrument, field operations with theodolite, traversing ,traverse computations, areas and volumes.

CHE 211	Physical Chemistry	3 Credits

Pre-requisite: GS115

Behaviour of real and ideal gases; the first law of thermodynamics and its applications; the second law of thermodynamics; the third law of thermodynamics; electromotive force; thermodynamics of electrochemical cells; chemical kinetics; reaction rates including zeroth, first, second and third order reactions. Introduction to stability.

CHE 211L	Physical Chemistry Lab	3 Credits

Pre-requisite: CHE 211

Measurements of density; viscosity; phase-equilibria; kinetics of first order reaction (inversion of sucrose); refractive index; equilibrium constant (by means of electrical conductivity, Ka of succinic acid; molecular weight determination (Victor Mayer); thermodynamics of galvanic cells (Zinc-Copper electrodes).

GeoE 110	Physical Geology	3 Credits

Pre-requisite: GS 102, GE121 and GE222

Geology and the earth, Plate Tectonics, Minerals, Igneous Rocks, Plutons and Volcanoes, Weathering and Soil, Sedimentary Rocks, Metamorphic Rocks, Geologic Time, Earthquakes and Earth's Structure, Ocean Basins, Geologic

Structures, Mass Wasting, Streams and Lakes, Groundwater, Deserts. Glaciers and Ice age, Coastlines, Geologic Resources.

GeoE 220	Structural Geology	3 Credits

Pre-requisite: GeoE 110 & GE125

Motivations and opportunities, Structural mapping techniques and tools, Characterizing structures using differential geometry, Physical quantities, fields, dimensions, and scaling, Deformation and flow, Force, traction, and stress, Conservation of mass and momentum, Elastic deformation, Brittle behavior, Viscous flow, Rheological behavior, Model development and methodology.

GeoE 230	Mineralogy and Petrology	4 Credits

Pre-requisite: GeoE 110, GS115 & GS112

Crystallization, crystal symmetry, crystal systems, forms, habits, elements of crystal chemistry, Bravais Lattice. physical properties of minerals, chemical properties of mineral crystals (Isomorphism, Polymorphism. psedomorphism), ionic substitution, solid solution, descriptive mineralogy, native minerals, Sulfides, Oxides……, and Silicates. Studying physical properties, occurrence, and uses of important economic and rock-forming minerals. Studying Igneous rocks, origin, composition, texture, and classification. Studying Metamorphic rocks, origin of contact and regional metamorphism, properties and classification. Studying Sedimentary rocks, origin of detrital and chemical sedimentary rocks, composition, texture, and classification. Lab: Crystal models to identify symmetry and form. Identification and description of the important of some portant economic and rock forming minerals and their thin sections. Hand specimens of ore and rock-forming minerals to identify minerals using physical Properties. Field trips to recognize some rock-forming minerals

GeoE 240	Stratigraphy and Sedimentation	4 Credits

Pre-requisites: GeoE220 & GeoE230

Intro to Sedimentary Processes and Sedimentary Rocks, Terrigenous Clastic Sediments and Sedimentary Rocks, Biogenic, Chemical and Volcanogenic Sediments and Rocks Sediments, Sedimentary Structures, Environments and Facies, Siliciclastic Depositional System, Carbonate Depositional System, Diagenesis: An Introduction, Stratigraphic Concepts: An Overview, Stratigraphic

Techniques: Fossils and Other Dating Methods, Sequence Stratigraphy and Sea-level Changes, Summary: Cycles and Sequence Stratigraphy.

GeoE 315	Fluid Mechanics	3 Credits

Pre-requisites: GS 102, GE121 and GE222

Introduction and definitions, Importance and development of fluid mechanics, Mathematics and physical background, Fluid Static: Pascal Law, Fluid dynamic: Classification of flow, laminar and turbulent, continuity, bernolli, momentum. Open channel flow, Flow through porous media.

GeoE 331	Geology of Libya	2 Credits

Pre-requisite: GeoE240 & GeoE220

Regional study of the geology of Libya through the geological formations from Precambrian to Quaternary with emphasis on tectonic framework, stratigraphy, geologic structures, geomorphology, mineral deposits, groundwater and hydrocarbons. Lab. work includes reading assignments, Analysis of Mapping and Cross Sections.

GeoE 350	Geomechanics I	3 Credits

Pre-requisite: GE121, GeoE220 & GE122

Overview of rock engineering problems, Index properties of rock system, Engineering classification of rocks, define the characteristics and classification of rock masses, the mechanical properties (strength and failure criteria) of rock discontinuities, Modes of rock failure, Common laboratory strength test for characterizing criteria, Stress-strain behavior in compression, moher-Coulomb failure criterion, The effect of water, deformation behavior of rock masses, The influence of the principal stress ratio on failure, Stress in a rock mass, Initial stresses in rock and their measurement, normal and shear stresses on a plane, problem-solving assignments, Exalt sheet.

GeoE 351	Hydrology	3 Credits

Pre-requisites: GeoE315 & GeoE240

Hydrological cycle. Precipitation. Evaporation and Transpiration. Infiltration. Stream flow. Stream flow hydrograph. Precipitation and run off relations. Hydrological design (Reservoir and Dams). Hydrological statistics. Climatic change impact on hydrological environment. Laboratory consists of Precipitation measurements. Evaporation and transportation measurements.

Infiltration measurements. stream flow measurements. hydrograph analysis statistics analysis.

GeoE 353	Geochemistry	3 Credits

Pre-requisite: CHE211 & GeoE230

Application of chemical principles to geologic processes, this includes chemical equilibrium, acids, basis well as Ph_Eh, solubility of minerals and solution chemistry, carbonate and silicate equilibria, chemical weathering process, minerals and rock alteration, hydrolysis reactions of carbonates and silicates, oxidation and reduction reactions, carbonate sediments, phosphate sediments and evaporates, clay mineral formation, genesis and structure, distribution of elements in igneous, metamorphic, and sedimentary rocks, free energy and ph-eh relations, introduction to organic geochemistry, alternative energy sources. lab: solving problems about chemical equilibrium, and solubility of minerals, studying stability of rock-forming minerals at surface and near surface environments, solving problems concerning chemical weathering and concentration of elements in the lithosphere using wt. %, ppm or mg/l, plots of pH-Eh boundaries for some mineral species.

GeoE 354	Geomorphology	2 Credits

Pre-requisites: GeoE240 & GeoE331

Examines endogenic processes originating within the Earth, exogenic processes occurring at the Earth's atmosphere and the way they interact to create landforms. Mechanics of geomorphic processes and the relationships between properties of earth materials and the forces applied to them by gravity, wind, ice, water, waves and humans. Methods of observing and analyzing landforms and geomorphic processes in the field.

GeoE 355	Numerical Analysis	3 Credits

Pre-requisite: GS203, GS104 & GS200

Mathematical Preliminaries, Error Analysis, Linear Systems, Nonlinear Equations, Interpolation by Polynomials, Differentiation and Integration, Differential Equations. Differential Equations.

GeoE 360	Soil Mechanics I	3 Credits

Pre-requisite: GS102, GeoE220, GE121 & GE122

This course covers the principles of soil mechanics and fundamentals of application in geotechnical engineering, This course covers origin of soil and grain size, soil behaviors and mechanical properties of soil, engineering classification of soil, soil compaction, permeability and seepage, in situ stresses, stresses in soil mass, compressibility of soil, shear strength.

GeoE 361	Well Logging I	3 Credits

Pre-requisites: GeoE240

Basic formation evaluation concepts, borehole environment, principles of resistivity, radiation, thermal and elastic wave measurements and measuring tools, applications to formation evaluation using commercial software packag, lithology plots, saturation, irreducible saturation and porosity studies from well logs. shale sand analysis, complex reservoir analysis, wire-line formation testing, cementing quality monitoring.

GeoE 362	X-Ray	3 Credits

Pre-requisite: GS112, GeoE353 & GeoE230

Wave theory, interference of waves, electromagnetic spectrum, review and principles of crystallography, physics of X-ray including generation, properties, and hazards, uses and applications of X-rays in geology, mineralogy and engineering, X-ray diffraction, bragg's law, diffraction methods, basal spacing determination, diffraction directions, determination of mineral phases by powder diffraction methods, X-ray fluorescence, purpose, theory and use of XRF spectrometers, sample preparation and qualitative chemical analysis of rock and mineral samples using XRF techniques, scanning electron microscopy and X-ray microanalysis, lab: analysis of rock samples using XRD techniques, interpretation of their resulted XRD patterns, to determine mineral phases, this well is done through home assignments and term papers, quantitative and qualitative chemical analysis of rock samples using XRF techniques, this also well be done using XRF analyzed rock samples to determine chemical analysis of these samples, contacting research centers to let students know analyzing X-ray facilities.

GeoE 363	Economic Geology	3 Credits

Pre-requisite: GeoE230 & GeoE220

Study of the nature, classification, mineral association and origin of ore deposits, a brief history of the use of minerals and the development of economic geology, migration of ore-bearing fluids, structural and chemical controls on ore

deposition, zoning in ore minerals, magmatic segregation (cr, ti, fe, ni, cu, pt) deposits, mineral texture and paragenesis, mineral deposits of pegmatites, hydrothermal deposits including epithermal, telethermal, mesothermal, xenothermal. volcanogenic deposits, contact and regional metamorphic deposits, open space filling and replacement, sedimentary deposits, mechanical and chemical, supergene enrichement, examples of economic mineral deposits in the world including placers, precambrian quartz pebble conglomerates, Pb-Zn deposits, and unconformity-related U deposits, roll front U, and porphery Cu deposits, kemberlite pipes, carbonatite ore depoite, and albitite, microclinite, and greisen Ore deposit, resources ore deposits from the ocean floor, Mn- bearing deposits, mineral deposits and plate tectonic, brief studying nonmetallic ore deposits (ground water and oil, natural gas), and ore deposited in libya, lab: maps and cross sections of mineral bodies using drill hole data. study of polished sections of some economic ore deposits, mineral textures of Ores.

GeoE 364	Prop. of Construction Materials	3 Credits

Pre-requisite: GeoE230 & GeoE350

Introduction to the physical and mechanical properties of highway construction materials. Properties of building stones. Aggregate for concrete. Cement. Lime and its types. Industrial gypsum. Bricks and Tiles and their specifications. Laboratory testing of material properties according to standard specifications.

GeoE 365	Petroleum Geology I	3 Credits

Pre-requisite: GeoE240 & GeoE315

Identify the geological origins of petroleum reservoirs and reservoir fluids, describe the history of the oil and gas industry, explain the structure of the modern oil and gas industry, list the various disciplines that make up the petroleum engineering profession; illustrate the differences between conventional and unconventional reservoirs, analyze rudimentary engineering methods, interpret semi-log aapply linear interpolation and regression, analyze statistical descriptions of reservoir data, identify and solve problems requiring simple iteration, and discuss the role of environmental stewardship in the petroleum engineering profession.

GeoE 373	DrIlling Technology	3 Credits

Pre-requisite: GE121, GE222, GeoE220, andGeoE315

Drilling fluids and hydraulics, Casing and Cementing, Bit technology, Drill string basics, Stuck pipe: stuck pipe problems, Well control, Rotary drilling, Directional drilling, Horizontal drilling, Cost analysis, Technical writing, Drilling in Libya problems.

GeoE 470	Geoengineering I	3 Credits

Pre-requisite: GeoE350 & GeoE360

Introduction of geoengineering, Strength of discontinuities of rock masses, Description of jointed rock masses, Description and rock masses classification, Types of failure: Plane failure; Circular failure; wedge failure, Lab: Rock mass classification; Plane failure; Circular failure; Wedge failure, Excel software application.

GeoE 472	Applied Geophysics	3 Credits

Pre-requisites: GeoE240 GS112

Seismic methods, seismic refraction method, reflection method. Magnetic method, Electrical method, Gravity method. Field measurement and analyses of geophysical data, problem-solving assignments.

GeoE 473	Groundwater Flow	3 Credits

Pre-requisites: GeoE351 & GeoE315

Principles and physical properties of groundwater, principles of groundwater flow, groundwater flow equations, flow nets, groundwater geology, radial flow, salute transport, concepts of diffusion and dispersion, flow management, solving some problems.

GeoE 475	Computer Applications	3 Credits

Pre-requisite: GeoE355 & GS200

Using Microsoft Word and Excel (using Excel for graphics and statistics). Drawing maps using Surfer. Applying rockwork for different geologic presentations.

GeoE 477	Remote Sensing and Geological Applications	3 Credits

Pre-requisite: GeoE354 & GeoE240

Air photographs and stereoscopy. Characteristics of aerial photographs. Methods of photo interpretation. Lithological mapping. Igneous and metamorphic rocks mapping. Applications. Laboratory consists of aerial photographs analysis using stereoscopes, measurement of height and orientations. Applications for rock types and natural resources.
Part two; Remote sensing fundamentals Satellites and sensors. Passive systems. Active microwave (RADAR). Image processing and enhancement. Applications of remote sensing to geological engineering problems. Laboratory work consists of slide shows for images. Analyses of land sat. Satellite, and radar images. Analyses of lineament, and lithology. Applications.

GeoE 578	Field Geology	1 Credits

Pre-requisite: GeoE599 & GeoE331

The course work presented in 2 weeks field trip. In the first part, the field trip work included reconnaissance geology, exploration of the stratigraphy, the main rock units, intrusions, structure geology with training of columnar sections, bearing and measurements of orientation. The second part included training on geological mapping.

GeoE 597	Special Topics	2 Credits

Pre-requisite: Nill

This course covers electives and special applications in mineral resources, water resources geotechnical or petrophysical branch. Lectures as given in special assignments and term papers are prepared by students.

GeoE 598	Seminar	1 Credits

Pre-requisites:

The student has to present his B. Sc. Project in a seminar attended by staff members and senior students.

GeoE 599	B. Sc. Project	4 Credits

Pre-requisites:

Two semester project should be done and advised by staff member. The student prepared his project within his branch especially for example, mineral resources, water resources geotechnical or petrophysical branch.

Courses for Mineral Resources Branch

GeoE 575	Industrial Rocks and Minerals	3 Credits

Pre-requisites: GeoE363

Features of industrial rocks and minerals and their use in industry, genetic classification, economic classification, and their origin, search and exploitation for them, studying their economic feasibility with emphesis on non-metallic minerals, applied chemistry, studying examples of such rocks and minerals in libya as granites, basalts, marbles, sands, diatomites, clays, bentonites, olivines, feldspars, calcites, dolomites, and gypsum, lab: testing of various rock and mineral samples to be used as industrial materials for different purposes, field trips to some localities of industrial rocks and minerals.

GeoE 577	Clay Minerals	3 Credits

Pre-requisites: GeoE353&GeoE362

Structure and composition of clay minerals. Clay mineral formation and occurrence in rocks and soils. Clay mineral properties and relation of these properties to industrial uses. Clay mineral diagenesis. Methods used to identify and study common clays as XRD, DTA, electron microscopy and infrared absorption. Lab.: Identification of clay mineral samples using XRD and DTA techniques, Textural preparation of rock samples to better identifying pure clay samples, Studying clay mineral properties in relation their industrial uses.

GeoE 579	Exploration Methods	3 Credits

Pre-requisites: GeoE472

Philosophy of exploration, planning prospecting and exploration programs. Integration of exploration tools as different geophysical methods, applications of different remote sensing techniques as well as photo geologic maps with various geochemical techniques in order to interpret surface and subsurface lithologies and structure in search for oil and gas, economic mineral deposits, groundwater, or to integrate these results in geotechnical studies. Lab: Includes map interpretation to delineate geologic structures. Field training to delineate mineralogical and geochemical anomalies using exploration tools and equipment**,** Summer training in the field with exploration companies.

GeoE 584	Mining Geo-engineering	3 Credits

Pre-requisites: GeoE579

Mineral deposits in the subsurface environment, ore and gangue minerals, economic mineral associations. Mineral and metal zoning, geochemical zoning, wall-rock alteration, mineral deposits in the zone of weathering. Mining methods, surface and subsurface mining, solution mining and related methods, marine mining, environmental engineering. Mining and mineral economics, national mineral policy, national mineral policy, transportation and marketing of minerals. Engineering economic analysis in exploration and mining. Geologic mapping in surface and underground mines. Evaluation of prospects and mines, sampling of ore bodies, type and thickness of overburden, lab: studying open-pit geology. Geological mapping of surface mines, studying environmental impact of open-pit mine exploitation and solving this environmental problem.

GeoE 585	Ore Evaluation	3 Credits

Pre-requisites: GeoE584

Surface geological evaluation of the ore, geological surveying, structural and geomorphological features and geographic location of the ore, subsurface geological evaluation of metallic and non-metallic ore bodies, design of drill hole patterns and spacings, sampling, channel sampling, grab sampling, bulk and placer sampling, drill cores and cuttings, estimation of mineral reserves, conditions and methods of ore evaluation, as arithmetic average method, block method, longitudinal and cross section method, types of mineral reserves, determination of shape and volume of ore bodies using thickness , density, extension…etc. drawing geological maps and cross sections, industrial evaluation, amount morphology and quality of the ore, ore variability including shape, quality, and pinch out of ore bodies, economic analysis of mineral deposits, risk analysis. lab: case studies of ore evaluation using data for ore reserves estimation, field training to evaluate gypsum reserve in Bir El Ghanam and cement raw material in Al Khoms and Suq el Khamees.

Courses for Water Resources Branch

GeoE 580	Water Well Hydraulics	3 Credits

Pre-requisites: & GeoE355

Definitions of aquifer types, properties, flow equation types, pumping test analysis for steady state flow, pumping test analysis for unsteady state analysis, step test pumping analysis, boundary effects on pumping well, lab: radial steady

state flow (Theim), radial un steady state flow (theis, jacob, hautush), step test analysis, excel sheet for pumping test analysis.

GeoE 581	Groundwater Geochemistry	3 Credits

Pre-requisites: GeoE351 & GeoE353

Chemical and physical properties of ground water, Geochemical processes that describe solution complexation reaction, solutions, gas interactions, mineral dissolution, precipitation, adsorption, description, Ground water Quality and contaminant, Contamination impact on environment, Lab: how to apply appropriate sampling and analytical approaches to collect and interpret of hydro-chemical data.

GeoE 589	Principles of Groundwater Modeling	3 Credits

Pre-requisites: GeoE355 & GeoE580

Introduction to groundwater models, finite difference (steady state), finite difference (Transient flow), Advective-Dispercive solute transport, case studies by the application of picket-Linguist. And Trescottpender-Iarson Models Using Real Data. Laboratory consists of Use of Various Modeling Packages-MODFLOW.

GeoE 590	Water Well Design and Maintenance	3 Credits

Pre-requisites: GeoE580

Review of water wells functions and drilling, Explaining design parameters (casing, screen, gravel pack and selecting pump depth and power), Development completion and disinfection, Water well maintenance (courses, methods, materials, frequency), Lab: Calculating length diameter of casing and screen, Selecting proper screen pores, Design gravel pack for installation, Calculating proper pressure for maintaining the well.

GeoE 591	Water Resources Management	3 Credits

Pre-requisites: GeoE580 & GeoE589

Definition of groundwater management, Groundwater basin investigation and development, Managing groundwater supplies and alternative basin yields, Water-energy-food nexus, Impact of groundwater exploitation on the environment. Groundwater basins of Libya.

Courses for Geotechnical Branch

GeoE 582	Geoengineering II	3 Credits

Pre-requisites: GeoE470

Open excavation, underground chamber, rasis, and anchor foundation. Grouting and shallow foundation on rock. Karsts formation and engineering. Subsidence and subsidence types. Bridges and pavements and their classifications. Beach engineering. Engineering seismology, earthquakes, and geotechnical earthquake engineering. Laboratory includes mapping and cross sections of geo-technical exercises, problem-solving assignments.

GeoE 583	Soil Mechanics II	3 Credits

Pre-requisites: GeoE360

This course covers the principles of soil mechanics and fundamentals of application in geotechnical engineering, This course covers origin of soil and grain size, soil behaviors and mechanical properties of soil, engineering classification of soil, soil compaction, permeability and seepage, in situ stresses, stresses in soil mass, compressibility of soil, shear strength, Other topics such as lateral earth pressures, fundamentals of retaining structures, soil bearing capacity, slope stability, pile foundation, and soil improvement. Laboratory consists of extensive problem-solving assignments and some Lab. testing.

GeoE 592	Slope Stability	3 Credits

Pre-requisites: GeoE470, GeoE360 & GeoE350

Shear strength of rock, introduction of rock slope engineering, plane failure, groundwater flow permeability and pressure, wedge failure, circular failure, toppling failure, blasting, factor of safety for reinforced rock slopes, lab: plane failure; circular failure; wedge failure; toppling failure, application software, practical examples and extensive assignments.

GeoE 593	Site Investigation	3 Credits

Pre-requisites: GeoE583 & GeoE360

Introduction of site investigation, Planning and procurements, Description and classification, Disk study and walk-over survey, Subsurface exploration: engineering geophysics, Subsurface exploration: boring, drilling, propping…etc., Sampling and sample disturbance, Undisturbed sample technique, Labrotarty testing, in situ testing, Basics field instrumentation, Assignments.

GeoE 594	Geomechanics II	3 Credits

Pre-requisites: GeoE350

Design of underground openings and tunnels in various rock masses, design of underground openings and tunnels in stratified rocks, design in fractured rock masses, some of the other concepts of open, supporting and reinforcement the rocks, analysis and problem-solving assignments for the stability of different rocks during the opening process of underground.

Courses for Petrophysics Branch

GeoE 586	Well Logging II	3 Credits

Pre-requisites: GeoE 361 & GeoE365

This course covers cased-hole logging including; Cased hole logs for Formation Evaluation are principally those from the radiation-measuring tools; e.g., the Thermal Decay Time (TDT), Gamma Ray Spectrometry (GST), Compensated Neutron (CNL), standard gamma ray (GR), and Natural Gamma Ray Spectrometry (NGS*) tools. Well Integrity include: (1) Cement Evaluation are cement bond log (CBL), Cement Evaluation Tool (CET). (2) Corrosion Evaluation of Casing and Tubing are types of inspection Equipment (Mechanical Calipers, Acoustic Devices, Electromagnetics Tools, Borehole Video Cameras and Casing Potential Profiles). Production logging include: Flow Regimes, Flow Meters, and Laboratory analyses of cased-hole and production logging.

GeoE 587	Reservoir Rock Properties	3 Credits

Pre-requisites: GeoE365

Petrophysical properties of reservoir rocks and measurement procedures: Coring and core handling, sandstone and carbonate reservoir rock and pore types, fundamental porosity, grain density, permeability and saturation properties, special core analysis such as mechanical, acoustic and electrical properties, multiphase rock and fluid interactions, interfacial tension, capillary pressure, wettability and relative permeability properties, The course is complemented by relevant lab experiments where the students get hands on experience on measuring some of the single and multiphase flow properties of reservoir rocks.

GeoE 588	Petroleum Geology II	3 Credits

Pre-requisites: GeoE365

Origin and occurrence of hydrocarbons, Basic Petroleum Geology, Origins of Oil and Gas, Hydrocarbon Types, Gibbs Phase Rule, Reservoir Types, Temperature in sedimentary basins, thermal conductivity, geothermal gradient,

Subsurface Pressure, Enhance oil recovery Drillsteam and transient testing, Geological factor in water flooding, Evaluation of an oil discovery: how to locate the second, third and fourth wells.

GeoE 595	Petrophysics	3 Credits

Pre-requisites: GeoE365

Introduction, Porosity and Permeability (Klinkenberg Effect), Statistical Analysis of reservoir Data, Reservoir Rock Heterogeneity, Application of Darcy's Equations, Skin Factor, Rock Fluids Interactions, Electrical Properties of Rock-Fluid Systems, Fluid Saturations.

GeoE 596	Basin Analysis	3 Credits

Pre-requisites: GeoE361 & GeoE365

Introduction, Foundations of Sedimentary Basins, Mechanics of Sedimentary Basin Formation, Sedimentary Basin-Fill, Application of Petroleum Play Assessment.

الجدول التالي الذي يوضح تفاصيل متطلبات عدد الوحدت التخرج لكل شعبة بالقسم :

القسم	الشعبة	العلوم الانسانية		العلوم الأساسية العامة		العلوم الهندسية العامة		المقررات التخصصية الملزمة لجميع طلبة القسم		المقررات التخصصية الملزمة لطلبة الشعبة فقط		العلوم التخصصية الاختيارية	
		عدد الوحدات	% من اجمالي عدد الوحدات الكلية	عدد الوحدات	% من اجمالي عدد الوحدات الكلية	عدد الوحدات	% من اجمالي عدد الوحدات الكلية	عدد الوحدات	% من اجمالي عدد الوحدات الكلية	عدد الوحدات	% من اجمالي عدد الوحدات الكلية	عدد الوحدات	% من اجمالي عدد الوحدات الكلية
الهندسة اجيولوجية	هندسة الثروات المعدنية	10	% 6.6	30	% 20	13	% 8.5	84	% 55	15	% 10		
	هندسة الموارد المائية	10	% 6.6	30	% 20	13	% 8.5	84	% 55	15	% 10		
	هندسة الجيوتقنية	10	% 6.6	30	% 20	13	% 8.5	84	% 55	15	% 10		
	شعبة هندسة البتروفيزياء	10	% 6.6	30	% 20	13	% 8.5	84	% 55	15	% 10		