hydrologic sciences (a graduate group)

gregory pasternack, ph.d., chairperson of the group

human rights

program objectives

in addition to completing religious studies 90 or 134, students must take two additional core courses. in addition to the elective course list, students must select courses from at least three different departments or programs to satisfy minor requirements.

minor program requirements:

units

religious studies 90 or 134 ........................ 4

choose two core courses from the following:

- history 142a, religious studies 131, sociology 104, spanish 159†, 160
- anthropology 123b, 126b, 130a, 131
- chicana/o studies 131/131s, 150
- english 107, history 142a, 142b, 172a, 177a, 178a,b, 183a, 189
- native american studies 11s, 130b, 130c, 157
- religious studies 131, 167, sociology 104, 130, 137, 157, 160, 171, spanish 159i, 175s
- women's studies 102, 140, 170, 182 collagen
- with prior permission of the interdisciplinary minor in human rights advisor, students may substitute one course from the list of electives as a core course.
- when taught as "witnessing in latin america: trauma, violence and memory.

advising.

religious studies program office, 213 sproul hall 530-752-1219

courses in human rights (hmr)

upper division

120a. art, architecture, and human rights (4)
lecture/discussion—4 hours. prerequisite: consent of instructor. study of human rights as they relate to art, architecture, and cultural heritage. examines museums, art collections, and cultural-heritage management, their relationship to the cultural prerogatives of communities and indigenous groups, and protection of cultural heritage during war and conflict.

130. special topics in human rights (4)
lecture/discussion—3 hours; term paper. prerequisite: course 134 or religious studies 134 recommended. thematic study of human rights. topics may include contemporary or historical issues in the protection, promotion, and violation of human rights; human rights and the arts, religion, literature are possible topical areas. no credit for students who have completed religious studies 90. (same course as religious studies 134) may be repeated for credit when topic differs. ge credit: art/hum or socsci | ah | ss, wc, w—iii.

131. genocide (4)
lecture/discussion—3 hours; term paper or discussion—1 hour. prerequisite: upper division standing. comparative and critical study of the modern phenomenon of genocide, ethical and historical perspectives. (same course as religious studies 131.) offered in alternate years. ge credit: art/hum or socsci, div, wrt | ah | ss, vl, wc, we. —iii.

134. human rights (4)
lecture/discussion—3 hours; term paper or discussion—1 hour. introduction to the interdisciplinary study of the origins, evolution, denial and protection of human rights. no credit for students who have completed religious studies 90. (same course as religious studies 134.) offered in alternate years. ge credit: art/hum or socsci, div, wrt | ah | ss, vl, wc, we. —iii.

198. directed group study (1-4)
prerequisite: consent of instructor. group study on focused topics in human rights. may be repeated for credit. (p/np grading only.)—i, ii, iii, iv.

199. special study for advanced undergraduates (1-3)
prerequisite: consent of instructor. opportunity for advanced undergraduate students to work with a faculty member in a focused manner on a topic or topics of human rights. may be repeated for credit. (p/np grading only.)—i, ii, iii, iv.

graduate

200a. history, theory and criticism of human rights (4)
seminar—3 hours; term paper. prerequisite: graduate standing or consent of instructor. restricted to graduate students. introduces the advanced study of human rights and the theoretical and practical elaboration of the international human rights system. seminar will engage with criticism of human rights and develop research and teaching within disciplinary and interdisciplinary frameworks. (same course as study of religion 231e.) offered in alternate years.—ii.

200b. memory, culture, and human rights (4)
seminar—3 hours; term paper. prerequisite: graduate standing or consent of instructor. restricted to graduate students. explores the multiple convergences among memory, culture, and human rights. discusses diverse approaches to how societal actors in different historical, cultural, and national settings, construct meanings of past political violence, intergroup conflicts, and human rights struggles. (same course as cultural studies 210.) offered in alternate years.—i.

Hydrologic Sciences

professional

396. teaching assistant training practicum (1-4)
prerequisite: graduate standing. (s/u grading only.)
of water on earth. Because of water’s ubiquity and importance to physical, chemical and biological processes, hydrology involves the geologic, atmospheric and oceanic sciences, as well as engineering and other applied physical sciences. Basic to the program are core courses in fluid dynamics, hydrogeology, chemistry, hydrology, and hydrologic policy. Students can pursue specializations in hydrogeology, surface hydrology, subsurface hydrology, irrigation and drainage, watershed hydrology and water resources management. The subsurface hydrology specialization includes hydrogeology and vadose-zone hydrology.

Preparation. Applicants to the program are expected to have completed, or to be completing an undergraduate degree in environmental or physical sciences, mathematics, or engineering. Undergraduate study must include one year each of calculus, physics with calculus, and of chemistry. A second year of vector calculus, linear algebra and differential equations is recommended and will be required, before completion of graduate work. Additional courses in applied statistics, computer programming, and geology are recommended.

Specialization. Each student will pursue an individual program of advanced study under the direction of a group of faculty members with similar interests but different specializations. Course work in addition to the above is typically taken in the most appropriate departments.

Graduate Adviser. Graham Fogg, Ph.D., Peter Hennes, Ph.D., and Carlos Puente, Ph.D.

Graduate Admissions Adviser. Mark E. Grismer, Ph.D.

Courses in Hydrologic Sciences (HYD)

Graduate

200. Survey of Hydrologic Sciences (1)
Seminar—1 hour; term paper. Prerequisite: open to students in the Hydrologic Sciences program. Seminar covers historical aspects of Hydrologic Sciences involved in the program. Students prepare a paper and presentation in their area of research interest. May be repeated two times for credit. (S/U grading only).—III. Grismer

205. Continuum Mechanics of Natural Systems (4)
Lecture/discussion—4 hours. Prerequisite: Mathematics 210 and 228, Physics 9B. Continuum mechanics of static and dynamic air, water, earth and biological systems using hydraulic, heat and electrical conductivity; diffusivity; dispersion; strain; stress; deformation gradient; velocity gradient; stretch. Examination course as Biological Systems Engineering 205.—III. Wallender

210. Vadose Zone Transport Processes and Modeling (3)
Lecture/discussion—3 hours. Prerequisite: Soil Science 107, Mathematics 228, programming language, or consent of instructor. Principles and modeling of water flow and chemical transport in the vadose zone, with specific applications to soils. Topics include hydrologic properties, finite difference approximation to unsaturated water flow, parameter optimization, diffusive and convective transport in gaseous and liquid phases. Offered in alternate years.—III. Harter

243. Water Resource Planning and Management (3)
Lecture—3 hours. Prerequisite: course 141 or Civil and Environmental Engineering 142. Applications of deterministic and stochastic mathematical programming techniques to water resource planning, analysis, design and management. Water allocation, capacity expansion, and reservoir operation. Consideration of surface water and groundwater. Water quality management. Irrigation planning and operation models. (Same course as Biological Systems Engineering 243.)—I; Marino

252. Hillslope Geomorphology and Sediment Budgets (4)
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 141 or Geology 35 or Civil and Environmental Engineering 142 or consent of instructor. Exploration of theoretical and empirical foundations of sediment production on hillslopes using computer models and case studies. Survey of the processes and landforms associated with sediment deposition in the coastal zone. Application of geomorphic principles to coastal management issues. Offered in alternate years.—I. Pasternack

256. Geomorphology of Estuaries and Deltas (4)
Lecture—3 hours; fieldwork—3 hours. Prerequisite: course 141 or Geology 35 or Civil and Environmental Engineering 142. Hands-on experience with sedimentary processes, estuary restoration and delta management. Survey of the processes and landforms associated with coastal sedimentation and associated geological and geomorphic processes. Offered in alternate years.—III. Puente

264. Modeling of Hydrologic Processes (3)
Lecture—3 hours. Prerequisite: course 141 or the equivalent and Statistics 102 or the equivalent. Techniques used to model the spatial-temporal structure of rainfall and runoff are introduced. Procedures studied include those based on stochastic point processes, chaos theory, fractal geometry, and fractional noises. Offered in alternate years.—III. Puente

269. Numerical Modeling of Groundwater Systems (3)
Lecture—3 hours. Prerequisite: course 145A or Civil Engineering 144 and course 145B, Mathematics 228. Finite difference and finite element techniques in modeling groundwater transport. Fundamentals of constructing and calibrating models with hands-on applications. Methods and limitations of numerical solution of transport equations. Model interpretation and ethics. (I, III.) Fogg

273. Introduction to Geostatistics (3)
Lecture—3 hours. Prerequisite: Statistics 130A and 130B, or the equivalent. Statistical treatment of spatial data with emphasis on hydrologic problems. Topics include theory of random functions, variogram analysis, Kriging, co-Kriging, indicator geostatistics, and stochastic simulation of spatial variability. Demonstration and use of interactive geostatistical software included. Offered in alternate years.—I. Fogg

274. Practice of Groundwater Flow and Transport Modeling (3)
Lecture—2 hours; laboratory—1 hour; project.—0.5 hours. Prerequisite: course 269, Civil and Environmental Engineering 2728, or Civil and Environmental Engineering 272C. Selecting and building groundwater flow and transport models. Plan an exploration, presentation, and review of modeling projects. Review of methods, assumptions, and limitations of groundwater models; practicing with MODFLOW, MT3D, associated GUIs, and groundwater modeling software of choice. Offered in alternate years.—III. Harter

275. Analysis of Spatial Processes (3)
Lecture—3 hours; laboratory—1 hour. Prerequisite: Statistics 102 or the equivalent; course 273 or Statistics 273A recommended. Characterization of homogeneous random fields; extremes and spectral parameters; geometry of excursions, local averaging; scale of fluctuation; non-Gaussian random fields, geostatistical applications. Offered in alternate years.—III. Puente

286. Selected Topics in Environmental Remote Sensing (3)
Discussion—2 hours; lecture—1 hour; project. Prerequisite: consent of instructor; Environmental and Resource Sciences 186 or equivalent required; Environmental and Resource Sciences 186 recommended. In-depth investigation of advanced topics in remote sensing applications, measurements, and theory. (Same course as Geography 286) May be repeated for credit. Offered irregularly.—I. Usin

Hydrology

(Hydrology Section)

Seminars, on page 364, Hydrology Section.

The Major Program

Hydrology is the study of the occurrence, distribution, circulation, and behavior of water and waterborne materials in the environment of Earth. It includes practical measurement and theoretical analysis of water phenomena underground, on the Earth’s surface, and in the atmosphere. Contemporary hydrologic problems continue to occur and are solved through the application of understanding, knowledge, and technology. The management of these problems demands hydrologic scientists with the comprehensive, interdisciplinary education embodied in this program. Beyond its societal utility, hydrology can be an exciting science for the curious-minded. Hydrologists explore natural phenomena such as climate change, waterfalls, health of coral reefs, biogeochemical cycles, and aquifers.

The Program. A hydrologist needs a strong background across the basic sciences of physics, mathematics, chemistry, and biology. Breadth of understanding comes from exposure to ecology, geology, engineering, policy, and law. Depth of experience is provided by core hydrology courses, internship opportunities, and practical outdoor training. Students choose electives to match their interests and career goals. Transfer students should have completed as much as possible of the preparatory subject matter listed below.

Internships and Career Alternatives. Job opportunities in hydrology exceed the available supply of trained hydrologists. Students commonly obtain internships and jobs with state and federal agencies and large consulting firms.