

Courses with a Focus on Sustainability

Course	Course #	School	Description
South American Indians of the Past and Present	ANTH3313	Dedman	A survey of the archaeology and ethnology of indigenous South Americans, from c. 13,000 years ago to recent times, focusing on environments, subsistence, and related levels of sociopolitical integration from Tierra del Fuego to the Amazon basin and the Andes.
Human Ecology	ANTH3319	Dedman	Examines interactions between human populations and their environments. Relationships between population size, technology, climate, and behavior in various living societies are explored.
Paradise Lost? The Archaeology and Ethics of Human Environmental Impacts	ANTH3384 CFA3384	Dedman	Interdisciplinary archaeological, anthropological, and historical examination of human impacts on the environment around the world over the last 50,000 years.
Sustainable Living	ANTH3385 CFA3385	Dedman	This course focuses on environmental challenges facing society and strategies for achieving a more sustainable existence.
Environmental Anthropology and Development	ANTH4346	Dedman	Analyzes the processes of globalization from the perspective of environmental anthropology and development.
The Natural Environment	BIOL1305	Dedman	An introduction to major environments and their resident populations for the nonscience major.
Plant Biology	BIOL1308	Dedman	An introduction to the economic, social, and industrial aspects of plant substances and material.
Ecology	BIOL3307 GEOL3307	Dedman	Basic principles and concepts of ecology, with emphasis on population and community interactions.
Ecology and Human Impact in the North and Baltic Seas	BIOL3310	Dedman	Marine ecosystems and communities, and their distribution and function in the North and Baltic seas. Problems related to human activities, e.g., fisheries, habitat deterioration, eutrophication, and pollution. Ecosystem approach, sustainability, and precautionary principle in management.
Tropical Ecology and Sustainable Development	BIOL3311	Dedman	Examines the ecological impact of human activity, especially agriculture, in a tropical country. Topics include water pollution, waste management, and climate change.
Environmental and Human Toxicology	BIOL4360	Dedman	Introduction to environmental toxicology, focusing on the fate and transport, biotransformation, and biochemical and physiological impacts of pollutants on humans and wildlife.

Environmental Chemistry	CHEM5390	Dedman	An examination of the chemistry of Earth's environment, and of environmental problems caused by anthropogenic activities. Topics include aquatic and soil chemistry, nuclear chemistry, alternative energy, CO <sub>2</sub> neutral, bio- material and green technologies, atmospheric chemistry and global warming.
Earth Systems	GEOL1301	Dedman	Examines geologic change within the earth as governed by physical, chemical, and biological processes, as well as interactions among the solid earth, oceans, atmosphere, and biosphere.
Oceanography	GEOL1305	Dedman	A study of the physical (geological), biological, and chemical processes responsible for the ocean, as it exists today. Examines the impact of man on the oceans and oceanography's role in resource development, climatic and environmental modification, and other human concerns.
Earthquakes and Volcanoes	GEOL1313	Dedman	Seismic and volcanic activity are two important manifestations of plate tectonics on the earth. They are also two major natural hazards affecting humankind. This course emphasizes the geologic insights provided by earthquakes and volcanoes, and their impact on society.
Introduction to Environmental Science	GEOL1315	Dedman	Uses the fundamental principles of ecology, hydrology, geology, population dynamics, land-use management, and re- lated fields as the basis for understanding many of the major environmental issues that face the planet: greenhouse climate changes, soil and water pollution, acid rain and related atmospheric pollution problems, habitat destruction and species extinctions, waste disposal, land-use management, energy resource development, geologic hazards, and others.
Southwest Environments: A Geological Approach	GEOL2320 GEOL2321	Dedman	Practice of the scientific method by investigation of the processes affecting geologic and environmental change in the southwestern United States.
Resources and the Environment	GEOL3330	Dedman	A study of Earth's materials and processes and the effects they have on resource conservation planning and the pollution problems that arise from humankind's intense use of the Earth's resources.
Natural Resources and Energy Economics	GEOL5361	Dedman	Students gain an under- standing of the economics of energy and natural resource use and policy.
Economic and Ethical Issues in Sustainable Development	ENSC3310	Dedman	Class will address and apply principles of ecological economics to assess the sustainability of development models at the micro and macro level. Basic concepts of

			ecological economics cost-benefit valuation techniques will be presented and applied to the local people, government, and aid agencies for the implementation of sustainable development models.
Techniques in Wildlife Management	ENSC3313	Dedman	Class will focus on the introduction of laboratory techniques for monitoring ungulate populations and optimizing management practices, while studying behavioral, physiological and social responses of animals to a changing environment.
Internship in Environmental Science	ENSC3322	Dedman	Students experience work in a business or organization concerned with environmental issues. Opportunities may be found in environmental law, assessment and remediation companies, or among nonprofit or government agencies.
Principles of Resource Management	ENST3311	Dedman	Class will introduce practical tools used in addressing complex environmental problems including coastal zone planning, guidelines for ecologically sustainable development, environmental impact assessment, fisheries management, and protected area planning and management.
Environmental Policy and Socioeconomic Values	ENST3315	Dedman	Class will introduce students to the major constituencies that effect African conservation (non-governmental conservation groups, economic interests, etc.) and their underlying philosophies. Students will learn to determine effective approaches to resource management.
Environmental Ethics	PHIL3379	Dedman	A course exploring our ethical obligations concerning the natural world. Topical issues like climate change, endangered species, recycling, and the population explosion are covered from a variety of philosophical perspectives.
Environmental Policy	PLSC3333 PP3310	Dedman	Overview of governmental environmental policies designed to provide a foundation for future application and study in the growing environmental field.
Environmental Statistics	STAT3380	Dedman	Examines statistical design and analysis methods relevant to environmental sampling, monitoring and impact assessment. Emphasizes statistical procedures that accommodate the likely temporal and spatial correlation in environmental data.
Energy and Environmental Law	BUSE4332	Cox	Examines the legal and regulatory issues applicable to energy as they relate to finance, investment, and the economics of the business. Provides the basic tools of an energy professional to identify and analyze the legal

			and regulatory issues related to energy and resource development and operation, property acquisition and divestiture, and project valuation and financing.
Environment and Technology: Ecology and Ethics	CEE1301	Lyle	Students are introduced to the economic, engineering, ethical, political, scientific, and social considerations of environmental decision-making and management. Local, regional, and global topics will be examined.
Introduction to Civil and Environmental Engineering	CEE1302	Lyle	Introductory course that emphasizes fundamental science, engineering, and ecological principles. Students develop their analytical and critical thinking skills with real-world problem-solving. Many of the hallmarks of modern society (e.g., high-rise office buildings, increased life span, the virtual elimination of numerous diseases, and reliable long-distance and public transportation systems) are the result of work by environmental and civil engineers. Likewise, environmental and civil engineers are at work on the many problems currently confronting developing nations: housing supply, food production, air and water pollution, spread of disease, traffic congestion, and flood control.
Introduction to Environmental Engineering and Science	CEE2304	Lyle	Introduction to a scientific and engineering basis for identifying, formulating, analyzing and understanding various environmental problems. Material and energy balances are emphasized for modeling environmental systems and processes. Although traditional materials in air and water pollution are examined, emphasis is placed on contemporary topics such as hazardous waste, risk assessment, groundwater contamination, global climate change, stratospheric ozone depletion, and acid deposition. Where appropriate, pertinent environmental legislation is described, engineering models are derived and applied, and treatment technologies introduced.
Introduction to Solid and Hazardous Waste Management	CEE3341	Lyle	Solid and hazardous waste are defined. Technology, health, and policy issues associated with solid waste and hazardous materials are examined. Methods of managing solid and hazardous waste are introduced and regulations presented where appropriate. The characteristics of hazardous and solid waste materials, health frameworks, and the distribution of contaminants in the environment are reviewed.
Introduction to Environmental Toxicology	CEE3353	Lyle	The physiological and biochemical effects of physical, chemical, and biological processes are linked to factors present in the environment. Natural phenomena are described in terms of the carbon, oxygen, sulfur,

			phosphorus, and heavy metal cycles. The processes by which anthropogenic chemicals enter the environment and their complex effects on living organisms are examined in detail.
Environmental Impact Evaluation, Policy and Regulation	CEE3355	Lyle	Methods for evaluating engineering projects on environmental quality are reviewed, as are environmental legislation and environmental quality indices. The strengths and weaknesses of government methodologies to protect the environment are reviewed. Pollution standards, marketable rights, taxes, and citizen empowerment are considered. Economic analysis and other policy perspectives are considered.
Fundamentals of Air Quality I	CEE3431	Lyle	he science, engineering, public health, and economic aspects of air quality are covered. Topics include the sources of air pollutants, transport of pollutants in the environment, and atmospheric chemistry. The important properties and behavior of airborne particles and gases are reviewed. Also discussed are the science and national and international policies relating to greenhouse gas emissions, global climate change, and stratospheric ozone depletion.
Industrial Hygiene and Occupational Health	CEE3451	Lyle	The recognition, evaluation, and control of health hazards in the working environment are presented. Principles of industrial toxicology, risk assessment/management, occupational diseases, and occupational health standards are examined. The application of industrial hygiene principles and practice as well as the measurement and control of atmospheric contaminants are presented. The design and evaluation of occupational exposure controls are introduced. Lecture and three hours of laboratory.
Fundamentals of Air Quality II	CEE4333	Lyle	Fundamental and advanced topics in air quality are covered, building upon CEE 3431. Atmospheric dispersion of pollutants is examined and modern computer models are used to predict transport. A thorough review of energy technology and energy policy is presented, focusing on the economics and environmental impacts of conventional and alternative methods of energy generation. The importance of indoor air quality is discussed, including the risks from radon and biological aerosols. Additional topics of current interest are presented. Each student prepares a term paper related to energy policy and the environment.
Environmental and Hazardous Waste Laws	CEE5311	Lyle	Federal environmental laws, with emphasis on laws dealing with hazardous substances, such as CERCLA

			and RCRA; regulations and the regulatory framework; definitions and substantive requirements; roles of the States and the Federal EPA; compliance and enforcement; case studies.
Integrated Waste Management	CEE5315	Lyle	Comprehensive introduction to the fundamentals of the complex interdisciplinary field of hazardous waste management; current management practices; treatment and disposal methods; and site remediation. Topics include detailed case studies and design examples to evaluate the effectiveness of different treatment and containment technologies in addressing today's hazardous waste situations.
Physical and Chemical Waste Treatment	CEE5321	Lyle	Introduces waste minimization techniques and objectives, and thoroughly reviews chemical equilibrium and chemical reaction kinetics. Design and analysis equations and procedures are rigorously derived for chemical reactors and physical unit operations. The treatment objectives examined include 1) solids-liquid separation accomplished by coagulation and flocculation, sedimentation, filtration, flotation, and solids handling processes; 2) immiscible liquid separation brought about by emulsion-breaking chemicals and gravity and flotation oil/water separators; 3) phase and species transformations through pH neutralization, chemical precipitation, chemical oxidation/reduction, air stripping, and solidification/stabilization; and 4) solute separation and concentration achieved with activated carbon absorption, synthetic ion exchange resins, and membrane separation techniques.
Introduction to Sustainability	CEE5328	Lyle	Introduces basic concepts in sustainability. Drawing on a range of sources, including selected books and readings, the course explores the idea of total connectedness of resource use globally, with particular emphasis on the situation in north Texas. Addresses the issues of air quality and energy supply, sustainable construction, water use, transit and other related areas of resource use, and waste generation. The inclusion of multiple guest lecturers will provide a series of multiple viewpoints and areas of specific expertise.
Methods and Technology for Sustainability	CEE5329	Lyle	This course covers technologies and methods used in sustainable design and analysis. Areas covered include the scientific understanding of alternative energy systems, water reuse and supply, and state-of-the-art materials created for sustainability. Also discussed are methods for assessing sustainability, including life cycle assessment and the development of sustainable

			indicators.
Design for Sustainability	CEE5330	Lyle	This course introduces the student to the issues involved in creating a sustainable built environment. The course will address issues of resource use at the regional and project specific level. Specific techniques for designing and constructing sustainable buildings will be addressed. Systems of measurement for sustainable properties will be discussed on a comparative level, and the USGBC's LEED system will be specifically addressed.
Air Pollution Management and Engineering	CEE5331	Lyle	Covers the science, engineering, public health, and economic aspects of air quality. Students develop an in-depth understanding and broad knowledge of the sources and properties of air pollutants, air quality management, fate and transport of pollutants in the environment, regulations of air quality, and the operation and design of air pollution control systems. Reviews the current status of science, policy, and regulations on several selected topics such as urban smog, regional haze, greenhouse gas and global climate change, stratospheric ozone depletion, and mercury emissions and control.
Environmental Epidemiology	CEE5353	Lyle	Introduction to the science of epidemiology. Design and conduct of studies examining health effects of environmental exposures. Strengths and limitations of research strategies and interpretation of study results. Areas of interest include air and water pollution, lead, and biological marker outcomes.
Environmental Engineering Principles and Processes	CEE5354	Lyle	Waste minimization and pollution prevention techniques and objectives are introduced. A comprehensive study is made of biological, chemical, and physical principles and treatment strategies for controlling pollutant emissions. Equal emphasis is placed on underlying theory and practical engineering application of both common and innovative water and wastewater treatment processes. Design equations, procedures, and process models are rigorously derived for chemical/biological reactors and physical unit operations. Emphasis is placed on engineering analysis and application of process modeling techniques for design of unit processes to achieve specific treatment objectives.
Energy Management for Buildings	CEE5384	Lyle	Procedures to select energy savings options for buildings are examined with emphasis on the practical aspects of the subject. Space planning, architectural considerations, cost, and environmental impact of the

			mechanical and electrical systems are considered along with optimizing the life cycle cost of the proposed alternative. Software for life-cycle cost and energy analysis is used to calculate energy consumption and compare energy features of proposed, audit-determined feasible changes to a building.
Green Engineering: Designing Tomorrow Today	ME1304	Lyle	Presents how design choices for materials, manufacturing processes, energy usage, and end-of-life disposal affect economic and natural environments. Also, case studies in design for the environment for various industries. In lab, students use computer modeling to create designs and then analyze and compare the designs' total life cycle impact through eco-audits of energy and carbon footprints. Students also use software to compare and select materials best suited for a particular design and its constraints.
Engineering and Design for the Developing World	SS2315	Lyle	Engineering design in the developed world takes for granted the availability of several key resources such as construction material, water, and electricity. This course examines engineering design in the absence of these resources, with a focus on the development of shelter and sanitation in an efficient manner. Emphasis on understanding the total energy cycle of a structure and multiple alternative energy solutions. Additional topics include developing solutions for extreme low-cost, high-population densities and ecological sustainability. Students work in interdisciplinary teams to design and build energy-efficient homes and sustainable sanitation options and to investigate alternative energy systems.
Environmental Field Methods	SS2320	Lyle	Covers topics related to environmentally relevant fieldwork in the developing world, with emphasis on field and lab practical experiences that are supplemented with necessary lecture. Addresses surface water and groundwater collection as well as the analysis of coliform bacteria, basic water quality parameters, and inorganic contaminants. Topics also include soil collection and analysis, sanitation and water systems in the field, mapping, basic GIS, and systems planning.

#### Courses that Incorporate Sustainability

Course	Course #	School	Description
Contemporary Archaeology: Controversies and Ethics	ANTH2380	Dedman	Introduces students to the social and political contexts of archaeological research in heritage and human rights arenas with emphasis on ethics and the law.
Cultures and	ANTH3374	Dedman	Patterns of land and resource use in prehistoric and

Environments of the Southwest	CFA3374		early historic times in the Southwest. The focus is on the mutual influence of cultures and resources in the northern Rio Grande region.
Applied Anthropology	ANTH4305	Dedman	The application of anthropological theories and methods to problems in contemporary societies, including global business, community development, health care issues, agricultural/environmental programs, urban planning, tourism projects and education policy.
Introductory Biology	BIOL1402	Dedman	Introduction to the study of living organisms: ecology, evolution, diversity, and physiology.
Wildlife Ecology	BIOL3312	Dedman	Ecological principles of the East Africa savanna ecosystem. Examines factors underlying distributions, population biology, and behavioral ecology, along with competition and predation, using African examples.
Evolution and Life History	BIOL1308	Dedman	Evolution as observed in the fossil record in light of biological principles. Evolution as a process, origins of life, adaptation, and extinction, emphasizing examples from the geological record.
Face of the Earth	GEOL3340	Dedman	Students study the theory of plate tectonics in order to understand earthquake, volcano, and mountain-belt formations. Specific application of the theory helps to illustrate North American regional geology features such as coastal areas and the San Andreas Fault.
Paleoecology	GEOL5368	Dedman	Interactions between the living world and the Earth's changing environments through geologic time.
Hydrogeology	GEOL5384	Dedman	An introduction to the chemical and physical behavior of natural waters and the role of fluids in geologic processes. The course will stress the application of thermodynamics, kinetics, and fluid mechanics to understand such geologic processes as ore formation, sediment diagenesis, isograd formation, acid rain, global warming and groundwater contamination.
North American Environmental History	HIST3309 CFB3309	Dedman	Surveys North American environmental history since pre-Columbian times. It expands the customary framework of historical inquiry by focusing on the interaction of human beings and the natural world.
The Human History of Natural Disaster in the United States	HIST3318	Dedman	A survey of the role of natural disasters in U.S. history, with emphasis on the ways that they (including Hurricane Katrina) are human events, caused or complicated by social practices.

Natural Resources and Energy Economics	ECO5361	Dedman	Students gain an understanding of the economics of energy and natural resource use and policy.
Nonprofit Organizations: Conceptual Primer	SOCI3321	Dedman	Explores the nonprofit sector and relevant topics such as nonprofit history, theories, management, and trends, with a focus on strategies for improving organizations in light of the nonprofit sector's relationship with government and business. Prepares students for their subsequent nonprofit internship.
Environmental Sociology	SOCI4385	Dedman	This capstone course examines the culture, economy, and environment, both domestically and globally.
Business Management, Planning, and Analysis in Energy	BUSE4333	Cox	Examines analytical, economic, and financial concepts of the modern energy industry as they relate to planning and decision-making in the firm, with particular emphasis on oil and gas and power generation. Topics include capital structure, reserve valuation, royalties, production-sharing agreements, and management of risk and uncertainty.
Global Energy Markets, Business, and Policy: Spikes, Myths, and Risks	BUSE4334	Cox	Examines the interrelationship among the economics of global energy markets, business profitability, and public policy as it relates to the energy business. Topics include the principles of exhaustible resource economics and their impact upon business decision-making, the impact of price shocks on the industry and the overall economy, and the global policy and regulatory environment faced by the industry.
Groundwater Hydrology	CEE3325	Lyle	The hydrologic cycle and the subjects of porosity and permeability are introduced. Flow theory and its applications, storage properties, the Darcy equation, flow nets, mass conservation, the aquifer flow equation, heterogeneity and anisotropy, regional vertical circulation, unsaturated flow, and recharge are examined. Well hydraulics, stream-aquifer interaction, and distributed- and lumped-parameter numerical models are considered, as are groundwater quality, mixing cell models, contaminant transport processes, dispersion, decay and adsorption, and pollution sources.
Civil and Environmental Engineering Design I	CEE4380	Lyle	Students are responsible for completing a term-long environmental or civil engineering project for an industrial or regulatory client. The nature of design problems, constraints, and analytical tools are examined in an applied setting. An integrated design process is employed including problem identification and formulation, project planning, evaluation of alternatives, internal peer review and design iterations, preparation of design drawings and specifications for

			bidding and procurement purposes, the interaction of design and construction professionals, and implementation of the completed project.
Civil and Environmental Engineering Design II	CEE4381	Lyle	Students are responsible for completing a term-long environmental or civil engineering project for an industrial or regulatory client. Students function on multidisciplinary design teams that stress the need for personal and written communication skills, leadership, effective group participation, and creative problem solving. Concepts of professional engineering practice are reinforced by student participation in applied design problems including the need for professional licensing, the ethical responsibilities of licensed engineers, and the need for lifelong learning to stay abreast of changing technology and public policy through active participation in professional societies, self-study, and continuing education. Periodic progress reports and reviews and a final report are prepared and presented. Both the client and faculty assess the completed design project.
Risk Assessment and Health Effects	CEE5312	Lyle	Introduction to toxicology as it relates to environmental and health effects of hazardous materials; toxicology methodology; risk management factors including legal aspects; human health and ecological risk assessment and risk communication; emergency response; computer databases.
Optimization and Reliability for Infrastructure and Environmental Systems	CEE5327	Lyle	Introduces the concepts of engineering systems optimization, reliability and risk assessment, and applies them to civil and environmental engineering systems. Includes an introduction to engineering systems definition, classical methods of optimization, linear programming, integer programming, dynamic programming, nonlinear optimization, and reliability and risk concepts in engineering planning and design. Engineering applications include transportation networks, fleet assignment, supply chain management, environmental engineering systems, fluid transport and water reservoir operation and structural engineering systems. Advance topics include an introduction to chance-constrained optimization and basic decomposition approaches and their application to real-world problems.
Introduction to Environmental Management Systems	CEE5350	Lyle	In-depth introduction to environmental management systems. Includes systems such as EMAS, Responsible Care, OSHAS 18000, ISO 14000, and the Texas EMS program. Takes a step-by-step look at the ISO 14002 standard from the policy statement to the management

			review, and allow students to fully understand the Plan-Do-Check-Act approach of the system. Also introduces management system auditing, the requirements of a system auditor and the certification process.
Introduction to Environmental Toxicology	CEE5351	Lyle	Toxicology is presented as it relates to environmental and health effects of hazardous materials. Toxicological methodologies, pharmacokinetics, mechanisms of action to toxicants, origin response to toxic substances, and relevant aspects of the occupational and regulatory environment will be examined. Specific topics include toxicology of metals, radiation, industrial solvents and vapors, pesticides, teratogens, mutagens, and carcinogens. Risk communication and risk assessment are examined as they related to toxic substance exposure.
Solar Cells and Applications	EE5313	Lyle	This laboratory-oriented course explores the sun's energy as a source of electrical power and the working principles of silicon and III-V solar cells. Covers characteristics of the sun, semiconductor properties, p-n junctions, solar cell fabrication, and photovoltaic system design. Students fabricate and test silicon solar cells in the SMU cleanroom. Lectures and class discussions explain the basic operation of p-n junction diodes and solar cells along with the basics of device processing, including photolithography, oxidation, diffusion, ion implantation, metallization, and etching.

### Maybe

Course	Course #	School	Description
Evolution	BIOL3303	Dedman	A study of the principles of biological evolution. Includes natural selection, adaptation, molecular evolution, the formation of new species, the fossil record, biogeography, and principles of classification.
Field Botany	BIOL3343	Dedman	Identification of vascular plants, with emphasis on ecological indicators.
Toxicology Laboratory	BIOL4160	Dedman	Modern biochemical and molecular techniques are used to assess the impact of environmental contaminants on liver biomarkers in fish.
Soils and Paleosols	GEOL5459	Dedman	This is a lecture, lab, and field-based course about modern and ancient (paleosol) soil description, classification, and genesis. The course emphasizes environmental controls on soil formation and distribution across Earth's landscapes.
Organizations and Their	SOCI3377	Dedman	Explores the theories and relationships between

Environments			organizations and their environments. Applies these theories to the analysis of real-world organization activities.
Meteorology	CEE1331	Lyle	Meteorology is the science and study of the earth's atmosphere and its interaction with the earth and all forms of life. Meteorology seeks to understand and predict the properties of the atmosphere, weather, and climate from the surface of the planet to the edge of space.
Transportation Infrastructure	CEE1378	Lyle	An overview and definitions of infrastructure elements with concentration on transportation. Principles of infrastructure planning and management. Congestion and performance measures. Relationship with economy, environment, safety, homeland security and technology.
Principles of Surface Water Hydrology and Water Modeling	CEE3327	Lyle	The theory and applications of the physical processes of the hydrologic cycle are examined. Different types of water bodies – streams, rivers, estuaries, bays, harbors, and lakes – are reviewed. The principal quality problems associated with bacteria, pathogens, viruses, dissolved oxygen and eutrophication, toxic substances, and temperature are examined in detail. Theoretical model approaches are emphasized.
Soil Mechanics and Foundations	CEE3385	Lyle	Introduction to the basic principles that govern the behavior of soils, foundations, and other geotechnical engineering works. The central concepts covered include the index properties and classification of soils, soil permeability and pore water movement, stress distribution in soil and the effective stress concept, bearing capacity, compressibility, consolidation, settlement, shear strength, and soil engineering properties and their measurement. Geotechnical facilities introduced include foundations, retaining walls, tunnels, excavations, earth-fill dams, pavements, stable earth slopes, sanitary landfills, and environmental remediation projects.
Design of Water and Wastewater Systems	CEE4329	Lyle	Covers physical, chemical, and biological concepts and processes that are specific to public water supplies and municipal wastewater management. Reviews fluid mechanics and introduces hydraulic modeling for design of water distribution networks and wastewater collection networks. Design and operation of treatment systems for both drinking water and municipal wastewater pollution control are covered. Process modeling is employed for completion of two design projects, one for a public water supply treatment plant and the other for municipal wastewater treatment plant. Field trips are conducted to

			a public water supply treatment plant and to a municipal wastewater treatment plant.
Environmental Chemistry and Biology	CEE5313	Lyle	Chemical and biochemical processes; controlling fate and transport of hazardous materials with emphasis on chemical equilibria; chemical thermodynamics; acid-base equilibria; precipitation and dissolution; oxidation reduction processes; environmental transformations of organic materials; introductory taxonomy; microbial growth and kinetics; energy transfer; microbial ecosystems.
Environmental Organic Chemistry	CEE5317	Lyle	This course will examine the fundamental processes that govern transformation of organic chemicals in natural and engineering systems. The course will be divided into three parts: (1) organic chemistry overview, (2) physical transformations of organic compounds and (3) organic chemical reactions in the environment. The organic chemistry overview will provide knowledge regarding basic properties of organic compounds such as nomenclature and structures. Physical transformation of organic compounds will provide an understanding in processes (such as sorption and volatilization) that control the distribution of organic chemicals between different phases (such as air, water, and soil). Environmentally-mediated reactions (such as hydrolysis and photolysis) that control the breakdown of organic chemicals will be the focus of chemical reactions.
Biological Waste Treatment	CEE5322	Lyle	Biological treatment topics include an overview of microbiology and microbial metabolism; kinetics of biological growth; aerobic suspended growth processes including the various modifications of the activated sludge process, aerated lagoons, and sequencing batch reactors; aerobic attached growth processes including trickling filters, biofilter towers, and rotating biological contactors; anaerobic processes including sludge digestion and liquid waste treatment with the anaerobic contact process and anaerobic filters; biosolids handling and disposal; composting; land treatment; in situ biotreatment and biotreatment of contaminated soils.
Project Management	CEE5323	Lyle	Role of project officer; systems and techniques for planning, scheduling, monitoring, reporting, and completing environmental projects; total quality management; project team management, development of winning proposals; contract management and logistics; case study application of project management to all environmental media and programs; community relations, risk communication, crisis management,

			consensus building, media, and public policy.
Heating, Ventilating, and Air Conditioning	CEE5383	Lyle	Examines the science and practice of controlling environmental conditions through the use of thermal process and systems. Specific applications include refrigeration, psychometrics, solar radiation, heating and cooling loads in buildings, and design of duct and piping systems. Theory and analysis are emphasized.
Fundamentals of Electric Power Engineering	CEE3352	Lyle	Introduction to electric power generation and distribution. Topics include energy resources such as fossil, hydraulic, wind, solar, and nuclear energies. Also, three-phase power generators and trans- formers, and electric machines such as induction motors, synchronous generators, DC and stepper motors, and power converters.