

**DIRECTORY OF  
WATER RELATED COURSES  
OFFERED AT COLLEGES AND UNIVERSITIES IN ARKANSAS**

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**The University of Arkansas is an equal  
opportunity/affirmative action institution.**



## **FOREWARD**

**This publication lists the water and water-related courses at several universities and colleges in Arkansas as reported during the Fall of 1996. It is anticipated that users of this directory will extend beyond college students, and will include professionals seeking continuing education, and professors desiring to exchange information on courses.**

**This directory is not an "absolute" source of water and water-related courses because all of the higher learning institutions in Arkansas are not listed, and, secondly, because the definition of "water and water-related" varies from institution to institution. None-the-less this directory provides a very valuable and impressive reference on water resources courses. Users must remember that course offerings, titles, and content change; therefore, one should contact the department to confirm details about each course.**

**We are very grateful to the many people, too numerous to list, who have cooperated in gathering the information in this first edition of the directory.**

**Kenneth F. Steele  
Director, Arkansas Water Resources Center**



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# ALPHABETICAL LISTING OF WATER RELATED COURSES BY COLLEGE OR UNIVERSITY

## **ARKANSAS STATE UNIVERSITY** State University, AR 72467

### ***Undergraduate Courses:***

Course Title: Agriculture and the Environment  
Course Number: AGRI 4223  
Course Description: None provided.

Course Title: Agricultural Law  
Course Number: AGECE 4033  
Course Description: None provided.

Course Title: Agricultural Policy and Current Issues  
Course Number: AGECE 4083  
Course Description: None provided.

Course Title: Capstone Agriculture  
Course Number: AGRI 4243  
Course Description: None provided.

Course Title: Forage and Pasture Crops  
Course Number: PSSC 3803  
Course Description: None provided.

Course Title: Introduction to Plant Science  
Course Number: PSSC 1303  
Course Description: None provided.

Course Title: Land Economics  
Course Number: AGECE 4043  
Course Description: None provided.

Course Title: Rice and Other Cereal Crops  
Course Number: PSSC 4803  
Course Description: None provided.

Course Title: Soil and Water Conservation  
Course Number: PSSC 4853  
Course Description: None provided.

Course Title: Soil Chemistry  
Course Number: PSSC 4863  
Course Description: None provided.

Course Title: Soil Fertility  
Course Number: PSSC 4853  
Course Description: None provided.

## **Graduate Courses:**

**Course Title:** Soil Physics  
**Course Number:** PSSC 4873  
**Course Description:** None provided.

**Course Title:** Advanced Plant Ecology  
**Course Number:** BOT 5172  
**Course Description:** A study of plant responses to environmental factors during germination, growth, reproduction, and dormancy. Lecture two hours per week. Prerequisites: BIOL 3121, 3122 or permission of professor or chair.

**Course Title:** Agricultural Policy and Current Issues  
**Course Number:** AGECE 5083  
**Course Description:** None provided.

**Course Title:** Aquatic Ecotoxicology  
**Course Number:** ENVR 6003  
**Course Description:** Prerequisites: BIOL 5363, or BIOL 6301 or permission of professor. A study of the effects of contaminants in water, their accumulation in the biota, and the functional response of population to specific contaminants. Lecture three hours per week.

**Course Title:** Aquatic Entomology  
**Course Number:** ENT 5001  
**Course Description:** Prerequisites: ENT 3001, 3003; BIOL 3121 OR ZOOL 4201, 4202. Identification, life histories, ecology of aquatic arthropods, with emphasis on freshwater insects. For students in wildlife management, fisheries management, aquatic biology, and advanced entomology. Lecture one hour per week.

**Course Title:** Aquatic Plants  
**Course Number:** BOT 5181  
**Course Description:** Prerequisites: BOT 1101, 1103. A systematic study of the structure, classification, and ecology of freshwater algae and freshwater aquatic vascular plants. Lecture one hours per week.

**Course Title:** Case Studies in Ecosystem Management  
**Course Number:** ENVR 6303  
**Course Description:** Prerequisites: BIOL 3122, ENVR 4203, ENVR 5002, ENVR 6002, or permission of professor. Evaluation of ecological, economic and sociological aspects of management of water, soil and air resources. Content will vary based on current topics of importance in the field of environmental biology. Lecture three hours per week. Offered in Fall of odd numbered years.

**Course Title:** Conservation Biology  
**Course Number:** ENVR 5003  
**Course Description:** Prerequisites: BIOL 3122 or permission of professor. A study of global and local biological resources, including the diversity of life, the value of biodiversity, the importance of diversity to humans and human cultures, and interdisciplinary strategies to conserve biological resources. Lecture three hours per week.

## **Arkansas State University**

**Course Title: Environmental Microbiology**

**Course Number: ENVR 5103**

**Course Description: Prerequisites: CHEM 1023 and BIOL 2103, or 4012, or BIOL 4133. A study of the physiology and diversity of microorganisms and their role in cycling of nutrients and mineralization of pollutants in the world.**

**Course Title: Environmental System Analysis**

**Course Number: ENVR 6103**

**Course Description: Prerequisites: one semester calculus, one semester statistics, ENVR 4203/5203, or permission of professor. Environmental problem-solving utilizing systems modeling and applied statistical analysis. Use the microcomputer as an analytical tool will be emphasized. Lecture three hours per week. Offered Spring of odd numbered years.**

**Course Title: Environmental Toxicology: Mechanisms and Impacts**

**Course Number: ENVR 5203**

**Course Description: Prerequisites: BIOL 4133 and BIOL 4131 or CHEM 4243 or permission of professor. Understanding the basic principles behind the study of impacts and the mechanisms of physiological disturbances associated with environmental toxicant exposure to natural systems. Lecture three hours per week. Fall of even years.**

**Course Title: Fishery Biology**

**Course Number: ZOO 5001**

**Course Description: Prerequisites: ZOO 1001, ZOO 1003. A study of identification, ecology, food habits, management, and behavior fishes. Lecture one hour per week.**

**Course Title: Ichthyology**

**Course Number: ZOO 5242**

**Course Description: Prerequisites: ZOO 1001, ZOO 1003. The taxonomy, distribution, natural history, and economic importance of fishes, with emphasis on Arkansas species. Lecture two hours per week.**

**Course Title: Issues in Human Ecology**

**Course Number: BIOL 5112**

**Course Description: A broad ecological approach demonstrating problems of modern society such as environmental deterioration, hunger, and resources depletion. Lecture two hours per week.**

**Course Title: Laboratory of Case Studies in Ecosystem Management**

**Course Number: ENVR 6301**

**Course Description: Prerequisites: BIOL 3122 or ZOO 4203, ENVR 5002, ENVR 6002, or permission of professor. Field and laboratory experiences in evaluation of ecological, economic and sociological aspects of management of water, soil, and air resources. Course will emphasize data collection, analysis and reporting. Laboratory three hours per week. Offered Fall of odd numbered years.**

**Course Title: Laboratory for Advanced Plant Ecology**

**Course Number: BIOL 5171**

**Course Description: Two hours per week. To be taken concurrently with BOT 5172.**

**Course Title: Laboratory for Aquatic Entomology**

**Course Number: ENT 5002**

**Course Description: Four hours per week. To be taken concurrently with ENT 5001.**

# **Arkansas State University**

**Course Title: Laboratory for Aquatic Plants**  
**Course Number: BOT 5182**  
**Course Description: Four hours per week. To be taken concurrently with BOT 5181.**

**Course Title: Laboratory for Environmental Systems Analysis**  
**Course Number: ENVR 6101**  
**Course Description: Three hours per week. To be taken concurrently with ENVR 6103. Offered Spring of odd numbered years.**

**Course Title: Laboratory for Fishery Biology**  
**Course Number: ZOOL 5002**  
**Course Description: Four hours per week. To be taken concurrently with ZOOL 5001.**

**Course Title: Laboratory for Ichthyology**  
**Course Number: ZOOL 5241**  
**Course Description: Two hours per week. To be taken concurrently with ZOOL 5242.**

**Course Title: Laboratory for Issues in Human Ecology**  
**Course Number: BIOL 5111**  
**Course Description: Two hours per week. To be taken concurrently with BIOL 5112.**

**Course Title: Laboratory for Limnology**  
**Course Number: BIOL 5361**  
**Course Description: Two hours per week. To be taken concurrently with BIOL 5363.**

**Course Title: Laboratory for Parasitology**  
**Course Number: ZOOL 5232**  
**Course Description: Four hours per week. To be taken concurrently with ZOOL 5222.**

**Course Title: Land Economics**  
**Course Number: AGECE 5043**  
**Course Description: None provided.**

**Course Title: Legal Aspects of Environmental Management**  
**Course Number: ENVR 5202**  
**Course Description: Policy, law and regulation relating to society's use, management and protection of natural resources. The course will present the difference and similarities between environmental regulation and previous social regulation, and examine the logic behind current regulatory programs. Lecture two hours per week. Spring of even years.**

**Course Title: Limnology**  
**Course Number: BIOL 5363**  
**Course Description: Physic-chemical condition of freshwater, and their effects on aquatic life; plankton analysis and bottom fauna studies. Lecture three hours per week. Prerequisites: ZOOL 1001, 1003; CHEM 1024.**

**Course Title: Parasitology**  
**Course Number: ZOOL 5222**  
**Course Description: Prerequisites; ZOOL 101, ZOOL 1003. The parasites of vertebrates and plants with emphasis on protozoan and helminth parasites of man and domestic animals. Lecture two hours per week.**

## **Arkansas State University**

**Course Title: Remote Sensing and Geographic Information Systems**

**Course Number: ENVR 6203**

**Course Description: Prerequisites: BOT 5172 or permission of professor.**

**A study of principles of compute based Geographic Information Systems (GIS) and the theory and practice of remote sensing for ecosystem analysis. A combination of lecture reading, and computer work will emphasize the collection and analysis of biological phenomena. Lecture three hours per week.**

**Course Title: Soil and Crop Production**

**Course Number: PSSC 6803**

**Course Description: None provided.**

**Course Title: Soil Chemistry**

**Course Number: PSSC 5863**

**Course Description: None provided.**

**Course Title: Soil Fertility**

**Course Number: PSSC 5813**

**Course Description: None provided.**

**Course Title: Soil Physics**

**Course Number: PSSC 5873**

**Course Description: None provided.**

***Undergraduate Courses:***

**Course Title:** Aquaculture

**Course Number:** FW 3204

**Course Description:** Prerequisites: BIOL 1124 or permission of instructor. Course is designed to provide students with the essential of successful warm water aquaculture including crayfish and alligators. Basics of cool and coldwater aquaculture are also covered. Emphasis ranged from maintenance of brood stock and culture of fingerling to production of market-size fish. Lecture three hours, laboratory two hours plus several full-day field trips that may involve weekend or overnight travel. Offered in Spring.

**Course Title:** Environmental Geology

**Course Number:** GEOL 3153

**Course Description:** Prerequisites: GEOL 1014. A study of the geological factors which influence the pollution of land, water, and biological resources; the role of rock and soil in the geobiological community; hydrology; land-sliding and faulting in the human environment, natural resource problems; urban and land-use planning based on geological data. Lecture three hours. Offered in Spring.

**Course Title:** Field and Laboratory Methods for Mine Environment Analysis

**Course Number:** MMT 2072

**Course Description:** Prerequisites: MMT 2073 or concurrent enrollment, and permission of instructor. Field and laboratory methods applicable to overburden, mine soil, surface and subsurface water, and revegetation analysis and evaluation. Laboratory: four hours. Offered in Spring.

**Course Title:** Limnology

**Course Number:** BIOL(FW) 4024

**Course Description:** Prerequisites: BIOL(FW) 3114. A study of physical and chemical processes in fresh water and their effects on organisms in lake and streams. Laboratory sessions and field trips demonstrate limnological instrumentation and methodology. Offered in Spring. Lecture two hours, laboratory four hours.

**Course Title:** Principles of Hydrology

**Course Number:** MMT 2083

**Course Description:** Prerequisites: permission of instructor required. An introduction to the science of hydrology and the study of the mechanics of surface and subsurface natural water systems. Offered in Fall.

**Course Title:** Principles of Irrigation

**Course Number:** AGE 3403

**Course Description:** Prerequisites: AGSS 2014. A discussion of the various types of irrigation systems, available water resources, principles of soil water movement, and the utilization of and requirements for water by different crop systems. Lecture three hours.

**Course Title:** Principles of Mine Land Reclamation

**Course Number:** MMT 2073

**Course Description:** Prerequisites: permission of instructor required. A course dealing with federal and state reclamation laws and regulations and strip mine operations and equipment usage. Data gathering methods for overburden and mineral resource characteristics, topographical and drainage conditions, hydrologic and climatologic data bases, and water quality of underground and surface sources are introduced. Consideration of natural vegetation and revegetation planning, land-use patterns eventual use of reclaimed lands, and reclamation costs is included. Offered in Spring.

## **Arkansas Tech University**

**Course Title: Soil, Water and Forest Conservation**

**Course Number: AGE 3202**

**Course Description: Prerequisites: Junior standing or consent of instructor. Causes and control of soil and water losses; methods of erosion control; relationship of soil and water conservation to forest, recreation, pollution and wildlife management. Lecture three hours.**

**Course Title: Water Resources Development**

**Course Number: RP 4053**

**Course Description: Prerequisites: A study of water resources with emphasis on surface supply and small watershed and reservoir recreation. Supply and pollution in federal, state, local and private water-use allocation will be considered. Basic wastewater certificate by the Arkansas Environmental Academy available.**

**Course Title: Watershed Management**

**Course Number: AGE 3213**

**Course Description: Prerequisites: Junior standing or consent of instructor. An introductory course in the problems of water supplies from surface sources and underground aquifers. Practices to develop supplies, to protect sources, and maintain water quality will be emphasized. Lecture three hours.**

**Course Title: Wildland Fire Suppression-Water Use**

**Course Number: RP 2992**

**Course Description: Prerequisites: RP 1901 or U.S. Forest Service Training Courses S-130 and S-190. A study of water use for wildland fire suppression including supply sources, delivery methods, application techniques, hydraulics, and equipment maintenance. Field exercise on weekends required with materials and equipment furnished.**

**HENDERSON STATE UNIVERSITY**  
Arkadelphia, Arkansas 71999

***Undergraduate Courses:***

Course Title: Herpetology

Course Number: BIO 3403, 5403

Course Description: Prerequisites: BIO 2114 or consent of instructor. A comprehensive study of reptiles and amphibians with emphasis on specimens collected and studied in the field. Two hours lecture and two hours field or laboratory per week.

Course Title: Microbiology

Course Number: BIO 3094, 5094

Course Description: Prerequisites: BIO 2105 OR 2114; CHEM 1024; or consent of instructor. A comprehensive study of microorganism with emphasis on conceptual and applied microbiology. Three hours lecture and three hours laboratory per week.

***Graduate Courses:***

Course Title: Ichthyology

Course Number: BIO 4223, 5223

Course Description: Prerequisites: BIO 2114. A comprehensive study of freshwater fishes and their food with emphasis on taxonomy, ecology and management. Two hours lecture and two hours field or laboratory per week.

Course Title: Phycology

Course Number: BIO 4343, 5343

Course Description: Prerequisites: BIO 2104. A study of taxonomy, morphology, ecology, and economic importance of freshwater algae. Two hours lecture and two hours laboratory or field per week.

**SOUTHERN ARKANSAS UNIVERSITY**  
Magnolia, Arkansas 71753

***Undergraduate Courses:***

Course Title: Analytical Chemistry

Course Number: CHEM 2013

Course Description: Prerequisites: CHEM 1123, 1121. Fundamental theories and techniques in classical chemical analysis. Three lectures and one three-hour laboratory per week (See CHEM 2001.)

Course Title: Analytical Chemistry Lab

Course Number: CHEM 2001

Course Description: Prerequisites: must be currently enrolled in CHEM 2013. One three-hour period per week.

Course Title: Crops

Course Number: AGRO 1002

Course Description: Prerequisite: Biological Science 1003/1031. A first course in crops: their value as cash, grain, feed, cover, or green manure crops; types and varieties. Lecture two hours.

Course Title: Crops Lab

Course Number: AGRO 1001

Course Description: Prerequisites: must be currently enrolled in AGRO 1002. Laboratory two hours.

Course Title: Ecology

Course Number: BIOL 4013

Course Description: Prerequisites: eight hours of biological science, four hours of chemistry, three hours of algebra, or consent of instructor. A study of the structure and function of aquatic and terrestrial ecosystems. Lecture three hours. Spring semester.

Course Title: Ecology Lab

Course Number: BIOL 4011

Course Description: Prerequisites: must be currently enrolled in BIOL 4013. Laboratory two hours.

Course Title: Forage Crops and Pasture Management

Course Number: AGRO 3032

Course Description: Principles involved in the general area of crop and pasture management. Lecture two hours.

Course Title: Forage Crops and Pasture Management Lab

Course Number: AGRO 3031

Course Description: Prerequisites: must be currently enrolled in AGRO 3032. Laboratory two hours.

Course Title: Instrumental Analysis

Course Number: CHEM 3113

Course Description: Prerequisites: CHEM 2013, 2001. Fundamental theories and techniques of instrumental methods commonly used in analytical and quality control laboratories. Three lectures and one laboratory each week.

## **Southern Arkansas University**

**Course Title: Instrumental Analysis Lab**

**Course Number: CHEM 3111**

**Course Description: Prerequisites: must be currently enrolled in CHEM 3113. Operational understanding of modern instrumental techniques of analysis.**

**Course Title: Principles of Agriculture Engineering**

**Course Number: AGEN 3003**

**Course Description: Prerequisites: Sophomore standing. A study of drainage, erosion control and terracing, farm power, farm machinery, and electricity. Problems include mapping, measurements, leveling, basic wiring, power measurements, drawing and lettering. Lecture three hours. Note: this course will substitute for AGEN 2012 with approval of Agricultural Education Director.**

**Course Title: Principles of Agriculture Engineering Lab**

**Course Number: AGEN 3301**

**Course Description: Prerequisite: must be currently enrolled in Agricultural Engineering 3303. Laboratory two hours.**

**Course Title: Principles of Horticulture**

**Course Number: HORT 2002**

**Course Description: Prerequisites: Biological Science 1033/1031 and sophomore standing. A study of the basic principles underlying the propagation, production, and handling of horticultural crops. Lecture two hours.**

**Course Title: Principles of Horticulture Lab**

**Course Number: HORT 2001**

**Course Description: Prerequisites: must be currently enrolled in HORT 2002. Laboratory two hours.**

**Course Title: Soils**

**Course Number: AGRO 2013**

**Course Description: Prerequisites: Chemistry 1013/1011, 1113/1111. Origin, classification, productiveness, and physical properties of soils. Lecture three hours.**

**Course Title: Soils Lab**

**Course Number: AGRO 2011**

**Course Description: Prerequisites: must be currently enrolled in AGRO 2013. Laboratory two hours.**

**Course Title: Special Problems in Agriculture**

**Course Number: AGRI 4003**

**Course Description: Prerequisites: written permission by departmental chair. A research project answering an agronomic problem will be planned, developed, answered, and written into a presentable format by the student enrolled in the program.**

## **Southern Arkansas University**

**Course Title: University Chemistry I**

**Course Number: CHEM 1023**

**Course Description: Prerequisites:** two years high school algebra or Mathematics 0012 and concurrent enrollment in Mathematics 1023. Basic theoretical and quantitative principles of inorganic chemistry associated with the concepts of the mole, solutions, concentration, heat, atomic and molecular structure, periodicity, bonding, physical states and stoichiometry. Credit for both CHEM 1013, 1011 and 1023, 1021 will not be granted. Three lectures and one three-hour laboratory period per week (See CHEM 1021).

**Course Title: University Chemistry I Lab**

**Course Number: CHEM 1021**

**Course Description: Prerequisites:** must be currently enrolled in CHEM 1023. One three-hour period per week.

**Course Title: University Chemistry II**

**Course Number: CHEM 1123**

**Course Description: Prerequisites:** CHEM 1023, 1021. A continuation of CHEM 1023 emphasizing basic kinetics, thermodynamics, acid/base theory, and descriptive chemistry of inorganic compounds. Three lectures and one three-hour laboratory period per week (See CHEM 1121).

**Course Title: University Chemistry II Lab**

**Course Number: CHEM 1121**

**Course Description: Prerequisites:** must be currently enrolled in CHEM 1123. One three-hour period per week.

***Undergraduate Courses:***

**Course Title: Agricultural, Municipal, and Industrial Waste Management**

**Course Number: CVEG 3013**

**Course Description: Prerequisites: junior standing for non-engineers. The types, natures, and volumes of agricultural wastes and the effect of these wastes on the environment. The control, management, and reuse of wastes to include final disposal. Lecture three hours per week. (Same as AGME 3013 and ENSC 3013.)**

**Course Title: Agricultural Waste Management**

**Course Number: BAST 3023**

**Course Description: Prerequisites: junior standing or consent and MATH 1203. The types, natures, and volumes of agricultural wastes and the effect of these wastes on the environment. The control, management, and reuse of wastes to include final disposal. Lecture three hours per week. (Same as ENSC 3023.)**

**Course Title: Algal Ecology**

**Course Number: BOTY 4554**

**Course Description: Principles of the interaction of physical, chemical, and biological parameters upon algae in freshwater habitats; emphasizing procedures for analyzing community and subcommunity structure, temporal and spacial distribution patterns, and trophic status. Lecture 2 hours, laboratory 4 hours per week. Prerequisite: BIOL 4414 and consent.**

**Course Title: Aquaculture**

**Course Number: ZOO 4712**

**Course Description: Prerequisites: eight hours of biological science and consent. General survey of principles and techniques of aquaculture. Two hours of lecture per week. Offered even numbered years.**

**Course Title: Bio-Environmental Engineering**

**Course Number: BAEG 4913**

**Course Description: Prerequisites: BAEG 4903 or CVEG 3223 or consent. Engineering principles for the design of systems for the biological treatment and utilization of organic by-products from animal and crop production and food and crop processing. Design of best management practices to protect bio-environmental resources by minimizing non-point pollution (off-site movement of sediment, nutrients and other constituents) and by minimizing nuisance odors associated with land applied organic residues, inorganic fertilizers and pesticides. Emphasis on economic utilization of beneficial components of typical wastes. Lecture two hours, laboratory three hours per week. Offered even numbered years.**

**Course Title: Environmental Engineering**

**Course Number: CVEG 3243**

**Course Description: Prerequisites: CVEG 3213, CHEM 1123 and concurrently enrolled in CVEG 3240L. Introduction to the theories and fundamentals of physical, chemical, and biological processes with emphasis on water supply and wastewater collection, transportation, and treatment. Lecture two hours per week.**

## **University of Arkansas, Fayetteville**

**Course Title: Environmental Engineering Design**

**Course Number: CVEG 4243**

**Course Description: Prerequisites: CVEG 3223, CVEG 3243.** Application of physical, biological, and chemical operations and processes to the design of water supply and wastewater treatment systems.

**Course Title: Environmental Engineering Lab**

**Course Number: CVEG 3240L**

**Course Description: Prerequisites: must be concurrently enrolled in CVEG 3243.** Laboratory three hours per week.

**Course Title: Environmental Geology**

**Course Number: GEOL 1133**

**Course Description: Prerequisites: GEOL 1113, 1111L, 1131L is recommended as a corequisite for students taking this course.** The application of geologic principles and knowledge to problems created by human occupancy and exploitation of the physical environment.

**Course Title: Environmental Geology Laboratory**

**Course Number: GEOL 1131L**

**Course Description: Prerequisites: GEOL 1113, 1111L, 1133 is corequisite with this course.** Laboratory exercises concerning human interactions with the physical environment. Including study of earthquakes, volcanoes, flooding, erosion, mass wasting, water supply and contamination, and waste disposal.

**Course Title: Fish Biology**

**Course Number: ZOOL 4723**

**Course Description: Prerequisites: 12 hours of biological science and consent.** Morphology, classification, life history, population dynamics, and natural history of fishes and fish-like vertebrates. Two hours of lecture and three hours of laboratory per week. Offered odd numbered years.

**Course Title: Fresh Water Invertebrates**

**Course Number: ZOOL 4623**

**Course Description: Prerequisites: BIOL 1013/1011L or equivalent, junior standing.** A systematic survey of invertebrates groups occurring in fresh water of the United States with emphasis on forms represented in the local aquatic fauna. Lectures, laboratories, field trips, and class projects. Offered odd numbered years.

**Course Title: Freshwater Phycology**

**Course Number: BOTY4414**

**Course Description: Prerequisites: four hours of biological science.** Morphology, taxonomy, systematics, and ecology of freshwater algae of soil, ponds, lakes, reservoirs, and streams. Lecture two hours, laboratory four hours per week.

**Course Title: Geomorphology**

**Course Number: GEOL 4053**

**Course Description: Prerequisites: GEOL 1004, 1113, or 3002.** Mechanics of landform development. Lecture two hours per week. Laboratory three hours per week. Several local field trips are required during the semester.

## **University of Arkansas, Fayetteville**

**Course Title: Hydraulics**

**Course Number: CVEG 3213**

**Course Description: Prerequisites:** must be concurrently enrolled in CVEG 3210L and MEEG 2013. Study of incompressible fluids. Topics include fluids properties, fluid statics, continuity, energy and hydraulic gradients fundamentals of flow in pipes and open channels. Hardy Cross analyses, measurement of flow of incompressible fluids, hydraulic similitude and dimensional analysis. Lecture two hours per week,

**Course Title: Hydraulics Lab**

**Course Number: CVEG 3210L**

**Course Description: Prerequisites:** must be concurrently enrolled in CVEG 3213. Laboratory three hours per week.

**Course Title: Hydrogeology**

**Course Number: GEOL 4033**

**Course Description: Prerequisites:** MATH 2564 and either GEOL 3516, 3511L or consent. Occurrence, movement, and interaction of water with geologic and cultural features.

**Course Title: Hydrology**

**Course Number: CVEG 3223**

**Course Description: Prerequisites:** must be concurrently enrolled in CVEG 3213. Use of ground water and surface water. Flood routing procedures in storage reservoirs and channels. Hydrologic planning including storage reservoir design, frequency duration analysis, and related techniques.

**Course Title: Ichthyology**

**Course Number: ZOO 4733**

**Course Description: Prerequisites:** ZOO 2404 or equivalent and consent. Taxonomy, systematics, and museum and collection methods of fresh-water fishes, concentrating on the fishes of North America. Two lectures and one laboratory each week. Offered even numbered years.

**Course Title: Karst Hydrogeology**

**Course Number: GEOL 4153**

**Course Description: Prerequisites:** GEOL 4003 or consent. Assessment of ground water resources in carbonate rock terrains, relation of ground water and surface water hydrology to karst, qualification of extreme variability in karst environments, data collection rationale. Field trips required.

**Course Title: Limnology**

**Course Number: ZOO 5814**

**Course Description: Prerequisites:** CHEM 1123/1121L or equivalent, twelve hours biological sciences or consent. Physical, chemical and biological conditions of inland waters. Three hours lecture per week, laboratory by arrangement.

**Course Title: Principles of Remote Sensing**

**Course Number: GEOL 4413**

**Course Description: Prerequisites:** GEOL 1113 or 3002 or consent. Theoretical and practical consideration of radar imagery, aerial photography, and infrared imagery for understanding earth resource problems related to agriculture, archeology, engineering, forestry, geography, and geology. Lecture two hours, laboratory two hours per week.

## **University of Arkansas, Fayetteville**

**Course Title: Rice Production**

**Course Number: AGRN 4113**

**Course Description: Prerequisites: AGRN 1103 and 2203 or consent. A study of rice production world wide, with major emphasis on the United States and Arkansas. Recitation three hours per week.**

**Course Title: Soil Science**

**Course Number: AGRN 2203**

**Course Description: Prerequisites: CHEM 1103. Origin, classification, and physical, chemical, and biological properties of soils. Recitation three hours and discussion one hour per week.**

**Course Title: Soil Science Laboratory**

**Course Number: AGRN 2001L**

**Course Description: Prerequisites: none. Field and laboratory exercises related to the study of the physical chemical and biological properties of soils. Laboratory mandatory of all agronomy majors and optional for others. Laboratory two hours per week. Pre - or corequisite AGRN 2203.**

**Course Title: Surface Water Hydrology**

**Course Number: CVEG 4223**

**Course Description: Prerequisites: CVEG 3223. Detailed investigations of hydrologic runoff relationships of surface and groundwater flow. Study of hydrograph and routing techniques as well as evaporation and sedimentation of storage reservoirs. Application of hydrologic techniques to engineering design.**

**Course Title: Water Quality**

**Course Number: ENCS 4023**

**Course Description: Prerequisites: eight credit hours of biological sciences and four credit hours of chemistry. Lectures concerning physical, chemical, and biological characteristics of water resources in association with reference systems and point and non-point pollution sources. Regulations pertaining to water quality standards as well as parameter selection and analytical models are discussed. Recitation three hours per week.**

**Course Title: Water Quality Analysis**

**Course Number: ENSC 4033**

**Course Description: Prerequisites: eight credit hours of biological sciences and eight credit hours of chemistry. Lectures concerning evaluation of water quality parameters with complementary field and laboratory experiences. Principles of parameter selection, quality assurance and quality control, sampling protocols, fields techniques, and instrumentation as well as laboratory analysis methodologies are emphasized. Recitation two hours and laboratory two hours per week.**

**Course Title: Water Resource Engineering**

**Course Number: BAEG 4903**

**Course Description: Prerequisites: CVEG 3213 or MEEG 3503. Engineering principles for the design of systems for utilization of surface water and ground water. Includes frequency analysis of rainfall, infiltration, runoff, evapotranspiration, hydraulic control structures, ground water pumping, drainage and irrigation. Lecture two hours, laboratory three hours per week. Offered even numbered years.**

## **University of Arkansas, Fayetteville**

**Course Title: Water Resource Issues**

**Course Number: GEOL 4043**

**Course Description: Prerequisites: consent. Human impact on the quantity and quality of water resources including impact of agricultural, industrial and municipal uses, and a comparative analysis of water policies and water development, past and present.**

**Course Title: Water Resource Planning and Economics**

**Course Number: CVEG 4253**

**Course Description: Prerequisites: CVEG 3243 and 3223. Investigation of water resource projects from the broad engineering viewpoint of the impact on society of design, justification, financing, construction, and operation. Emphasis is placed on engineering economy studies of public works projects and the political aspects of decisions by public works agencies.**

**Course Title: Water Resources Planning and Design**

**Course Number: CVEG 4273**

**Course Description: Prerequisites: CVEG 3243 and 3223. Planning, design, and economics of water supply and wastewater disposal units. topics include the analysis and design by optimization techniques to minimize construction and operational cost in meeting required water quality standards.**

### ***Graduate Courses:***

**Course Title: Advanced Field Methods of Applied Hydrogeology**

**Course Number: GEOL 5076**

**Course Description: Prerequisites: GEOL 4033 or consent. Applied field course emphasizing collection and interpretation of ground water data. Three hours may be applied toward an M.S. degree in geology.**

**Course Title: Advanced Hydrogeology**

**Course Number: GEOL 5043**

**Course Description: Prerequisites: GEOL 4033. Qualitative and quantitative geohydrology with emphasis on physics and chemistry of groundwater simulation of low, and contamination/remediation. Several local field trips are required during the semester.**

**Course Title: Advanced Pollution Control Design**

**Course Number: CVEG 5273**

**Course Description: Prerequisites: CVEG 4243. Design of advance and tertiary processes for wastewater treatment. Innovations in wastewater treatment by both aerobic and anaerobic wastewater treatment processes.**

**Course Title: Advanced Topics in Soil Science**

**Course Number: AGRN 622V**

**Course Description: Graduate standing. Topics include doctoral-level concepts in soil physics, soil chemistry, and soil microbiology/biochemistry not considered in other soil science courses. May be taken more than once.**

## **University of Arkansas, Fayetteville**

**Course Title: Algal Ecology**

**Course Number: BOTY 5454**

**Course Description: Prerequisites: BOTY 4414 and consent. Principles of the interaction of physical, chemical, and biological parameters upon algae in freshwater, habitats; emphasizing procedures for analyzing community and subcommunity structure, temporal and spacial distribution patterns, and trophic status. Lecture two hours, laboratory four hours per week.**

**Course Title: Biology of Fresh-water Zooplankton**

**Course Number: ZOOL 5684**

**Course Description: Prerequisites: consent. Consideration of selected qualitative aspects of the study of fresh-water zooplankton, including treatment of the representative groups, their origins, distribution, migration, production, and cyclomorphosis. Introduction to various field and laboratory techniques.**

**Course Title: Crop Physiology**

**Course Number: AGRN 5013**

**Course Description: Prerequisite: BOTY 4304 or equivalent. Understanding and quantitative measurement of physiological processes, plant responses, and environmental parameters in relation to the production of crops. (Odd numbered years.)**

**Course Title: Environmental Site Assessment**

**Course Number: GEOL 5153**

**Course Description: Prerequisites: GEOL 4033 or consent. Principles, problems, and methods related to conduction of an environmental site assessment. An applied course covering field site assessment, regulatory documentation, and report preparation.**

**Course Title: Fish Biology**

**Course Number: ZOOL 5723**

**Course Description: Prerequisites: twelve hours of biological sciences and consent. Morphology, classification, life histories, population dynamics, and natural history of fishes and fish-like vertebrates. Two hours of lecture and three hours of laboratory per week.**

**Course Title: Geochemistry**

**Course Number: GEOL 5063**

**Course Description: Prerequisites: CHEM 1104,1114. Chemistry of geologic processes and the geochemical cycles of selected elements.**

**Course Title: Groundwater Hydrology**

**Course Number: CVEG 5242**

**Course Description: Prerequisites: CVEG 3223. Detailed analysis of groundwater movement, well hydraulics, groundwater pollution and artificial recharge. Surface and subsurface investigations of groundwater and groundwater management, saline intrusion and groundwater modeling will be addressed.**

# University of Arkansas, Fayetteville

Course Title: Hydrochemical Methods

Course Number: GEOL 5263

Course Description: Prerequisites: CHEM 1123/1121L. Collection analysis and interpretation techniques, and methods for water including quality control and quality assurance.

Course Title: Hydrogeologic Modeling

Course Number: GEOL 5163

Course Description: Prerequisites: GEOL 4033, computer literacy and consent. Topics include numerical simulation of ground water flow, solute transport, aqueous geochemistry, theoretical development of equations, hypothesis testing of conceptual models, limitations of specific methods and error analysis. Emphasis on practical application of problem solving.

Course Title: Ichthyology

Course Number: ZOO 5733

Course Description: Prerequisites: ZOO 2404 or equivalent and consent. Taxonomy, systematics, and museum and collection methods of fresh-water fishes, concentrating on the fishes of North America. Two lectures and one laboratory each week. Offered even numbered years.

Course Title: Instrumental Methods of Water and Wastewater Analysis

Course Number: CVEG 5212

Course Description: Prerequisites: CVEG 5234. Introduction to the basic theory and techniques of modern instrumental procedures used for physical, chemical, and biological analysis in environmental engineering. Instrumental methods include atomic absorption, gas chromatography, and carbon analysis. Lecture one hour, laboratory three hours per week.

Course Title: Limnology

Course Number: ZOO 4814

Course Description: Prerequisites: CHEM 1123/1121L or equivalent, twelve hours biological sciences or consent. Physical, chemical and biological conditions of inland waters. Three hours lecture per week, laboratory by arrangement.

Course Title: Protozoology

Course Number: ZOO 5633

Course Description: Prerequisites: consent. Survey of phylum with emphasis upon the biological aspects. Lectures and laboratory. On demand.

Course Title: Remote Sensing of Natural Resources

Course Number: GEOL 5423

Course Description: Prerequisites: GEOL 4413. Advanced course in remote sensing technology with special emphasis on interpretation techniques for resources management and research.

Course Title: Resource Economics

Course Number: AGE 5133

Course Description: Prerequisites: graduate standing and consent. Application of economic theory to utilization of land and water resources by both private and public sectors. Applicable laws, future land settlement, conservation, land and water use planning and externalities in resource use are considered. Appropriate research tools and decision criteria are discussed

## University of Arkansas, Fayetteville

Course Title: Sanitary Microbiology

Course Number: CVEG 5253

Course Description: Prerequisites: CVEG 3243. Fundamental and applied aspects of microbiology and biochemistry relating to water quality control, wastewater treatment, and stream pollution.

Course Title: Soil Chemistry I

Course Number: AGRN 5453

Course Description: Prerequisites: AGRN 2203 and CHEM 1123, 1121L. Application of the principles of chemistry to processes of agronomic and environmental importance to soils. Soil clay mineralogy, soil solution thermodynamics, structure and reactivity of humus, surface complexation and ion exchange, electro-chemical phenomena and collateral activity. Physicochemical properties of clay mineral, clay mineral structures, cation and anion exchange reactions in soils as they influence nutrient uptake by plants. Recitation three hours per week. Offered even numbered years.

Course Title: Soil Physics I

Course Number: AGRN 5224

Course Description: Prerequisites: AGRN 2203 and MATH 1203. Physical properties of soils and their relation to other soil properties, growth of plants and transport of water, oxygen, and solutes such as pesticides and plant nutrient ions. Recitation three hours and laboratory three hours per week.

Course Title: Stream Ecology

Course Number: ZOOL 5914

Course Description: Prerequisites: consent. Some previous course work in ecology is essential. Current concepts and research in logic ecosystem dynamics. Lecture, laboratory, field work and individual research projects required.

Course Title: Stream Pollution Analysis

Course Number: CVEG 5263

Course Description: Prerequisites: CVEG 3243. The determination and application of deoxygenation and reaeration rates to stream pollution analysis. A study of biological degradation rates for municipal and industrial wastes.

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Course Title: Water and Wastewater Analysis

Course Number: CVEG 5234

Course Description: Prerequisites: CVEG 3243. Application of chemistry to environmental engineering. Quantitative determinations of constituents in water and wastewater. Principles of bacteriological laboratory techniques. Lecture three hours, laboratory three hours per week.

Course Title: Water Treatment & Distribution System Design

Course Number: CVEG 5293

Course Description: Prerequisites: CVEG 3243. Design industrial and municipal water treatment plants. Discussion of raw and treated water requirements for the several uses. Distribution system analysis and design including distribution storage and pumping.

***Undergraduate Courses:***

Course Title: Environmental Economics

Course Number: Economics & Finance 4324

Course Description: Prerequisites: Economics 2321 and 2322, or equivalent. Applied microeconomic covering various aspects of environmental economics. The problems of preventing future pollution and cleaning past pollution in an economically efficient manner are explored. Economic theory, actual practice, and legal aspects of pollution are explored in the context of the trade-offs must be considered. On demand.

Course Title: Environmental Impact Analysis

Course Number: Environmental Health Sciences 3415

Course Description: Prerequisites: Environmental Health Sciences 2320 or the equivalent, consent of instructor. Knowledge and skills necessary to prepare and review environmental impact assessments and statements. The content of the National Environmental Policy Act is presented and analyzed. Case studies and group discussions are used to supplement class lectures. Field studies are performed on a selected site for which an environmental impact assessment will be written. Three hours lecture, two hours laboratory per week. Offered Spring of even numbered years.

Course Title: Environmental Planning

Course Number: Environmental Health Sciences 4410

Course Description: Prerequisite: Environmental Health Sciences 3310 or the equivalent. Environmental planning process and evaluation method applicable to environmental programs; resource allocation and procurement; emphasis on environmental planning case studies including watershed planning, land use, solid and hazardous waste, air quality, wastewater treatment facilities planning, wetland, and master planning. Group discussions and role-playing exercises will supplement class lectures. Three hours lecture, two hours laboratory per week. Offered Spring of odd numbered years.

Course Title: Fisheries

Course Number: Biology 4410

Course Description: Prerequisites: Biology 1401, 2403, 3303, 3409, or their equivalents, or consent of instructor. A survey of fish management and fish culture principles and techniques including population assessment, habitat improvement, pond culture, commercial fish farming, and an introduction to fish diseases. Three hours of lecture, three hours laboratory per week. Offered Spring of odd numbered years.

Course Title: Ichthyology

Course Number: Biology 4405

Course Description: Prerequisites: Biology 1401, 3404 or 3409. Classification, phylogeny, morphology, physiology, and ecology of fishes concentration on North American and Arkansas freshwater fishes. Three hours lecture, three hours laboratory per week. Offered Fall of even numbered years.

Course Title: Introduction to Water Resources Management

Course Number: Environmental Health Sciences 3340

Course Description: Prerequisites: Environmental Health Sciences 2320, Chemistry 1403, Biology 2401, Mathematics 1302, or the equivalents. Concepts related to the management of surface and ground water resources; sources of environmental pollutants, sampling methods and pollution control alternatives; the application of computer to water resource management problems. Three hours lecture per week. Offered Fall of odd numbered years.

## **University of Arkansas, Little Rock**

**Course Title: Oceanography I**

**Course Number: Earth Science 3581**

**Course Description:** Prerequisites: Earth Science 1402, Chemistry 1402, 1403, Mathematics 1302. This introductory course in oceanography integrates chemical geological, and physical oceanography to provide a multidisciplinary approach to the fundamentals of oceanography. Course offered through Gulf Coast Research Laboratory, Ocean Springs, Mississippi. Offered in Summer.

**Course Title: Sedimentology**

**Course Number: Earth Science 3450**

**Course Description:** Prerequisites: Earth Science 2410. Analysis of modern sediments, properties of sedimentary grains, sedimentary processes; modern environments; composition, classification lithification of sedimentary rocks. Megascopic and microscopic methods. Two hours lecture, four hours laboratory per week. Offered Fall of odd numbered years.

**Course Title: Soils and Foundation Technology**

**Course Number: Construction Management 3320**

**Course Description:** Prerequisites: a grade of C or better in Construction Management 2310, Mechanical Engineering Technology 3301, and Earth Science 1402. Introduction to structural foundation types and design, use of soil mechanics technology, techniques for moisture control and drainage, Construction considerations, subsurface exploration, retaining structures, sheet pile walls, pill and drilled pier foundations, reinforced earth, and soil reinforcement. Two hours lecture, two hours lab per week. Offered in Fall.

**Course Title: Surficial Hydrology**

**Course Number: Earth Science 3411**

**Course Description:** Prerequisites: Mathematics 1304 or 2303 and consent of instructor; junior standing in earth science, physics, chemistry, biology, environmental health science, or engineering technology. Hydrologic cycle, basin analysis, runoff analysis, stream hydraulics, flooding, case histories, field methods in hydrology, hydrologic planning. Three hours lecture per week. Offered Spring of odd numbered years.

### ***Graduate Courses:***

**Course Title: Geomorphology**

**Course Number: Earth Science 4321/5321**

**Course Description:** Prerequisites: Earth Science 1302/1102, 2320, or consent of instructor. The study of the shaping of the earth's surface. The processes of weathering, mass movement, erosion, and deposition involved in the evolution of landforms; geomorphic cycles and regional physiography; applications to environmental studies. Laboratory includes analysis of maps, aerial photos, and field work. Two hours lecture, three hours laboratory or field study per week. Offered Spring of even numbered years.

**Course Title: Hydrogeology**

**Course Number: Earth Science 4373/5373**

**Course Description:** Prerequisites: Mathematics 1304 or 2303; Earth Science 3330. Ground water occurrence, flow, porosity, permeability, aquifer analysis, geology of ground water, water well logging, well development, case histories, field methods, hydrogeologic planning. Three hours lecture per week. Offered Spring of even numbered years.

## **University of Arkansas, Little Rock**

**Course Title: Limnology**

**Course Number: Biology 4402/5402**

**Course Description: Prerequisites: Biology 1401, 2402, 2403, 3303, Chemistry 1403, or equivalents. A study of physical and chemical characteristics of water, morphometry and physiography of lake and stream basins, and an introduction to the ecology and taxonomy of aquatic communities. Laboratory: Instruction in methods of physical, chemical, and biological sampling and analysis. Field work will include study of various types of aquatic habitats and sampling methods involved. Some extended Saturday field trips will be required. Two lectures, one four-hour laboratory per week. Offered Fall of odd numbered years.**

***Undergraduate Courses:***

**Course Title:** Aquaculture

**Course Number:** ANSC 3313

**Course Description:** Prerequisites: BOIL 1153 and 1161. A study of the scientific principles of commercial aquaculture with emphasis on production systems. A two hours lecture and laboratory.

**Course Title:** Environmental Science

**Course Number:** BIOL 3439

**Course Description:** Prerequisite: 3 hours biology or earth science. A survey of the environment to provide an understanding of and respect for the ecosystems upon which the human species is dependent. Fall offering in even-numbered years. Lecture three hours.  
**Note:** Same as ESCI 3493.

**Course Title:** Forest Biology

**Course Number:** FOR 3514

**Course Description:** Prerequisites: BIOL 114, FOR 2281, and 2291 or permission of instructor. Fundamentals of physiological processes as applied to forestry. Topics include tree physiology, environmental influences, nutrient cycling, ecosystem dynamics, and forest community development. A three hours lecture and laboratory.

**Course Title:** Forest Hydrology

**Course Number:** FOR 3592

**Course Description:** Prerequisites: FOR 2264. Basic processes and measurements of water distribution and movement in forests with emphasis on fire management effects on water quantity, quality, and water related resources. A two hours lecture.

**Course Title:** Forest Soil

**Course Number:** FOR 2264

**Course Description:** Prerequisites: CHEM 1104 and 1114. Fundamentals of soil science with application to forestry. Origin, development, and properties of soils. Identification and classification of soils with emphasis on productivity. A three hours lecture and laboratory.

**Course Title:** General Ecology

**Course Number:** BIOL 3484

**Course Description:** Prerequisites: BIOL 114, 1153; CHEM 1104, 1114. Principles of ecology; study of the environment and their components, the flow of energy and materials, ecological succession, pollution, and radiation ecology. Annual Fall offering. A three hours lecture and laboratory.

**Course Title:** Ichthyology/Herpetology

**Course Number:** BIOL 3314

**Course Description:** Prerequisites: BIOL 1153, 1161. Taxonomy and natural history of fishes, amphibians, and reptiles, emphasizing the local fauna. A three hours lecture and laboratory.

# **University of Arkansas, Monticello**

**Course Title: Soil and Water Conservation**

**Course Number: AGEN 2263**

**Course Description: Prerequisites: Sophomore standing. Soil and Water conservation practices on agricultural lands involving surveying, leveling, terracing, drainage, irrigation, water supply, exacting, mapping, and farm pond measurements. A two hours lecture and laboratory.**

**Course Title: Soils**

**Course Number: AGRO 2244**

**Course Description: Prerequisites: CHEM 1104, 1114. The study of soil as a natural body from the standpoint of how to produce agronomic and horticulture plants. A three hours lecture and a two hours laboratory. Note: Extended field trips required in addition to regular lab hours.**

**UNIVERSITY OF CENTRAL ARKANSAS**  
Conway, Arkansas 72032

***Undergraduate***

Course Title: Environmental Chemistry

Course Number: CHEM 4351

Course Description: Coverage of important environmental issues based on sound scientific principles. Energy, the atmosphere, the hydrosphere, and the biosphere are covered.

Course Title: Environmental Chemistry Laboratory

Course Number: CHEM 4152

Course Description: A laboratory course in environmental chemistry covering the topics of environmental sampling, sample analysis procedures, and instrumentation.

Course Title: Water Resources

Course Number: GEOG 4304

Course Description: Occurrence, distribution, and movement of water on and beneath the surface of the land; the integration of water into human activities - floods, irrigation and drainage, water power, navigation, municipal water supplies, industry, and water pollution.

***Graduate Courses:***

Course Title: Aquatic Ecology

Course Number: BIOL 6442

Course Description: A study of the physical, chemical, and biological characteristics of water and the interrelationships of these characteristics.

