**Water-Related Courses Taught at SSU**

Water-related topics are taught across campus. This list brings together a description of courses with curriculum related to water. The list helps community partners identify faculty and students with interests in water projects. We list only those courses that have been taught since 2010. Four letter codes represent Department names.

**Conservation & Restoration**

* GEP 200 Global Environmental Issues. Lecture-discussion, 3 hours. An introduction to environmental studies and planning, including: humans in relation to the global ecosystem; an overview of problems of energy use, pollution, resource depletion, population growth, food supply, urbanization, climate change and biodiversity and the search for solutions and future prospects. Satisfies GE, category D5 (Contemporary International Perspectives).
* GEP 315 Environmental Forum. Regular weekly departmental lecture series. Outside professional speakers and ENSP alumni and faculty report on environmental topics and opportunities for environmental careers. Cr/NC only.
* GEP 340 Applied Ecology This course explores major concepts of ecology and examines current environmental issues in light of these concepts. Topics include: relationship between organisms and the physical environment, community-level ecological processes, the structure and function of ecosystems and their distribution on the planet, evolutionary processes, and population ecology. Environmental issues include loss of biodiversity, global climate change, invasive species and others. Development of speaking and writing skills is a significant element of the course. Field trip required. Prerequisite: ENSP majors and minors; completion of Area B2 or consent of instructor.
* GEP 444 Native Plant Propagation. Field course in applied aspects of propagation of plants native to the local area. Topics include native plants and plant communities; techniques for collecting, growing, and planting native plants; and ecologically sound guidelines for col­lection and reintroduction of native plants. Experimental approaches to improve propagation success are emphasized. Course provides native stock for restoration of local riparian habitats
* GEP 323 Conservation of Natural Resources. This class explores the use and management of natural resources. Each year, it focuses on a different set of renewable and non-renewable resources, such as water, oil, diamonds, rangeland, and others. It addresses topics such as distribu­tion, scarcity, substitution, access and use-rights, resource cartels, regulation and sustainability. It also looks at how these issues are changing under globalization and the rise of transnational corporations.
* GEP 359 Special Topics in Conservation and Restoration. Interdisciplinary seminar addressing ecological, historical, cultural, social, and/or policy aspects of different natural resource topics each year. Examples of topics could include forestry, wetlands ecology, fisheries, management, endangered species protection, etc. Students will read and discuss material from diverse sources to achieve a thorough understanding of a particular issue in conservation and restoration, allowing them to participate constructively in on-going policy and management debates. Open to juniors, seniors, and graduate students only or consent of instructor.
* GEP 445 Restoration Ecology. Field course introducing major concepts and practical aspects of restoration ecology and land management. Topics include: the conservation context of restoration, restoration goals, measuring success, experimental approaches, dynamic systems and change over time, disturbance, restoring animal populations and the role of animals in ecosystem restoration, and educational elements of restoration. Practical techniques covered include: seed collection, ex-situ seed and plant management and propagation, invasive species removal, planting native species, and others. Topics are addressed in a variety of diverse local systems. Prerequisites: ENSP 302 or BIOL 122, or consent of instructor. Course fee.
* GEP 331Restoration and Society (Restoration Seminar. This seminar focuses on the ideas and theories behind environmental restoration work and asks some critical questions about current challenges in the field: Where did the idea of restoration come from? What are the goals of environmental restorations, and how do you know if a project is meeting those goals? What do we really mean by the terms “wilderness,” “native,” “diversity,” and so forth? Do environ- mental mitigation projects really work? We will also look at several real-work cases of restoration projects through the semester. Prerequisite: juniors, seniors and graduate students.

**Culture & History**

* ANTH 200 Introduction to Linguistic  
  In its examination of culture and linguistics, Anthropology 200 will in part focus on how water and its physical presence figures into linguistic systems. This introduction to the anthropological study of language surveys core topics in linguistics (e.g., phonetics, morphology, syntax, semantics, and pragmatics) and the relationship of language to social, cultural, and psychological factors. Nonverbal communication, evolution of language abilities, and historical linguistics are included, with linkages to the other subfields of anthropology. Satisfies GE Area D5.
* LIBS 201 Exploring the Unknown (12)   
  An investigation of the meaning and limits of knowledge with respect to the nature of the mind and physical reality. These issues are pursued through several different but interrelated fields of study, including literature, art, philosophy, comparative religion and science. The course considers Newtonian and quantum mechanical theories of physical reality, the religions of various cultures, and the functions of myth. The term includes a section focusing on the nature of human creativity.
* LIBS 202 Challenge and Response in the Modern World (12)   
  An examination of modern accomplishments and problems that have derived from several sources: the 18th century mechanical models, the Scientific and Industrial Revolutions, and the rise of modern economic theories. Asking how it is possible in the 21st century to live a moral life, the course examines the rise of individualism, the tension between personal and social values, the problems of poverty and the distribution of wealth, and the multiple consequences of modern technology upon the human and natural environments.
* ANTH 203: Introduction to Cultural Anthropology  
  Examination of the anthropological approach to the study of human behavior. Exploration of human dependence on learned, socially transmitted behavior through consideration of ways of life in a broad range of societies. The course will examine ethnographies of peoples ranging from Africa to Alaska that have connections to the Water Works theme.
* GEP 330 Environmental History. History of the American environment and the ways in which different cultural groups have perceived, used, managed, and conserved it from colonial times to the present. Changes in attitudes and behavior toward nature and the conservation/environ- mental movements are also examined. Prerequisite: Completion of GE category A (Communication and Critical Thinking).
* GEP 320 Geopolitics. In this course we dig deep into the field of geopolitics, the struggle for control over territory, transportation corridors, and natural resources. We analyze the origin of the discipline, its historical development, and key contemporary issues, including the Iraq War, the U.S. missile defense shield and the expansion of NATO, the promo- tion of democracy as a security strategy, Iranian nuclear ambitions, and Chinese military expansion. We will also examine the upsurge of nationalism since the end of the Cold War, and examine ethno-national rebellion from multiple perspectives, including the failure of nation-building, the failure of economic development, and competition over scarce natural resources.
* ANTH 341: Emergence of Civilizations  
  A presentation of theory and data related to the development and characteristic features of civilization. Water Works themes will be explored as part of the course. Such crucial issues as the domestication of plants and animals, the appearance of stratified societies, the emergence of urban life, the emergence of literacy and its implications for thought, and the emergence of the state will be addressed from a comparative perspective. The course takes a global approach to these topics, covering materials from Southwest Asia, Africa, the Mediterranean, and North, Central and South America. Not applicable to the Archaeology subfield requirement for the anthropology major. Satisfies upper-division GE, category D2 (World History and Civilization). Prerequisite: upper-division standing or consent of instructor.
* GEP 337 Landscapes of the American West. Use of and interactions with natural resources have transformed the American West over time, and greatly affected the western environment as we know it today. This seminar takes a historical look at the settlement, development, and management of the western landscape, both in terms of natural resources (timber, **water,** grazing, parks etc.) but also in terms of cultural settlement and use - and considers landscape as a tool for understanding the cultural/social/political history of a place. Students can expect to do some serious reading, writing, and thinking about how and why the West has become such a distinctive natural and cultural landscape. Open to juniors, seniors, and graduate students only or consent of instructor.
* HIST 472 California History I (4)   
  Study of California history from the period of European contact through the early years of the 20th century. Special attention is given to the origins, means, and consequences of Spanish expansion into Alta California, to the emergence of Mexican California and to its accelerated Americanization after the Treaty of Gua­dalupe-Hidalgo. The closing weeks of the course will include attention to themes that, though rooted in the earlier period, continue to shape present-day California. Among those themes are **water policies**, immigrations, and the consequences of California’s great size and of its location on the Pacific.

**Economics & Business**

* GEP 325 Global Food Systems: Scarcity and Sustainability. This course explores the development of agriculture from its origins to its modern forms. It discusses the historical development and current structure of five agri­cultural systems: small and large corporate farms in the development of the world, as well as traditional peasant production systems, plantations and green revolution forms in the developing world. It then considers issues such as world hunger, food aid, global commodity trade, and the affect of biotechnology in both the developed and developing world.
* BUS 340W Survey of Human Resource Mgmt/Wine (4)   
  Survey of Human Resource Management/Wine examines the same subject matter as BUS 340 Survey of Human Resource Management. However the focus of BUS 340W is on the practice of human resource management in the wine industry and special issues encountered within that industry. There are frequent guest appear­ances by human resource professionals working in the wine industry. Credit may not be received for both BUS 340 and BUS 340W. Prerequisite: BUS 211 and BUS 225.
* ECON 381 Natural Resource and Environmental Economics (4)   
  A study of public and private sector strategies for achieving the optimal use of natural resources and the control of pollution. Topics include: energy, **water**, minerals, forests, air pollution, climate change and the valuation of environmental benefit and costs. Prerequisites: ECON 204 and 205, or consent of instructor.
* BUS 555W Sustainability in the Wine Hospitality Industry (3)   
  Current theory and practice of how wine and hospitality businesses can become sustainable business. Course content includes business rationale for adopting environment and social equity practices for improved business performance and success. Students analyze and debate cutting-edge issues in sustainability includ­ing a review of global wine and hospitality businesses using sustainable practices; audit and compliance; energy management systems; ISO standards; creation of sustainable business strategies; development of policies and practices for sustainable practices for operations; success measures; and cost-benefit analysis. Prerequisite: Classified Graduate status in the Wine M.B.A. Concentration.

**Hydrology, Geology, Climate**

* GEOL 102: Our Dynamic Earth (Introductory Geology)(3)  
  Lecture, 2 hours; laboratory, 3 hours. A study of the minerals, rocks and landforms that make up our Earth in the context of the dynamic forces that form them. Emphasis on local geology, including earthquakes and other environmental aspects. Laboratory study of minerals, rocks and maps. Required one-day weekend field trip. Fee required. Satisfies GE, category B1 (Physical Sciences) and GE laboratory requirements.
* GEOL 204 Global Environmental Systems. An integrated study of the physical environment, focusing on the processes and relationships between the four spheres: the atmosphere, biosphere, **hydrosphere**, and lithosphere. Major topics include global and regional patterns of climate and weather, soils, distribution of plants and animals on earth, and erosional and depo­sitional processes that create landforms on the earth’s surface. Also explored are possible links between human activities and changes in climate and vegetation patterns and dominant landform processes. Field trips and hands-on lab exercises included. Satisfies GE, category B3 (Specific Emphasis in Natural Sciences).
* GEOL 110: Natural Disasters (3)  
  A course to examine the interaction between natural processes and human activi- ties and the often costly and fatal results. Course emphasis will be on the principles underlying natural disasters such as earthquakes, volcanic eruptions, landslides, floods, severe weather, coastal processes, asteroid impacts, fires, great dyings, and population growth. Many examples will be drawn from the northern California area. Course content may vary with instructor. Satisfies GE, category B3 (Physical Sciences, Specific Emphasis).
* GEOL 302: Geology of Climate Change (3)  
  Lecture, 3 hours. Climate changes on time scales of days to millions of years. We will review methods by which the amplitude and pacing of climate changes are measured, use data analysis to assess the significance of past climate variability, and consider interpretations and theories proposed to explain Earth’s climate. Prerequisites: GEOL 102 and CHEM 115A.
* GEP 352 Soil Science. An introduction to soil science emphasizing applications to agronomy, archaeology, botany, ecology, engineering, geography, geology, land use planning, hazard­ous materials management, and **water quality**. Technical exercises emphasize low-cost scientific analytical equipment. Prerequisite: completion of GE, category B (Natural Science and Mathematics).
* GEOL 311: Sedimentary Geology (4)  
  Lecture, 3 hours; laboratory, 3 hours. The description, classification and origin of sedimentary rocks. Discussion of weathering and origin of sediment, sediment transportation and sedimentary structures, clastic and nonclastic classification; and petrology. Prerequisite: GEOL 303 and 304.
* GEOL 312: Field Course in Sedimentary Geology (1)  
  Lecture, 1 hour. Field studies done in conjunction with GEOL 411. Required week- end field trips. Prerequisites: GEOL 303 and concurrent enrollment in GEOL 311. Students must be in good physical condition.
* GEP 441 Physical Geography Lab Methods  
  This course provides hands-on experience with laboratory analysis techniques commonly used in physical geography. Topics include stratigraphic and laboratory analyses, report writing and data presentation.  Data collected from sediment profiles will be used to interpret environmental conditions.   Students will follow laboratory methods, protocols and use analytical equipment.
* GEOL 323 Hydrology. Lecture, 3 hours. Water as a natural resource, the hydrologic cycle, distribution of water on the earth. Atmospheric water, soil water, runoff and groundwater as related to water supply and use. Applications to problems of flood control, water management and water pollution, with special emphasis on California and Sono­ma County. Prerequisites: GEOL 102 or consent of instructor; MATH 106 or 107.
* GEP 350 Geomorphology. Lecture 3 hours; laboratory, 3 hours. Explores the relationships between surface processes such as weathering, mass movements, **running water**, wind, waves and glacial ice, and the landforms these processes create. The course looks at geo­morphic systems and the role of tectonics and climate in changing the balance of these systems. Actual research projects are presented to demonstrate geomorphic approaches to environmental questions. Students are exposed to research meth­ods in the field and lab. Field trips and field reports, use of maps, and hands-on labs are included. A fee will be charged for this course. Prerequisites: GEOG 204, GEOL 102, or consent of instructor.
* GEP 356 Global Climate Change: past, present and future. An advanced course focusing on evidence of climate change in the past and potential climate change in the future. Present research methods used to investigate past climate and project possible climatic trends will be studied. The range of theories regarding past, present and future climate, and the response of the environment to such changes will be explored in detail. Prerequisite: GEOG 204 or consent of instructor.
* GEP 351 Natural Hazards. Natural hazards do not exist alone, but in reference to people. This course provides a survey of natural hazards in relation to human populations and activities around the world. The focus is on natural disasters generated by weather, climate, geomorphic, and biogeographical events and processes. Students study natural occurrences such as drought, severe weather, hurricanes and tornadoes, as well as fires and air pollution events. We also look at landslides, floods, volcanic eruptions, tsunamis, earthquakes, and disease dispersals such as ebola, and bird flu. Hazards related to global climate change are also explored. Basic concepts regarding risk assessment, hazard perception, population change, and impact on the built environ- ment are studied. Prerequisite: GEOG 204 or consent of instructor.

**Organisms & Ecosystems**

* BIOL240 General Microbiology (4)   
  Lecture, 3 hours; laboratory, 3 hours. An introduction to the organization and characteristics of microorganisms, including bacteria, fungi, protists and viruses. Topics include their role in agriculture, industry and disease processes. Prerequisites: BIOL 110 or 115, and CHEM 115AB or 105.
* BIOL 312 Biological Oceanography (3)   
  Lecture, 3 hours. An introduction to the world's oceans with emphasis on the way in which their physical properties support life. Satisfies GE, category B3. Prerequisite: BIOL 110, 115 or 121/122.
* BIOL 322 Invertebrate Biology (4)   
  Lecture, 3 hours; laboratory and field, 3 hours. Exploration of the systematics, functional morphology, behavior, and ecology of invertebrate animals. Prerequisite: BIOL 121 and 122
* BIOL 323 Entomology (4)   
  Lecture, 3 hours; laboratory and field, 3 hours. A comprehensive foundation in the biology of insects, with emphasis on ecology, behavior, evolution, and systematics. Emphasis on the diagnostic features of insects and their major orders. Prerequisites: BIOL 121 and 122.
* BIOL327 Vertebrate Biology (4)   
  Lecture, 3 hours; laboratory and field, 3 hours. Exploration of the systematics, behavioral ecology, biogeography, evolution, and conservation biology of fish, am­phibia, reptiles, birds, and mammals. At least one weekend field trip. Prerequisites: BIOL 121 and 122.
* BIOL 329 Plant Biology (4)   
  Lecture, 3 hours; laboratory, 3 hours. An overview of plant biology, with focus on structure, function, reproduction, and evolution. Emphasis is on flowering plants, but a survey of all plant and plant-like organisms, both modern and extinct, is included. Prerequisites: BIOL 121 and 122.
* BIOL 330 Plant Taxonomy (4)   
  Lecture, 3 hours; laboratory and field, 3 hours. An introduction to the principles and practices of plant taxonomy, including approaches to classification, data analysis, and a survey of vascular plant families in the California flora. A minimum of two Saturday field trips is required. Prerequisites: BIOL 121 and 122.
* BIOL 335 Marine Ecology (4) Lecture, 3 hours; laboratory and field, 3 hours. An overview of current topics in marine ecology and conservation with emphasis on ecology of coastal ecosystems. Extensive focus on field and laboratory research projects. Includes experimental design, data analysis, and presentation. At least three 5-hour field trips outside of scheduled class time. Prerequisites: BIOL 121 and 122 and MATH 165.
* BIOL 340 General Bacteriology (4)   
  Lecture, 3 hours; laboratory, 3 hours. An introduction to prokaryotes covering their cell structure, metabolic diversity, interactions with other organisms, and pivotal roles in biogeochemical cycling. Laboratory projects develop skills essential for studies of bacteria. Laboratory in two 1.5 hour sessions per week. Prerequisites: BIOL 123 and CHEM 335A.
* BIOL348 Plant Physiology (4)   
  Lecture, 3 hours; laboratory, 3 hours. Concepts and principles of plant function. The following areas are investigated in detail: photosynthesis, **water** relations, mineral nutrition, and plant growth regulation. Prerequisite: BIOL 123.
* BIOL 463 Herpetology (4)  
  Lecture, 3 hours; laboratory and field, 3 hours. Classification, functional and evolutionary morphology, environmental physiology, and ecology of reptiles and amphibians. Includes at least one weekend field trip. Prerequisite: BIOL 327 or 328.

**Planning, Policy & Politics**

* GEP 364 Environmental Planning. Review of land use planning and regulation as it relates to the protection of various natural resources and environmental systems. Course subject matter varies and may include wetlands, open space, biodiversity, endangered species, coastal resources, agricultural land, forests, land subject to flooding, multi-species habitat planning, and air quality. Regulatory tools used to ensure resource and environmental protection. Prerequisite: ENSP 310 and/or ENSP 401 recommended, juniors, seniors and graduate students.
* GEP 366 Planning for Sustainable Communities. Sustainability as a concept in environmental and land use planning. Definitions and models of sustainability. Evaluation of sustainable development on global, national, regional, and local levels. Practical experience with city and county planning for sustainability. Prerequisite: ENSP majors and minors; juniors, seniors, and graduate students. ENSP 310 recommended.

**Supporting Techniques**

* MATH 175/375 Mathematics Colloquium (1)  
  A student taking this course will be required to attend all presentations in the M\*A\*T\*H Colloquium series during the semester and, in addition, keep a journal. May be taken three times for credit. Cr/NC only. Prerequisite: consent of instructor
* GEP 380 Remote Sensing and Image Processing (4)  
  Lecture, 3 hours; laboratory, 3 hours. In this class, students learn how to create land-cover maps from satellite imagery. Raw satellite images are imported into computer software programs, preprocessed for radiometric and geometric corrections, enhanced for better interpretation, and finally classified into land cover maps using various techniques. These land cover maps are then assessed for accuracy through field ground truthing using geographic positioning systems. Students make land-cover maps of Sonoma county and use these to monitor changing land-use and cover patterns. Students utilize various software programs, including IDRISI and ERDAS. The class incorporates hands on computer labs, field trips, and an independent project. Prerequisites: GEOG 205, no exception but can be taken concurrently. Laboratory fee may be charged; see current Schedule of Classes.
* GEP 387 Geographic Information Systems (4)   
  Geographic information system (GIS) technologies provide researchers and policy makers with a powerful analytical framework for making decisions and predictions. As with any technology, the appropriate use of GIS depends greatly on the knowledge and skills of the user. This course addresses the scientific and technical aspects of working with geographical data, so that GIS users understand the general principles, opportunities, and pitfalls of recording, collecting, storing, retrieving, analyzing, and presenting spatial information. Both fundamental concepts and “hands on” experience with state-of-the-art software are incorporated through readings, lecture discussion and laboratory assignments. The first half of the course focuses on the “nuts and bolts” of how a GIS works, while the second half concentrates on methods for spatial analysis and modeling. Prerequisite: CS 101 or basic competency with Microsoft operating system and Office applications, and GEOG 205 with no exception but can be taken concurrently. Laboratory fee may be charged; see current Schedule of Classes.
* MATH 470 Mathematical Models (3)   
  The process of expressing scientific principles, experiments, and conjectures in mathematical terms. Topics include: gathering reliable data, exposing underlying assumptions, variables, relationships, levels, refining of models, and stochastic models. Deterministic versus stochastic models. Applications to biology, physics, chemistry, geology, social science and environmental sciences. Prerequisite: MATH 211 or consent of instructor.
* GEP 487 Advanced Geographic Information Systems (3)   
  This course provides greater depth in the foundations of geographic information systems (GIS). Readings, group discussions, and lectures delve into database development issues, advanced spatial analysis, and GIS research applications. Students also complete a semester-long research project using GIS technologies. Students learn to identify problems that can benefit from a spatial-analytical approach and determine the appropriate data for pursuing such a project. Students build their own GIS database, mastering skills such digitizing and attributing spatial data; importing data from the internet; collecting field data for GIS integration; and converting GIS layers into a single coordinate system and map projection. Finally, students learn to choose and implement the most appropriate spatial analysis method for their research, and then interpret the results. Prerequisite: GEOG 387 or consent of instructor.
* ES 492 Engineering Science Senior Design Project Planning (2)   
  Lecture, 1 hour; laboratory, 3 hours. This course is the first phase of the capstone course. In the lecture part, the students will learn design techniques, how to plan a project, evaluate and perform trade-offs, make project presentations and write project reports. In the laboratory parts, the students will choose a project, do planning, acquire parts, components and other resources needed and start the project work.

**Water Quality & Water Technology**

* SCI 120: A Watershed Year Freshman Year Experience - Fall & Spring semesters. Created by a core team of faculty led by Physics Professor Jeremy Qualls, and funded by a grant from the National Science Foundation, this year-long course for first-time freshmen immerses students in real-world issues of environmental sustainability through hands-on work and outdoor field experiences at Center for Environmental Inquiry preserves. By design, Science 120 is an integrated course for students exploring their interest in the environment and considering a science major other than biology. Through real‐world problem solving done in collaboration with faculty, peer mentors, and community partners, students will learn biological principles, mathematical reasoning, and critical thinking skills to help understand and address global issues in the context of our local environment and Sonoma County’s watershed.
* CHEM 125AB Quantitative General Chemistry (5)   
  Lecture, 3 hours; discussion 1 hour; laboratory 3 hours (5 units). The second semester (CHEM 125B) starts by applying the topics covered in the first semester to chemical literature, chromatography, spectroscopy, biological chemistry, thermodynamics, electrochemistry, quantum mechanics, bonding, and kinetics. After completion of this course students will receive credit for the full year of general chemistry and one semester of quantitative analysis (CHEM 255). Prerequisite: CHEM 125A.
* LIBS 320B Elective Seminar Core B (3) Included in this core area are courses that deal with science and technology and their relationship to the individual and society. Students build upon their under- standing of the sciences and come to grips with some of the crucial issues posed by our culture’s applications of science and technology. Students write on topics which address scientific aspects of social issues, the contribution science makes to understanding issues of personal concern, and science as a social endeavor. Examples of seminars in Core B: Health and Healing, Machine as Metaphor, Global Food Web, and the Future of Energy. Prerequisite: LIBS 302 prior or concurrently or LIBS 202 prior.
* GEP 373 Energy, Technology and Society. A lecture/discussion course designed to assist students in understanding energy as a fundamental measure of organization, structure, and transformation in society. Principal topics include: energy history; thermodynamics; energy resources and conversion technologies; global issues and trends; environmental impacts; energy economics, institutions, and politics. Elementary quantitative analysis. Prerequisite: ENSP majors and minors, junior- or senior-level standing, and completion of GE Area B4 (Mathematical Concepts) and prior or concurrent enrollment in ENSP 202.
* GEP 473 Thermal Energy Management. An introduction to energy management in residential and commercial buildings, focusing on space heating and cooling, and **hot water**. Fundamentals of heat transfer, thermal properties of building materials, building load calculations, and energy economics. Prerequisite: ENSP majors, completion of MATH 107, MATH 161 or ENSP 202, PHYS 114 or PHYS 210A or equivalent.
* BIOL 338 Environmental Microbiology and Biotechnology (4)   
  Lecture, 3 hours; laboratory, 3 hours. Examines microbial ecology and diversity along with biotechnological applications of microbes in agriculture, **wastewater** treatment, bioremediation, and biofuel production. Satisfies the ENSP Hazardous Materials Management and Water Quality Technology core requirement. Prerequi­sites: BIOL 121/122 and CHEM 115AB, or consent of instructor.
* GEP 476 Small Scale Energy Sources. Course will focus on functional design of small-scale wind, photovoltaic, biomass, and hydroelectric energy sources. Siting, evaluating potentially available power, design of fully operable installation, and by-products and **waste streams** will be discussed. Energy storage mechanisms, interconnections to existing energy networks, and energy cost comparisons will be examined. Prerequisite: ENSP 338 or consent of instructor.