CHGC503. INTRODUCTION TO GEOCHEMISTRY. 3.0 Semester Hrs.
(I) A comprehensive introduction to the basic concepts and principles of
geochemistry, coupled with a thorough overview of the related principles
of thermodynamics. Topics covered include: nucleosynthesis, origin of
earth and solar system, chemical bonding, mineral chemistry, elemental
distributions and geochemical cycles, chemical equilbrium and kinetics,
isotope systematics, and organic and biogeochemistry. Prerequisite:
Introductory chemistry, mineralogy and petrology. 3 hours lecture; 3
semester hours.

CHGC504. METHODS IN GEOCHEMISTRY. 3.0 Semester Hrs.
(II) Field sampling of natural earth materials including rocks, soils,
sediments, and waters. Preparation of naturally heterogeneous materials,
digestions, and partial chemical extractions. Principles of instrumental
analysis including trace elemental analysis by ICP-atomic spectroscopy,
isotope analysis by ICP-MS, EM/X-ray methods, and chromatography.
Quality assurance and quality control. Interpretation and assessment
of geochemical data using statistical methods. Course format is hands-
on, project oriented. Prerequisite: Graduate standing in geochemistry or
environmental science and engineering. 2 hours lecture, 3 hours lab; 3
semester hours.

CHGC505. INTRODUCTION TO ENVIRONMENTAL CHEMISTRY. 3.0
Semester Hrs.
Equivalent with CHGN403.
(II) Processes by which natural and anthropogenic chemicals interact,
react, and are transformed and redistributed in various environmental
compartments. Air, soil, and aqueous (fresh and saline surface and
groundwaters) environments are covered, along with specialized
environments such as waste treatment facilities and the upper
atmosphere. Meets with CHGN403. CHGN403 and CHGC505 may
not both be taken for credit. Prerequisites: GEGN101, CHGN122 and
CHGN209 or CBEN210. 3 hours lecture; 3 semester hours.

CHGC506. WATER ANALYSIS LABORATORY. 2.0 Semester Hrs.
Instrumental analysis of water samples using spectroscopy and
chromatography. Methods for field collection of water samples and
field measurements. The development of laboratory skills for the use of
ICP-AES, HPLC, ion chromatography, and GC. Laboratory techniques
focus on standard methods for the measurement of inorganic and
organic constituents in water samples. Methods of data analysis are also
presented. Prerequisite: Introductory chemistry, graduate standing. 3
hour laboratory, 1 hour lecture, 2 semester hours.

CHGC509. INTRODUCTION TO AQUEOUS GEOCHEMISTRY. 3.0
Semester Hrs.
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. 3 hours lecture; 3
semester hours.

CHGC511. GEOCHEMISTRY OF IGNEOUS ROCKS. 3.0 Semester
Hrs.
A survey of the geochemical characteristics of the various types of
igneous rock suites. Application of major element, trace element, and
isotope geochemistry to problems of their origin and modification.
Prerequisite: Undergraduate mineralogy and petrology. 3 hours lecture; 3
semester hours. Offered alternate years.

CHGC514. GEOCHEMISTRY THERMODYNAMICS AND KINETICS. 3.0
Semester Hrs.
(II) Fundamental principles of classical thermodynamics and kinetics
with specific application to the earth sciences. Volume-temperature ?
pressure relationships for solids, liquids, gases and solutions. Energy
Energy, chemical equilibria and the equilibrium constant. Solutions and
activity-composition relationships for solids, fluids and gases. Phase
equilibria and the graphical representation of equilibria. Application of
the fundamentals of kinetics to geochemical examples. Prerequisite:
Introductory chemistry, introductory thermodynamics, mineralogy and
petrology. 3 hours lecture, 3 semester hours. Offered in alternate years.

CHGC527. ORGANIC GEOCHEMISTRY OF FOSSIL FUELS AND ORE
DEPOSITS. 3.0 Semester Hrs.
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, CHGN438. 2 hours lecture; 3 hours lab; 3 semester hours.
Offered alternate years.

CHGC555. ENVIRONMENTAL ORGANIC CHEMISTRY. 3.0 Semester
Hrs.
A study of the chemical and physical interactions which determine
the fate, transport and interactions of organic chemicals in aquatic
systems, with emphasis on chemical transformations of anthropogenic
organic contaminants. Prerequisites: A course in organic chemistry and
CHGN503, Advanced Physical Chemistry or its equivalent. Offered in
alternate years. 3 hours lecture; 3 semester hours.

CHGC562. MICROBIOLOGY AND THE ENVIRONMENT. 3.0 Semester
Hrs.
This course will cover the basic fundamentals of microbiology, such as
structure and function of procaryotic versus eucaryotic cells; viruses;
classification of micro-organisms; microbial metabolism, energetics,
genetics, growth and diversity; microbial interactions with plants, animals,
and other microbes. Additional topics covered will include various aspects
of environmental microbiology such as global biogeochemical cycles,
bioleaching, bioremediation, and wastewater treatment. Prerequisite:
ESGN301. 3 hours lecture, 3 semester hours. Offered alternate years.

CHGC563. ENVIRONMENTAL MICROBIOLOGY. 2.0 Semester Hrs.
An introduction to the microorganisms of major geochemical importance,
as well as those of primary importance in water pollution and waste
treatment. Microbes and sedimentation, microbial leaching of metals from
ores, acid mine water pollution, and the microbial ecology of marine and
freshwater habitats are covered. Prerequisite: none. 1 hour lecture, 3
hours lab; 2 semester hours. Offered alternate years.
CHGC564. BIOGEOCHEMISTRY AND GEOMICROBIOLOGY. 3.0
Semester Hrs.
Designed to give the student an understanding of the role of living things, particularly microorganisms, in the shaping of the earth. Among the subjects will be the aspects of living processes, chemical composition and characteristics of biological material, origin of life, role of microorganisms in weathering of rocks and the early diagenesis of sediments, and the origin of petroleum, oil shale, and coal. Prerequisite: none. 3 hours lecture; 3 semester hours.

CHGC598. SPECIAL TOPICS. 1-6 Semester Hr.
(I, II, S) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once, but no more than twice for the same course content. Prerequisite: none. Variable credit: 0 to 6 credit hours. Repeatable for credit under different titles.

CHGC599. INDEPENDENT STUDY. 0.5-6 Semester Hr.
(I, II, S) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: ?Independent Study? form must be completed and submitted to the Registrar. Variable credit: 0.5 to 6 credit hours. Repeatable for credit under different topics/experience and maximums vary by department. Contact the Department for credit limits toward the degree.

CHGC698. SPECIAL TOPICS. 1-6 Semester Hr.
(I, II, S) Pilot course or special topics course. Topics chosen from special interests of instructor(s) and student(s). Usually the course is offered only once, but no more than twice for the same course content. Prerequisite: none. Variable credit: 0 to 6 credit hours. Repeatable for credit under different titles.

CHGC699. INDEPENDENT STUDY. 0.5-6 Semester Hr.
(I, II, S) Individual research or special problem projects supervised by a faculty member, also, when a student and instructor agree on a subject matter, content, and credit hours. Prerequisite: ?Independent Study? form must be completed and submitted to the Registrar. Variable credit: 0.5 to 6 credit hours. Repeatable for credit under different topics/experience and maximums vary by department. Contact the Department for credit limits toward the degree.