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Directory of Water Related Courses Offered at Colleges and Universities in Arkansas as of November 1998

Kenneth F. Steele

University of Arkansas, Fayetteville

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

As of November 1998

AWRC Publication No. MSC 223

**Arkansas Water Resources Center
University of Arkansas
113 Ozark Hall
Fayetteville, Arkansas 72701
Telephone: (501) 575-4403
Fax: (501) 575-3177**

**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 1998. 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 must 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 second 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** **(870) 972-2100**

Undergraduate Courses:

Course Title: Agriculture and the Environment

Course Number: AGRI 4223

Course Description: This course will explore the complex and varied interrelationships of agriculture and the environment with the ultimate goal of identifying viable procedures to make agricultural programs more sustainable.

Course Title: Agricultural Law

Course Number: AGECE 4033

Course Description: Prerequisite: AGECE 1003 or ECON 2313 or ECON 2323. Farm laws pertaining to land purchases, legal descriptions, leases, mortgages, security agreements, fences, drainage, irrigation, pollution, and quarantines.

Course Title: Agricultural Policy and Current Issues

Course Number: AGECE 4083

Course Description: Prerequisite: AGECE 1003 or ECON 2313 or ECON 2323. Economic developments in agriculture; role of the government in agriculture and policies affecting rural people are considered. Text and current information are utilized.

Course Title: Aquatic Entomology

Course Number: ENT 4001

Course Description: Prerequisite: BOT 3001,3003; BIOL 3121, 3122; or ZOOL 4201,4202. Identification, life histories, and 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. Offered Spring of odd numbered years.

Course Title: Aquatic Plants

Course Number: ENT 4181

Course Description: Prerequisite: BOT 1101, 1103. Structure, classification, and ecology of freshwater algae and freshwater aquatic vascular plants. Lecture one hour per week. Offered Summer of even numbered years, every 4 years.

Course Title: Capstone Agriculture

Course Number: AGRI 4243

Course Description: Course provides opportunity to address current issues that impact agriculture, society and the world. The course is designed for the senior class student.

Course Title: Environmental Microbiology

Course Number: ENVR 4103

Course Description: Prerequisite: BIOL 3122 or permission of instructor. Study of the physiology and diversity of microorganisms and their role in cycling of nutrients and mineralization of pollutants in world. Offered Spring of odd numbered years.

Arkansas State University

Course Title: Fishery Biology

Course Number: ENVR 4001

Course Description: Prerequisite: ZOO 1041 and 1043. Identification, ecology, food habits management, and behavior of fishes. Lecture 1 hour per week. Offered Summer of even numbered years.

Course Title: Ichthyology

Course Number: ENVR 4241

Course Description: Prerequisite: ZOO 1041, 1043. Taxonomy, distribution, natural history, and economic importance of fishes; with emphasis on Arkansas species. Lecture two hours per week. Offered Spring of even numbered years.

Course Title: Laboratory for Aquatic Entomology

Course Number: ENT 4002

Course Description: Four hours per week. To be taken concurrently with ENT 4001. Offered Spring of odd numbered years.

Course Title: Laboratory for Aquatic Plants

Course Number: ENT 4182

Course Description: Four hours per week. To be taken concurrently with ENT 4181. Offered Summer of even numbered years, every four years.

Course Title: Laboratory for Fishery Biology

Course Number: ZOO 4002

Course Description: Four hours per week. To be taken concurrently with ZOO 4001. Offered Summer of even numbered years.

Course Title: Laboratory for Ichthyology

Course Number: ZOO 4241

Course Description: Four hours per week. To be taken concurrently with ZOO 4242. Offered Spring of odd numbered years.

Course Title: Laboratory for Limnology

Course Number: BIOL 4361

Course Description: Four hours per week. To be taken concurrently with BIOL 4363. Offered Fall of odd numbered years.

Course Title: Land Economics

Course Number: AGEC 4043

Course Description: Prerequisite: AGEC 1003. Physical characteristics as related to land use; the economics of land use. Principles of land utilization, classification, conservation, zoning and land-use planning.

Course Title: Limnology

Course Number: BIOL 4363

Course Description: Prerequisite: ZOO 1041,1043. Physic-chemical condition of freshwater, and their effects on aquatic life; plankton analysis and bottom funa studies. Lecture three hours per week. Offered Fall of odd numbered years.

Arkansas State University

Course Title: Soil and Water Conservation

Course Number: PSSC 4853

Course Description: Prerequisite: PSSC 2813. Properties of soil which affect erosion and water infiltration, with practical methods of holding water and soil.

Course Title: Soil Chemistry

Course Number: PSSC 4863

Course Description: Prerequisite: PSSC 2813. Chemical properties of soils and determination of several elements. Lecture two hours, laboratory two hours per week.

Course Title: Soil Fertility

Course Number: PSSC 4813

Course Description: Prerequisite: PSSC 2813. Principles involved in maintaining and increasing fertility of soil.

Graduate Courses:

Course Title: Aquatic Biology

Course Number: BIOL 6301

Course Description: Prerequisite: BOT 1101,1103; ZOO 1041,1043. The collection, identification, and study of aquatic invertebrate and vertebrate animals with emphasis on life history, ecology, and importance to man. 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 hour per week.

Course Title: Aquatic Entomology

Course Number: ENT 5001

Course Description: Prerequisites: ENT 3001, 3003; BIOL 3121 or ZOO 4201, 4202. Identification, like 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: Case Studies in Ecosystem Management

Course Number: ENVR 6303

Course Description: Prerequisites: BIOL 3122, ENVR 5202, ENVR 4203, or ENVR 6003, 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 Fall of odd numbered years.

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 of the microcomputer as an analytical tool will be emphasized. Lecture three hours per week. Offered Spring of odd numbered years.

Arkansas State University

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. Offered Fall of even years.

Course Title: Fishery Biology

Course Number: ZOOL 5001

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

Course Title: Ichthyology

Course Number: ZOOL 5242

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

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 Aquatic Entomology

Course Number: ENT 5002

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

Course Title: Laboratory of Case Studies in Ecosystem Management

Course Number: ENVR 6301

Course Description: Prerequisites: BIOL 3122 or ZOOL 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 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 Limnology

Course Number: BIOL 5361

Course Description: Two hours per week. To be taken concurrently with BIOL 5363.

Course Title: Laboratory for Wetlands Plant Ecology

Course Number: BOT 5171

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

Arkansas State University

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: Remote Sensing and Geographic Information Systems

Course Number: ENVR 6203

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

A study of principles of computer 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 Physics

Course Number: PSSC 4873

Course Description: Prerequisite: PSSC 2813. Soil Physical properties and measurements, with emphasis on the relation to plant growth. Lecture two hours, laboratory two hours per week.

Course Title: Wetland Plant Ecology

Course Number: BOT 5172

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

ARKANSAS TECH UNIVERSITY
Russellville, Arkansas 72801
(501) 968-0389

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 essentials 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 lakes 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.

Arkansas Tech University

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.

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
(870) 230-5000

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 microorganisms 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.

PHILANDER SMITH COLLEGE
Little Rock, AR 72202
(501) 375-9845

Undergraduate Courses:

Course Title: Man and Earth

Course Number: BIO 224

Course Description: This course is designed to present a study of man and his environment from the standpoint of an integrated approach to geological, biological, chemical, physical, and social aspects. The central concepts in the self-regulating systems and the flow of energy in the biosphere are emphasized. Lecture-discussion three hours and laboratory three hours (4 credit hours).

Course Title: Microbiology

Course Number: BIO324

Course Description: Basic morphology, physiology, genetics, and classification industry; elements of immunology. Laboratory exercises include basic staining culture techniques, physiology, and identification of microorganisms. The course is designed for pre-professional students, including medical, paramedical, nutrition, health, teaching, and environmental fields as well as students. Lecture three hours and laboratory three hours (4 credit hours).

SOUTHERN ARKANSAS UNIVERSITY
Magnolia, Arkansas 71753
(870) 235-4040, (800) 322-7286

Undergraduate Courses:

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.

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.

Southern Arkansas University

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.

UNIVERSITY OF ARKANSAS
Fayetteville, Arkansas 72701
(501) 575-2000, (800) 377-8636

Undergraduate Courses:

Course Title: Advanced Invertebrate Zoology

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: 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: Aquaculture

Course Number: ZOOL 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: 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.

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.

University of Arkansas, Fayetteville

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: ZOOL 4733

Course Description: Prerequisites: ZOOL 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: ZOOL 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.

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.

University of Arkansas, Fayetteville

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.

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.

University of Arkansas, Fayetteville

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. Offered summer only.

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 flow, 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 advanced 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.

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.

University of Arkansas, Fayetteville

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 substances investigations of groundwater and groundwater management, saline intrusion and groundwater modeling will be addressed.

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.

University of Arkansas, Fayetteville

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: AGECE 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

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 lotic 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.

University of Arkansas, Fayetteville

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.

UNIVERSITY OF ARKANSAS
Little Rock, Arkansas 72204
(501) 569-3000

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 that 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.

University of Arkansas, Little Rock

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.

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, pile 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

University of Arkansas, Little Rock

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.

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.

UNIVERSITY OF ARKANSAS
Monticello, Arkansas 71655
(870) 367-6811

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
(501) 450-5000

Undergraduate Courses:

Course Title: Environmental Chemistry

Course Number: CHEM 4351

Course Description: Prerequisites: CHEM 3411, 3520. Coverage of important environmental issues based on sound scientific principles. Energy, the atmosphere, the hydrosphere, and the biosphere are covered.

Course Title: Environmental Chemistry Lab

Course Number: CHEM 4152

Course Description: Pre- or Corequisite: CHEM 4351. Laboratory designed to strengthen and expand topics covered in CHEM 4351 and provide students with experiential opportunities in environmental sampling and analysis procedures and instrumentation.

Course Title: Introduction to Marine Biology

Course Number: BIOL 3660

Course Description: Prerequisites: BIOL 1441, CHEM 1451, and PHYS 1410. An introduction to the marine environment as habitat, to the biota of various marine communities, and to human impact issues such as overharvesting and pollution.

Course Title: Oceanography

Course Number: GEOG 4308

Course Description: Prerequisites: GEOG 1315 or consent of instructor. Introduction to oceanic environments, distribution, ocean basin topography, physical and biological characteristics, marine climate, currents, ecology, and politics. Emphasis on the oceanic physical environment and natural resources.

Course Title: Water Resources

Course Number: GEOG 4303

Course Description: Prerequisites: GEOG 1315 or consent of instructor. Occurrence, distribution, and movement of water on and beneath the surface of the land; the integration of water into human activities-floods, drainage, irrigation, water power, navigation, municipal and rural water supplies, industry, and water pollution.

Graduate Courses:

Course Title: Aquatic Ecology

Course Number: BIOL 6642

Course Description: Prerequisites: Undergraduate minor in biology and one year of general chemistry. A study of the physical, chemical, and biological characteristics of bodies of water and the interrelationships of these characteristics.

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