

## Graduate Classes in the Geophysics Curricular Group

**223A. Geophysical Data Analysis (4)** Probability and statistics and their application to make inferences from geophysical data: point processes, distributions, maximum likelihood estimation, hypothesis testing and confidence intervals, least squares, density estimation, interpolation and smoothing. Agnew, Constable (W)

**223B. Geophysical Data Analysis (4)** Analysis of geophysical measurements, especially time series, Fourier theory, digital signal processing, and spectral analysis. Staff (S)

**224. Internal Constitution of the Earth (4)** An examination of current knowledge about the composition and state of the earth's interior revealed by geophysical observations. Seismic velocity and mass density distributions; equations of state; phase changes; energy balance and temperatures; constraints on composition from extraterrestrial samples and exposed rocks; spherical and aspherical variations of properties. Prerequisites: calculus and differential equations, basic chemistry and physics, or consent of instructor. Akber/Masters (S)

**225. Physics of Earth Materials (4)** Mathematics and physics of continuous media, focusing on geophysical problems. Topics include deformation, stress, conservation laws, elasticity, attenuation, viscoelasticity, fracture mechanics, and porous media. Prerequisite: consent of instructor. Agnew, Fialko (F)

**226. Introduction to Marine Geophysics (4)** Methods of exploration geophysics with emphasis on those useful at sea. Magnetic and gravitational potential field methods, multi-beam echo sounding reflection and refraction seismology will be covered. Recent papers from the literature will also be read and discussed. Prerequisites: differential equations; at least one geology course. (S/U grades permitted.) Dorman, Chadwell (W)

**227A. Introduction to Seismology (4)** Introduction to seismometers and seismograms; stress and strain; potentials and the wave equation; geometrical ray theory and travel times in layered media; representation of seismic sources; WKBJ and synthetic seismograms; seismic hazards and other applications of seismology. Prerequisite: consent of instructor. (S/U grades permitted.) Shearer (W)

**227B. Advanced Seismology I (4)** Introduction to low-frequency digital data; continuum mechanics and the equations of motion; free oscillation solutions; construction of Earth models; excitation of free-oscillations and source mechanism retrieval; array processing of long-period data; modelling aspherical structure; surface waves. Prerequisite: consent of instructor. (S/U grades permitted.) Masters (W)

**227C. Advanced Seismology II (4)** High-frequency wave propagation; methods for computing synthetic seismograms including WKBJ, reflectivity and finite differences; body-wave spectra; attenuation of body waves; source physics; reflection and refraction

seismology; seismic tomography. Prerequisite: consent of instructor. (S/U grades permitted.) Staff (S)

**229. Gravity and Geomagnetism (4)** Introduction to potential theory, with applications to gravity and geomagnetism. Topics include the geoid, spherical harmonics, Laplace's equation, the Dirichlet problem on a sphere, and Fourier methods. Gravity anomalies and geomagnetic field modeling and sources are discussed; also paleomagnetic observations. Prerequisites: advanced calculus, differential equations, complex variables, and familiarity with Maxwell's equations, or consent of instructor. (S/U grades permitted.) C. Constable, Parker (S)

**230. Introduction to Inverse Theory (4)** Solution of linear and nonlinear inverse problems in geophysics by optimization techniques such as norm minimization and linear programming. Construction of models by regularization; inference by bounding functionals. Illustrations from gravity, geomagnetism, and seismology. Prerequisite: consent of instructor. (S/U grades permitted.) Parker (W)

**231. Introduction to EM methods in geophysics (4)** Introduction to electromagnetic methods for both global geophysics and applied/exploration methods. Covers history of EM Induction, conduction in rocks, binary mixing laws, self potential, induced polarization, DC resistivity, magnetotellurics, geomagnetic depth sounding, elementary inverse methods, global conductivity structure, and marine EM methods. Constable (W)

**233. Introduction to Computing at SIO (4)** Introduction to the SIO computing environment and common software tools in geophysics and other disciplines. Topics include UNIX, Matlab, Postscript, GMT, LaTeX, HTML, and a scientific programming language such as C or Fortran90. Prerequisite: consent of instructor. (S/U grades permitted.) Staff (F)

**234. Geodynamics (4)** A general course on the dynamics and kinematics of the solid earth based on the text of Turcotte and Schubert. Topics include plate tectonics, heat flow, lithospheric cooling, flexure, viscous flow, global gravity, crustal structure, and other related topics. Prerequisite: familiarity with partial differential equations and Fourier transforms. (S/U grades permitted.) Sandwell (F)

**236. Satellite Remote Sensing (4)** A general course on physical principles of remote sensing based on the text by Rees. Topics include: orbit geometries and platforms; propagation, reflection, and emission of electromagnetic waves; electro-optical systems; passive microwave systems, ranging systems; and scattering techniques such as SAR. Prerequisite: consent of instructor. (S/U grades permitted.) Sandwell (F)

**239. Special Topics in Geophysics (1-4)** Special course offerings by staff and visiting scientists. Example topics are seismic source theory, geophysical prospecting methods, dislocation theory and seismic mechanisms, tectonic interpretation of geodetic data, and dynamo theory. (S/U grades permitted.) Staff (F,W,S)

**247. Rock Magnetism and Paleomagnetism (4)** Rock magnetism and acquisition of magnetic remanence in geological materials as well as laboratory procedures and data analysis (isolating remanence components and statistical approaches). The paleomagnetic literature will be used to illustrate applications in geological and geophysical problems. *Prerequisites: one year each of college-level physics and geology; mathematics through calculus.* (S/U grades permitted.) Tauxe (S)

**249. Special Topics in Marine Geology (1-4)** Special course offerings by staff and visiting scientists. (S/U grades only.) Staff (F,W,S)