

# GEOP - GEOPHYSICS (GEOP)

## GEOP 170 Planet Quest

**Credits 3. 3 Lecture Hours.**

Materials and processes that create solar systems and potentially habitable exoplanets; use of simple models to explore how exoplanets are found, and how the existence and surface condition of a planet are affected by stellar composition and luminosity, physics of orbits, gravity, magnetism, volcanism and tectonics.

## GEOP 291 Research

**Credits 0 to 4. 0 to 4 Other Hours.**

Research conducted under the direction of faculty member in geophysics. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.

**Prerequisites:** Freshman or sophomore classification and approval of instructor.

## GEOP 313 Geophysical Field Methods

**Credits 4. 3 Lecture Hours. 2 Lab Hours.**

Planning, safe execution and analysis of applied geophysical surveying including magnetics, gravity, resistivity, induced polarization, seismic reflection, seismic refraction, ground-penetrating radar, frequency-domain and time-domain electromagnetic induction; experimental design, precise navigation, quality assurance and control, data management, elementary processing, error analysis and estimation, visualization and interpretation procedures.

**Prerequisites:** GEOP 341; PHYS 206 and PHYS 207, or equivalent; MATH 308; GEOL 250.

## GEOP 341 Fundamentals of Geophysics

**Credits 3. 2 Lecture Hours. 2 Lab Hours.**

The structure, composition and evolution of the earth; the concepts and application of various geophysical methods to infer earth structure, including seismology, gravity and geodesy, magnetics; generation of internal heat and heat loss; quantification of the driving forces of plate tectonics and isostatic topography.

**Prerequisites:** PHYS 206 and PHYS 207, or equivalent; MATH 308; GEOL 210 and GEOL 150 or equivalent.

## GEOP 361 Geophysical Signal Processing

**Credits 3. 2 Lecture Hours. 2 Lab Hours.**

Fundamental concepts in digital signal processing for geophysicists; practical applications of sampling theory, Fourier analysis, filter design, spectral decomposition, instrument deconvolution, and methods of finding hidden signals within geophysical data; Matlab-based laboratory exercises involve analysis of various types of real geophysical/geological data.

**Prerequisites:** GEOP 341, PHYS 221 and MATH 311 or equivalent.

## GEOP 413 Near-surface Geophysics

**Credits 3. 3 Lecture Hours.**

Fundamentals of traditional and emergent surface and borehole geophysical methods, as they are applied to shallow (less than 100 meters) subsurface investigations; emphasis on electrical, magnetic and electromagnetic methods; seismic reflection and crosswell tomography.

**Prerequisites:** GEOP 313 and GEOP 361, or approval of instructor.

## GEOP 421 Seismology

**Credits 4. 3 Lecture Hours. 2 Lab Hours.**

Mathematical theory of elasticity and seismic wave propagation; properties of body and surface waves and applications to inference of earth structure; introduction to source theory; use of seismic data to determine major earth structures; characteristics of seismic noise fields; influence seismic anisotropy.

**Prerequisites:** GEOP 361, MATH 311 and PHYS 221, or approval of instructor.

## GEOP 435 Methods of Geophysical Exploration

**Credits 4. 3 Lecture Hours. 3 Lab Hours.**

Introduction to theory of gravity, magnetic, electrical and seismic exploration methods; physical properties of earth materials and their influence on geophysical measurements; limitations of geophysical data in the interpretation of subsurface structure.

**Prerequisites:** GEOL 309; MATH 251.

## GEOP 470 Computational Geophysics

**Credits 3. 3 Lecture Hours.**

Techniques used in the study of geophysical processes, including heat and chemical transport in the Earth, rock deformation and viscous fluid flow; development of conservation laws, relevant boundary conditions and analytical solutions; introduction to numerical solutions.

**Prerequisites:** GEOL 101 or GEOL 104; MATH 308; or approval of instructor.

## GEOP 475 Interpretation of Gravity and Magnetic Fields

**Credits 3. 3 Lecture Hours.**

Applications of potential theory in the interpretation of gravity and magnetic fields; analysis of geophysical anomalies produced by geologic structures and by variation in the physical properties of rocks; use of regional gradients, residual anomalies, higher derivatives and surfaces, line integrals and two and three dimensional models.

**Prerequisites:** GEOL 312; MATH 311 or approval of instructor.

## GEOP 484 Internship

**Credits 0. 0 Other Hours.**

Directed internship in a private firm, government agency or non-governmental organization to provide work experience related to the student's degree program and career objectives. May be taken two times.

**Prerequisites:** Junior or senior classification and approval of internship agency and approval of instructor.

## GEOP 485 Directed Studies

**Credits 1 to 12. 1 to 12 Other Hours.**

Advanced problems in geophysics.

## GEOP 489 Special Topics In...

**Credits 1 to 4. 1 to 4 Other Hours.**

Selected topics in geophysics. May be repeated for credit.

**Prerequisite:** Junior or senior classification.

## GEOP 491 Research

**Credits 0 to 4. 0 to 4 Other Hours.**

Research conducted under the direction of faculty member in geophysics. May be repeated 2 times for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.

**Prerequisites:** Junior or senior classification and approval of instructor.