

# GEOLOGICAL SCIENCES (GEOL)

## GEOL 7200 Earth Systems of Central Canada 3 cr

An overview of the Earth structure, bedrock geology, surficial geology and hydrology of Manitoba and adjacent regions from an Earth systems perspective; and the occurrence and development of mineral, petroleum and water resources.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: enrolment in a M.Sc. or Ph.D. program, and permission of department.

## GEOL 7230 Geophysics of the Earth's Crust and Mantle 3 cr

Processes in crust-mantle evolution and geophysical methods used to study this region of the earth.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisites: (GEOL 4320), and (GEOL 4330).

## GEOL 7310 Quaternary Geology 3 cr

Seminars and lectures on sedimentary aspects of the Quaternary Epoch with emphasis on glaciation. The glacial and interglacial stratigraphic record on the continents and in the ocean basins. Three-day field trip in mid-September.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisites: (GEOL 3490), and (GEOL 3900).

## GEOL 7350 Remote Sensing in the Earth and Planetary Sciences 3 cr

Selected topics in remote sensing with emphasis on geophysical and geologic problems.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: B.Sc. (Honours Geology, Geophysics, or Geological Engineering), or permission of instructor for graduates of other disciplines.

## GEOL 7470 Advanced Petroleum Geology and Geochemistry 3 cr

Lectures and seminars examining the four major components of petroleum geology: source and migration, reservoir, trap, and economics. Major emphasis on the origin and generation of petroleum and source rock geology. Field trip and core logging required.

## GEOL 7480 Advanced Seismology 1 3 cr

Theory of wave propagation; source mechanisms; other selected topics.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: GEOL 7260.

## GEOL 7490 Advanced Seismology 2 3 cr

Seismic surface waves and normal modes of Earth, Earth tides and dynamic evolution.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: GEOL 7480 or equivalent.

## GEOL 7540 Isotope Geology and Geochronology 3 cr

The principles and methods of isotopic age determination and the measurement of geological rate processes using certain radioactive nuclides and the variations of the isotopic compositions of their daughter products. The evolution of the earth's mantle, continental and oceanic crust. The application of light, stable isotope fractionation to understanding geological processes.

## GEOL 7550 Hydrothermal Petrochemistry 3 cr

The chemistry, mineralogy, and petrology of mineral deposits and alteration zones of the hydrothermal type, and their association with igneous and tectonic events. Theory and experimental data on metasomatic processes.

## GEOL 7590 Advanced Paleontology 1 3 cr

Topics in paleobiology of the invertebrates, and principles of paleontology. Upon request, course may be adapted to individual requirements of students in other disciplines (for example, specific groups of invertebrates, paleoecology, trace fossils, etc.).

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisites: (GEOL 3310), and (GEOL 4310), or permission of instructor.

## GEOL 7600 Advanced Paleontology 2 3 cr

Topics in paleobiology of the invertebrates, and principles of paleontology. Upon request, course may be adapted to individual requirements of students in other disciplines (for example, specific groups of invertebrates, paleoecology, trace fossils, etc.).

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: GEOL 3310, or GEOL 4310, or permission of instructor.

## GEOL 7700 Advanced Clastic Sedimentology 3 cr

Lectures and seminars on clastic depositional environments. Critical evaluation of accepted facies models followed in each case by examination of the ancient record. One week field trip and core logging required.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: GEOL 3900, or permission of instructor.

## GEOL 7720 Geophysical Imaging and Data Processing 3 cr

Advanced frequency filter design; deconvolution methods for seismogram; velocity and wavefield stacking; various digital methods for potential field data; principles of tomography and geophysical imaging techniques.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisites: (GEOL 3740), and GEOL 7260, or permission of instructor.

## GEOL 7740 Workshop in the Geological Sciences 1 3 cr

Critical, in-depth group study of problems and new concepts in the geological sciences; discussion of current research by staff and visiting scientists; students will pursue individual research interests and will work with staff on specific topics.

## GEOL 7750 Workshop in the Geological Sciences 2 3 cr

Critical, in-depth group study of problems and new concepts in the geological sciences; discussion of current research by staff and visiting scientists; students will pursue individual research interests and will work with staff on specific topics.

## GEOL 7760 Seminar in Geological Sciences 3 cr

A discussion of topics of current interest from the whole spectrum of geological sciences to inform students on research work outside their specialty. Required of all graduate students. For ancillary credit only. Geological Sciences Colloquium. Weekly discussion of topics of current interest. Presentation of recent research from geological literature, the department, and visitors. Required of all graduate students who have received credit for GEOL 7760.

## GEOL 7780 Advanced Carbonate Sedimentology 3 cr

Lectures and seminars on selected topics of carbonate sedimentology, including depositional environments, lithofacies sequences and diagenesis.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: GEOL 3900, or permission of instructor.

## GEOL 7790 Advanced Instrumental Techniques in Geology 3 cr

Lectures and laboratory course covering the application of microbeam, mass spectrometer, diffraction and wet geochemical analytical techniques in mineralogy and geochemistry. Includes coverage of ICP, PIXE, powder and single crystal diffraction and electron microprobe analysis.

**GEOL 7810 Electromagnetic Methods in Geophysics 3 cr**

Examination of the theory and application of electromagnetic methods in geophysics. Topics include: electrical properties of earth materials, review of EM methods, EM theory for layered media, EM responses of simple structures and case studies.

**GEOL 7820 Environmental Geophysics 3 cr**

Examination of the application of geophysics to environmental targets. Topics will vary according to student interest and may include aspects of near-surface geophysics, engineering geophysics, geophysics of global climate change and geophysical risk assessment.