

# **DOCTOR OF PHILOSOPHY IN AQUACULTURE/FISHERIES**

## **Program Guidelines**

**Department of Aquaculture and Fisheries  
School of Agriculture, Fisheries and Human Sciences  
University of Arkansas at Pine Bluff**

**November 2016**

The policies and guidelines listed in this handbook require continuing evaluation, review and approval by the department and the university administration. The procedures in this handbook reflect the policies at the time of printing and the department and the university reserve the right to change the policies at any time without prior notice. It is the responsibility of each student to become familiar with these guidelines and to become aware of changes as they occur.

## **OVERVIEW OF AQUACULTURE/FISHERIES CENTER**

The Aquaculture/Fisheries Center at the University of Arkansas at Pine Bluff (UAPB) was created in 1988. It combines resident instruction, research and extension responsibilities into one comprehensive unit. Currently, the Center has a total of 24 faculty and staff including 11 Ph.D. scientists, 6 M.S., 5 B.S.-level staff and 2 secretarial and maintenance personnel. The research component of the Aquaculture/Fisheries Center is supported by a 106-pond earthen pond facility that also includes a 40-pool unit. The 5,400 sq. ft. hatchery houses holding, spawning, and experimental tanks along with a small recirculating culture system. Additional buildings provide storage areas for feed, chemicals, tools and seines.

The S. J. Parker Agricultural Research Center building provides laboratory space that includes a 1,300 sq. ft. wet laboratory for aquarium studies, a water quality laboratory, and a 1,000 sq. ft. nutrition laboratory. The 1890 Extension building houses the state-of-the-art fish health diagnostics laboratory that is fully equipped to conduct microbiological, viral, and histopathological analyses of fish. The Aquaculture Equipment Development Building provides facilities for research and development of aquaculture equipment. The Hatchery Development and Research Building was completed in 2005 for hatchery fish and water quality research. It is divided into two dry labs and two wet labs that can be combined or separated with independent temperature/light control.

The Fish Shop, the Applied Sciences Building, and the Boat Barn provides approximately 7,000 sq. ft. of laboratory, wet-lab, offices, and equipment storage for natural fisheries research. This research program has available 2 electrofishing boats, 2 backpack shockers, 1 barge shocker, 6 aluminum boats ranging in size from 10 to 18 ft., outboard motors from 7.5 to 40 hp, a state of the art fish aging laboratory, and additional equipment (nets, seines, trawls, and traps) necessary to support recreational fisheries research needs.

Aquaculture research conducted at UAPB focuses primarily on pond and hatchery production technologies, fish nutrition, water quality, fish health, and economics and marketing of aquaculture products. Much of the work is devoted to catfish, sportfish, and baitfish production. UAPB aquaculture researchers developed new fish spawning and hatching technologies that dramatically improved hatch rates and survival, lowered production costs, and reduced groundwater usage. The UAPB fish nutrition program developed new feed formulations that lowered costs of production and improved growth and feed conversion. New catfish farming equipment developed and patented at UAPB reduced harvesting labor, removed undersized fish from harvesting nets and effectively sorted other species from catfish. Aquaculture research includes work with new “split-pond” systems. UAPB research develops guidelines that help farmers select the most efficient and profitable management strategies.

Water quality research has focused on the effects of filter-feeding fish in catfish ponds and the effects of aerial applications of common herbicides on pond plankton populations and water quality.

UAPB natural fisheries research is focused on improving recreational fishing in Arkansas. Research includes evaluating stocking success of largemouth bass and crappie in rivers, oxbow lakes, and reservoirs; identification of appropriate species, impacts of stocking programs, and management options in farm ponds; program evaluations of community fishing programs; and studies that are designed to gain a better understanding of floodplain river ecosystem function and its importance for maintaining and enhancing fisheries resources.

Aquaculture Extension programming in Arkansas is administered through the Aquaculture/Fisheries Center at UAPB. Disease diagnostics, water quality testing, and aquatic vegetation identification support is provided through four laboratories in Lonoke, Pine Bluff, Lake Village, and Newport, Arkansas, and the APHIS-certified Fish Health Inspection Laboratory in Lonoke, Arkansas. Extension efforts have included intensive in-service training of county agents in fish production, producer workshops, problem solving, publication of the quarterly newsletter *Arkansas Aquafarming*, bilingual farm labor training, farm demonstrations, an innovative Catfish Research Verification Program, farm pond management, and a Fish Farm Safety Program.

The aquaculture industry in Arkansas supports the Aquaculture/Fisheries Center with financial support, in-kind contributions and through participation in the National Fisheries Advisory Council to the Center. The Advisory Council provides overall guidance in terms of research priorities.

The Department of Aquaculture and Fisheries offers post-baccalaureate training for careers in aquaculture (applied fisheries, fish farming and related support industries) and natural fisheries (fisheries science, fish population management and related support areas of study).

## **ADMISSION PROCESS**

All prospective students must submit a complete set of application materials. Items 1-2 and 9-11 (below) should be submitted to the UAPB Office of Admissions. Items 3-8 (below) should be submitted to the Aquaculture and Fisheries Graduate Coordinator. The set of application materials includes:

1. UAPB Application for Admission to Graduate Studies (found online at <https://onlineapp.uapb.edu/Account/Login?ReturnUrl=%2f> ).
2. \$45 non-refundable application fee for students submitting a paper UAPB Application or \$40 fee for students submitting an electronic UAPB Application. Pay online or by check. Checks should be made out to the University of Arkansas at Pine Bluff.
3. Application for Admission to the Graduate Program in Aquaculture/Fisheries (Form 01).
4. Three letters of recommendation (Form 02).
5. Official transcripts from all schools attended beyond high school.
6. Official GRE scores.

7. Copy of Immunization Records, including MMR. International applicants also need TB test results and a second MMR immunization.
8. Official TOEFL (iBT) score of 79 or higher, or IELTS score of 6.5 or higher (International students). International students who hold degrees or diplomas in a related subject from post-secondary institutions in English-speaking countries (e.g. the United States, Canada, England, Ireland, Australia, New Zealand) or who have successfully completed at least a two-year post-secondary course of study in which English was the language of instruction are not required to submit TOEFL or IELTS scores.

International students will also need to submit:

9. UAPB Affidavit of Support (International Students; Form 16).
10. Homeland Security Form I-134 Affidavit of Support (International Students; Form 17).
11. UAPB Financial Statement for Prospective F-1 Visa (International Students; Form 18).  
NOTE: Form 18 states \$17000, but for students with assistantships \$5000 must be shown by bank statement.

Ph.D. students must have an M.S. degree from an accredited institution of higher education in an aquaculture, fisheries, agriculture, natural resources or related scientific discipline.

The applications for admission and the recommendation forms are available on the departmental web site [www.uaex.edu/aqfi/grad/](http://www.uaex.edu/aqfi/grad/). For additional information contact the Graduate Coordinator:

Graduate Coordinator  
University of Arkansas at Pine Bluff  
Box 4912  
Pine Bluff, AR 71601  
(870) 575-8165; Fax 870-575-4639  
E-mail: lochmanns@uapb.edu

### **APPLICATION DEADLINES**

Application deadlines for admission to the Doctoral Degree program are: June 20 for Fall Semester, November 10 for Spring Semester, and April 1 for Summer Sessions. Application deadlines for International students are: June 1 for the Fall Semester and October 20 for Spring Semester, and March 10 for Summer Sessions.

### **ADMISSION REQUIREMENTS AND STUDENT CLASSIFICATION**

No student will be admitted under any condition unless a faculty member agrees to serve as the student's advisor. If at any time during the student's course of study, the advisor declines to continue to serve as the student's advisor, and no other advisor with the appropriate graduate faculty status agrees to assume advisory responsibilities for the student, the student will be dismissed from the program. During the application process, the applicant indicates a preferred area of specialization that is referred to the appropriate faculty member for review. This requirement ensures that adequate research facilities and funding will be available upon admission for the student's dissertation work.

Admissions requirements include the following:

1. M.S. degree from an accredited institution of higher education in an aquaculture, fisheries, agriculture, natural resources, or related scientific discipline.
2. Minimum GPA during the M.S. studies of 3.0 on a 4-point scale.
3. Minimum GRE of 297 (combined verbal and quantitative).
4. Minimum TOEFL (iBT) score of 79 or IELTS score of 6.5 (for International students). International applicants who hold degrees or diplomas in a related subject from post-secondary institutions in English-speaking countries (e.g. the United States, Canada, England, Ireland, Australia, New Zealand) or who have successfully completed at least a two-year post-secondary course of study in which English was the language of instruction are not required to submit TOEFL or IELTS scores.
5. Agreement of graduate faculty member in the Department of Aquaculture and Fisheries to supervise the student and fund the dissertation research.

The program will provide graduate students a strong academic foundation and advanced training in aquaculture/fisheries at the highest level of quality and fully integrated with research ranging from controlled aquaculture to natural fisheries so that graduates are prepared for distinguished careers in academia, industry, or public service.

### **Regular Admission**

To be admitted as a regular student, applicants must have earned a Master of Science degree in a natural science field from an accredited institution and have an Official TOEFL (iBT) score of 79 or higher, or IELTS score of 6.5 or higher (international students, if applicable). Applicants must have scored at least 297 on the GRE (quantitative & verbal) with a grade point average during their Master of Science studies of 3.0 or better.

### **Provisional Admission**

Provisional Applicants who meet the GRE and grade point average requirements but have a Master of Science degree from an accredited institution in a non-natural science field may be accepted as a provisional student. Provisional students must make up deficiencies through undergraduate course work that will not count for credit toward a degree. The specific course work will be determined by the graduate coordinator, the student's advisor, and the department chair.

### **Conditional Admission**

Students with a Master of Science degree in a natural science field from an accredited institution who do not meet the GRE and/or grade point average requirements may be accepted as a conditional student. Conditional acceptance is granted only at the chair's discretion and is usually reserved for individuals with extensive work experience in the field. Conditional students must earn a GPA of 3.0 or better during their first semester to continue in the program. Thereafter, the student is considered a regular student.

## **FEES** (effective Fall 2016 – Summer 2017)

### **Tuition**

In-state tuition is \$199 per credit hour and out-of-state tuition is \$451 per credit hour. Graduate students on assistantships are charged in-state tuition. Students are responsible for all fees.

### **Other Fees**

Athletic Fee	\$17.00/credit
Facility Use Fee	\$22.00/credit
Technology Fee	\$14.00/credit
Transportation Fee	\$1.50/credit
Wellness Fee	\$1.50/credit
Assessment Fee	\$1.50/credit
Public Safety	\$1.50/credit
Health Services Fee	\$50.00/regular semester
Student Activity Fee (Full-time)	\$48.00/regular semester
Student Activity Fee (Part-time)	\$25.00/regular semester
Health Services Fee	\$17.00/summer session
Student Activity Fee	\$8.00/summer session
Matriculation Fee (first time students)	\$37.00
Graduation Fee – Graduates	\$63.00
Application Fee – Graduate School (Electronic Submission)	\$40.00
Application Fee – Graduate School (Paper Submission)	\$45.00
Change of Schedule Fee (per class)	\$15.00
Late Registration Fee	\$34.50
Teaching Equipment & Laboratory Enhancement Fee	\$35.00/lab
Transcript Fee	\$4.00
International Students Fee (international only)	\$50.00/regular semester
International Students Fee (international only)	\$25.00/summer session
Student Reserved Area Parking Permit	\$30.00

### **RESEARCH ASSISTANTSHIPS**

Research assistantships are awarded for a maximum of 4 years for Ph.D. students. Research assistantships are funded through research grants to individual faculty members and funding possibilities should be discussed with prospective advisors. Teaching assistantships are also available for Ph.D. students. The stipend for Doctoral students is \$20,739 per annum and \$22,739 per annum after successful completion of the preliminary examination. Students receiving assistantships are expected to work 20 hours per week and to be enrolled as a full-time student. Students are responsible for all tuition and fee payments. In addition, international students are required to use and pay for international health insurance and to submit the International Students Fee.

## **TRANSFER OF CREDIT**

Subject to the approval of the student's advisor, the graduate coordinator, and the department chair, a student may transfer up to 8 semester hours of credit from graduate courses with a "B" grade or above, taken elsewhere, prior to admission to the Aquaculture and Fisheries graduate program (Form 03). These credits would be applied toward the minimum 24 hours of core courses to be completed in the UAPB Department of Aquaculture and Fisheries.

## **GRADUATE STUDENT LOAD**

A full-time graduate student load is 6 credit hours during a regular semester and 2 credit hours during the summer. A full-time graduate student's load may not exceed 15 credit hours per regular semester, including any undergraduate courses. A full-time graduate student's load may not exceed 8 credit hours during the summer term. Students who wish to enroll in a course at another campus must file a concurrent enrollment form (Form 15), signed by their major advisor, department chair and dean, with the Registrar prior to enrolling on another campus. There is a separate concurrent enrollment form to be filed by international students with the Office of International Studies. Students who are not enrolled full-time are not eligible for graduate assistantships. Students not on assistantships, but finishing their dissertation must maintain graduate student status by registering for 1 credit of Research and Dissertation each semester of the academic year and during 1 of the summer sessions. International students will need to contact the Office of International Studies for a course reduction form and will need a letter from their advisor to maintain graduate student status with 1 credit. Students must maintain full-time student status to maintain their assistantship.

## **AUDITING COURSES**

Students registering for "Audit" must indicate during the registration period. The symbol to use for a course being audited is "AUD". Auditors pay the regular student fee (no academic credit is awarded). Students seeking to audit a graduate course must obtain permission from the course instructor.

## **ADVISORY COMMITTEE**

Each student must satisfactorily pass a series of milestones throughout their program of study leading to the Ph.D. degree. These milestones have been developed to ensure that students have a clearly-defined path to follow and understand the direction needed for steady progress towards their degree. However, the program also includes mechanisms that allow students to adapt to changing circumstances that arise throughout many research projects, to change research projects, and to change advisors.

A student's advisor must be a faculty member of the Department of Aquaculture and Fisheries. During a student's first semester an advisory committee must be assembled (Form 04). The advisory committee must meet during the first semester to review and unanimously approve the student's program of study and to discuss preliminary plans for the research to be undertaken. This is the responsibility of both the student and the advisor. Failure to complete this requirement will result in receiving an "F" in Graduate Seminar GAQF 5195-5196. The advisory committee should consist of at least five members including the advisor. Faculty from the Department of Aquaculture and Fisheries must compose a majority of the committee members and must have UAPB graduate faculty status. UAPB faculty from other departments must also have UAPB

graduate faculty status to serve on advisory committees. Students are encouraged to seek professionals from outside of the department to serve on their advisory committee. A Memorandum of Agreement with the Graduate School of the University of Arkansas for Medical Sciences provides for UAMS doctoral faculty to also serve on advisory committees of Ph.D. candidates in Aquaculture/Fisheries. These professionals or other external advisory committee members are not required to have UAPB Graduate Faculty status. The graduate coordinator will maintain a list of possible external committee members. External committee members should submit a CV or resume and receive approval from the advisor, graduate coordinator, and the department chair before serving on an advisory committee. Switching advisors is allowed during the first two years of study (but only to a faculty member assigned with a vacant Ph.D. student slot) with permission of the current advisor, the prospective advisor, the graduate coordinator, and the department chair (Form 05). Changes in a committee member (Form 06) must be approved by the student's advisory committee, the graduate coordinator, and the department chair. All original forms must be filed with the graduate coordinator. Copies will be forwarded to the registrar's office by the graduate coordinator.

### **PROGRAM OF STUDY**

Specific courses to be taken by each student will be specified in a program of study approved by the advisor and the advisory committee. This program of study will ensure that the student possesses the expected knowledge base prior to standing for the preliminary examination. We expect students who enroll in the program to bring varied backgrounds and levels of preparation in aquaculture and fisheries; thus the committee will assist the student to tailor an appropriate program of study.

The program of study must be finalized by the end of the first semester of graduate course work in a committee meeting (Form 07). This meeting should be arranged by the student and attended by the advisor, all committee members, and the graduate coordinator and/or the department chair. Conference call arrangements should be made for committee members unable to attend the meeting. The advisory committee, the graduate coordinator, and the department chair must sign programs of study, indicating their approval. The program of study should include a minimum of 42 credit hours beyond the M.S. degree. A student's committee may require further course work. Each student must complete a minimum of 24 hours of core coursework in the Department of Aquaculture and Fisheries. Within this minimum requirement, three hours of an ethics course will be required and up to eight additional hours of appropriate external coursework may be substituted, with the approval of the advisory committee, graduate coordinator, and department chair. These courses will include aquaculture-related classes in fish health, aquatic animal nutrition, aquaculture engineering, water quality, physiology, and aquaculture economics and marketing and fisheries courses such as fisheries management, population dynamics, stream ecology, ecology of fishes, and management of small impoundments. A memorandum of Agreement has been signed with the Graduate School of the University of Arkansas for Medical Sciences to allow Ph.D. students from UAPB to enroll in graduate-level courses that add depth to the aquaculture/fisheries coursework offered at UAPB. In addition to the 24 hours of core coursework, students will also take two hours of Graduate Seminar, at least one hour of a teaching/extension practicum, Research and Dissertation credit hours, and possibly additional advanced coursework in biological, chemical, and social sciences. A student's committee may require further course work. One credit hour of Graduate Seminar must be taken in the first semester of study. Failure to complete this requirement by the end of the first semester will result



in receiving an “F” in Graduate Seminar. Changes in the program of study (Form 08) must be approved by the student’s advisory committee, the graduate coordinator, and the department chair. All original forms must be filed with the graduate coordinator to be forwarded to the registrar’s office, with copies kept on file by the graduate coordinator.

**GRADE POINT AVERAGE**

A cumulative grade point average of 3.0 or better on a 4-point scale must be maintained during the student’s academic career. If a student’s GPA falls below a 3.0 he/she is placed on academic probation during the following semester. If at the end of the probationary semester, the student’s GPA is still below a 3.0, the student will be dismissed from the Ph.D. degree program. The dismissal may be appealed to the advisory committee, graduate coordinator and the department chair.

**COMMITTEE MEETINGS**

Committee meetings are essential to a successful and positive graduate student experience. This format brings members of the students support team together to exchange ideas, work through research problems and changes, and monitor the student’s academic and research progress. Students are required to have a program of study committee meeting their first semester. Students are strongly encouraged to schedule additional committee meetings during their tenure in the department.

**DISSERTATION PROPOSAL AND PROPOSAL DEFENSE**

Students will be expected to spend a substantial amount of time involved in research and demonstrate the ability to design and conduct high-impact research studies. Students will be engaged in research throughout their tenure in the program, and will enroll in Research and Dissertation credit hours after completing the coursework identified in their program of study.

Students will prepare a dissertation proposal concerning original research during their tenure in the Doctoral Degree program within the first 200 days in the program. The proposal must include an Introduction, Literature Review, Methods, and Citations section. The style of the dissertation proposal will follow the “manuscript preparation” guidelines for American Fisheries Society or World Aquaculture Society journals (see PREPARATION OF THE THESIS/DISSERTATION below).

The proposal must be approved by the advisor and the advisory committee one week prior to scheduling a public dissertation proposal defense. At least one week’s notice to all faculty, staff and students is required. The defense should be scheduled in a major auditorium. Following the defense of the dissertation proposal, the committee will meet to discuss any changes to the proposal (the proposal must have unanimous approval from the committee). The deadlines are as follows:

<b>Date of Entry in Program</b>	<b>Deadline for Submitting Completed &amp; Approved Proposal Defense Forms</b>
Spring	July 31 <sup>st</sup>
Summer I	December 15 <sup>th</sup>
Summer II	January 31 <sup>st</sup>
Fall	March 15 <sup>th</sup>

**Failure to complete the dissertation proposal, (i.e., public presentation and defense of proposal, and submission of dissertation proposal approved by all committee members) by the above deadlines will result in suspension of the assistantship. Upon completion of the dissertation proposal, proposal defense, and submission of the proposal with signatures of committee members the assistantship will be resumed.** Lost income will not be returned and the student is not eligible for employment in the department during this time period. Exceptions to the assistantship loss are only granted due to extreme circumstances and must be approved by the department chair. The advisory committee, the graduate coordinator, and the department chair must sign the dissertation proposal. The original must be filed in the department office with the graduate coordinator. The proposal must be defended prior to the student initiating his/her research.

## **GRADUATE COURSE OFFERINGS**

### **GAQF 5210 Advanced Aquaculture 3 Credits (3 hrs. Lecture)**

Students will learn the biological, chemical, and physical bases, determinants and limitations of production systems and major species. Climatic influences will be discussed. Special consideration will be given to species of regional importance and elements of hatchery management and fish genetics. This course is needed by all aquaculturists. Offered spring semester of odd years.

**Prerequisites: None**

### **GAQF 5322 Aquaculture Economics 3 Credits (3 hrs. Lecture)**

Aquaculturists need to be able to develop, interpret, and use results of economics and financial analyses to improve economic and financial performance of aquaculture businesses. The course will cover the application of economics, and financial analysis techniques in aquaculture. Enterprise budgets, balance sheets, income statements, cash flow budgets, loan management, risk analysis, business plan development and whole-farm modeling are included. No prior background in economics and marketing is required. Offered fall semester of odd years.

**Prerequisites: None**

### **GAQF 5323 Aquaculture Marketing 3 Credits (3 hrs. Lecture)**

Aquaculturists need to understand how to develop a marketing plan and interpret results from marketing research. This course will cover key marketing concepts, functions, channels, and strategies. Examples will be focused on the aquaculture industry. No prior background in economics and marketing is required. Offered fall semester of even years.

**Prerequisites: None**

### **GAQF 5324 Quantitative Methods in Fisheries and Aquaculture Economics 3 Credits (3 hrs. Lecture)**

This course will introduce students to quantitative methods used to: 1) identify consumer preferences; 2) estimate demand for either an aquaculture product or a non-market good or service; 3) willingness-to-pay techniques; 4) contingent valuation; 5) logit analysis; and hedonic analyses. Offered spring semester of odd years.

**Prerequisites: Aquaculture Economics (5322) or Aquaculture Marketing (5323)**

**GAQF 5336 Aquatic Animal Nutrition 3 Credits (3 hrs. Lecture)**

This course covers metabolism and nutritional requirements of fishes and other aquatic animals. Biochemical concepts of nutrient utilization will be discussed. Emphasis is on the differences between nutrient use and requirements of aquatic animals versus terrestrial ones. This course is needed by aquaculture students. Offered fall semester every year.

**Prerequisites: None**

**GAQF 5136 Aquatic Animal Nutrition 1 Credit (3 hrs. Lab)**

This course covers laboratory analytical procedures relevant to fish nutrition studies (protein, lipid, dry matter, ash, etc.). Students will also initiate and maintain a group project (usually a feeding trial) to gain practical experience in methods used to determine nutrient requirements or optimal feeding strategies for different fish species. Offered fall semester every year.

**Prerequisites: None**

**GAQF 5414 Ecology of Fishes 4 Credits (3 hrs. Lecture, 3 hrs. Lab)**

Students will learn the fundamental concepts of ecology. Students will learn specific life history requisites of native Arkansas fishes and how they interrelate with habitat parameters. Students will also be introduced to simplistic habitat modeling techniques. This course is recommended for students with the goal of working in natural resource management or research. Students should have taken a course in ichthyology that emphasized taxonomy of fishes. Offered spring semester of even years.

**Prerequisites: None**

**GAQF 5220 Engineering and Construction of Aquaculture Facilities I 2 Credits (3 hrs. Lecture, 3 hrs. Lab)**

This course will cover site selection and construction of levee and watershed ponds, repairing levees and ponds, cage construction and placement, in-pond raceways, aeration, and pond effluents. Strongly recommended for all aquaculture students. Offered summer semester I of odd years.

**Prerequisites: None**

**GAQF 5221 Engineering and Construction of Aquaculture Facilities II 2 Credits (3 hrs. Lecture, 3 hrs. Lab)**

This course will cover degassing mats, pumps, open channel and piping systems, transportation, and management, and components of recirculating aquaculture systems with fish only and with fish integrated with plant production. Offered summer semester II of odd years.

**Prerequisites: None**

**GAQF 5430 Fish Health Protection 4 Credits (3 hrs. Lecture, 3 hrs. Lab)**

Fish diseases are a major factor governing the management of natural fisheries and diseases also have a significant impact on commercial aquaculture. In this class, students will learn disease diagnostic techniques from microscopy to PCR, survey the major diseases of wild and cultured fish, and learn about the relationships between fish disease and regulatory actions. Additional lectures will cover shrimp and shellfish diseases. The laboratory portion of the course is conducted in the UAPB Fish Disease Diagnostic Laboratory and requires students to diagnose, document, and report on fish disease cases. Offered spring semester of even years.

**Prerequisites: None**

**GAQF 5325 Fish Population Dynamics 3 Credits (3 hrs. Lecture)**

Students will learn theoretical aspects of population dynamics and the interaction of natality, mortality, growth, and exploitation of fish populations in order to model and manage them. Some modeling applications are explored through standard computer software and programming for model derivation and applications. Offered fall semester of even years.

**Prerequisites: None**

**GAQF 5371 Fisheries Management 3 Credits (3 hrs. Lecture)**

Students will learn about fish population in streams, reservoirs, lakes and oceans and will also learn techniques and methods to assess and manage these populations. This course is needed by all fisheries biologists. Offered spring semester of odd years.

**Prerequisites: None**

**GAQF 5435 Management of Small Impoundments 4 Credits (3 hrs. Lecture, 3 hrs. Lab)**

Students will learn the principles that govern the management of small impoundments for recreational fishing. Students will learn about species balance, population balance, field techniques to assess balance, and methods to correct unbalanced populations. Labs will be field trips to ponds in Jefferson and adjacent counties to assess the balance of farm ponds; to make recommendations about their balance; and to formulate solutions to unbalanced populations. This course is needed by extension biologists, aquaculturists, and research biologists. Offered spring semester of even years.

**Prerequisites: None**

**GAQF 5300 Research Methods and Scientific Writing 3 Credits (3 hrs. Lecture)**

The two main objectives of this course are: 1) to familiarize students with planning and execution of scientific experiments and 2) to enable students to convey research results effectively through written communications. Students will learn general principles of scientific writing and how to conduct literature searches. Different formats of written communications pertinent to aquaculturists and fisheries biologists will be examined (e.g. peer-reviewed journal articles, extension and trade publications, government documents). Offered spring semester every year.

**Prerequisites: None**

**GAQF 5405 Statistics in Research 4 Credits (3 hrs. Lecture, 2 hrs. Lab)**

This course will cover the fundamentals of basic statistics and analytical techniques that are needed for scientific research data analysis. The statistics taught in this class will range from descriptive statistics, simple t-test, ANOVAs, to linear regression. Theories and applications of statistics will be dealt with real-world examples. Offered fall semester every year.

**Prerequisites: College Algebra**

**GAQF 5406 Univariate and Multivariate Models in Fisheries Science 4 Credits (3 hrs. Lecture, 3 hrs. Lab)**

This course will cover models that are developed to deal with univariate and multivariate data analysis. The statistical modeling techniques taught in this class include multiple regressions, model selection methods, logistic regressions, multivariate ANOVAs, ordinations, and classification analyses. Theories and application to real-world examples will be used to understand the statistical methods. The laboratory session will focus on the application of the models for specific uses. Offered spring semester of even years.

**Prerequisites: Statistics in Research (5405)**

**GAQF 5407 Experimental Design and Analysis 4 Credits (3 hrs. Lecture, 3 hrs. Lab)**

The success of research studies starts with the research design. This course addresses the needs of graduate students preparing for a career in agricultural and aquaculture research as professional scientists in the subject areas of experimental design, plot layout, analysis and interpretation of laboratory and field experiments. Many numerical examples and problems will be presented, and the recitation through homework assignments will allow students to explore their analyses. Laboratories will be devoted to practical applications and exercises. Offered spring semester of odd years.

**Prerequisites: Statistics in Research (5405)**

**GAQF 5208 Nonparametric Methods in Data Analysis 2 Credits (2 hrs. Lecture)**

Parametric statistics, such as t-test and F-tests, require very rigorous parametric assumptions about the underlying distribution of populations. However, we often deal with data that do not satisfy the restrictive parametric assumptions of sufficient sample size that are crucial for accurate and unbiased statistical inferences. This course will introduce alternative nonparametric statistical methods that can be used in the analysis of data that do not meet parametric statistical assumptions. Offered summer session II of even years.

**Prerequisites: None, Statistics in Research (5405) recommended**

**GAQF 5420 Fish Physiology 4 Credits (3 hrs. Lecture, 2 hrs. Lab)**

This course will impart an understanding of the organization of diverse physiological systems. The course begins with energy mobilization and systems responsible for the maintenance of homeostasis; followed by integration of and response to environmental signals through sensory biology and the neuroendocrine systems; and concludes with applications of fish physiology to fisheries management and aquaculture. Offered fall semester of odd years.

**Prerequisites: None.**

**GAQF 5445 Stream Ecology 4 Credits (3 hrs. Lecture, 3 hrs. Lab)**

Students will learn about the chemical, physical and biotic factors that affect stream organisms and will also learn how aquatic ecosystems function. Stream organisms have developed adaptations to cope with such systems. Stream habitat management, impact assessment, and habitat modeling will be emphasized. Hydrologic data interpretation will be integrated into field exercises. This course is recommended to acquire an understanding of stream hydrology and dynamics and is necessary for students who embark on careers with regulatory or management functions. Offered fall semester of odd years.

**Prerequisites: None**

**GAQF 5440 Aquatic Chemistry and Analysis 4 Credits (3 hrs. Lecture, 3 hrs. Lab)**

The physical, chemical, biological, and hydrological characteristics of surface water systems will be reviewed. Specific attention will be given to procedures that evaluate interactions among water, soils, and biota that provides the driving forces behind overall productivity of aquatic systems and carrying capacity of pond aquaculture facilities. This course will be useful to all aquaculture and fisheries scientists. Offered fall semester of even years.

**Prerequisites: None**

**GAQF 5341 Water Quality Management 3 Credits (3 hrs. Lecture)**

This course covers the management of water quality in commercial fish ponds, farm ponds, impoundments and streams. Students will apply water chemistry to management goals for various water bodies. This course is useful to all aquaculture and fisheries scientists. Offered spring semester of odd years.

**Prerequisites: Aquatic Chemistry and Analysis (5440)**

**GAQF 5310 Program Evaluation and Survey Methods 3 Credits (3 hrs. Lecture)**

This course will cover the fundamentals of program evaluation and survey methodologies. Evaluation models such as systems analysis, behavioral objectives, and goal-free will be studied. The construction, design, and implementation of questionnaires using a sound scientific approach will be covered in depth. Offered spring semester of even years.

**Prerequisites: None**

**GAQF 5315 Extension Methodology 3 Credits (3 hrs. Lecture)**

This course will cover the history and mission of the land-grant system with particular emphasis on Extension. Extension community needs assessment, program development, implementation, and evaluation will be covered. Extension methodologies for technology transfer will be covered in depth. Strongly recommended for all students. Offered summer I of even years.

**Prerequisites: None**

**GAQF 5340 Integrative Fish Hatchery Science 3 Credits (2 hrs Lecture, 3 hrs Lab)**

An integration of the concepts of basic biology of aquaculture species and hatchery techniques will be presented. Current finfish hatchery practices will be presented in a physiological context and in a quantitative fashion. Students are expected to develop a skill set that can be applied to the development of new hatchery protocols adapted from active areas of aquaculture research. Offered spring semester of even years.

**GAQF 5345 Genetic Principles and Applications in Fisheries and Aquaculture 3 Credits (3 hrs Lecture)**

The goal of this course is to provide students the tools to understand and evaluate the use of genetic approaches for fisheries management and aquaculture. Chromosomal, biochemical, quantitative and ecological aspects of fish genetics will be presented with emphasis on their application to aquaculture and fish management. This course is needed by all fisheries and aquaculture biologists. Offered spring semester of odd years.

**GAQF 5326 Fisheries Modeling 3 Credits (3 hrs Lecture)**

Students will learn to use a variety of statistical models commonly employed in fisheries science and ecology. Both deterministic and stochastic models will be employed that pertain to mainstream concepts in fish population dynamics and ecology. Examples of topics include virtual population analysis, fish bioenergetics, modeling fish-environment relationships, and models used for fish community analyses. Offered \_\_\_\_semester of \_\_\_\_ years. Prerequisites: GAQF 5325, GAQF 5405 (or equivalent statistics course)

**GAQF 5335 Reservoir Fisheries and Ecology 3 Credits (3 hrs Lecture)**

This course will provide an in-depth look at the limnology, ecology, and management of reservoir systems. Students will learn reservoir physical/chemical properties, processes, and dynamics; trophic aspects; and specialized management issues. Students will be able to compare and contrast reservoir systems with lakes and rivers, and will be expected to present seminar topics to their peers. This course will be needed by all fisheries biologists. Offered \_\_\_\_ semester of \_\_\_\_ years.

**GAQF 5336 Ecology of Caribbean Reef Fishes 3 Credits (2 hrs Lecture, 3 hrs Lab)**

This course will introduce students to the biology and ecology of Caribbean reef fishes. The course will be needed by fisheries biologists interested in working in marine environments and will be offered every other summer. It will involve three weeks of intensive work in Pine Bluff and two weeks of field work. Students will be required to pay their own expenses for the field work (transportation, room, board, dive fees, and equipment rental) in addition to tuition. Offered Summer I. Prerequisite: Students must be SCUBA certified prior to the class.

**GAQF 5v71-75 and 5v81-85 Teaching/Extension Practicum**

Each Ph.D. student is required to take at least 1 hour of this course to gain experience in teaching and/or extension. Students who intend to pursue a career in either a university teaching or extension specialist position may choose to take more hours or take it twice (with a second number). The number of hours taken will be specified in the student's program of study. Offered every semester.

Students in the Ph.D. program in Aquaculture/Fisheries may also take courses outside of the areas of aquaculture and fisheries, to provide additional overall depth. Such courses may include graduate courses currently offered by other departments at UAPB or graduate courses available at the University of Arkansas at Little Rock, the University of Arkansas at Monticello, and the University of Arkansas for Medical Sciences. These campuses are located within 1 hour's drive of UAPB. In addition, the existing Special Topics class provides a mechanism to cover specific study areas of particular interest to students, but not offered as full courses on campus. These

may include topics such as population or conservation genetics, bioinformatics, behavioral or stress physiology, physiology of disease, epidemiology, bioenergetics, fatty acid signatures, otolith microchemistry, or isotope analysis.

**GAQF 5391 Special Topics (3 credit hours)**

This course is offered as a forum to cover timely and topical issues that affect aquaculture and fisheries as they arise. Examples of such issues include aquatic vegetation, regulatory issues, processing and food technology.

**GAQF 5196 Graduate Seminar (1 credit hour)**

Seminars will be presented each week by faculty, staff, students, and guest lecturers. Approaches will include recent perspective and historical overviews as well as critiques of recent research in applied and natural fisheries. First semester graduate students must take GAQF 5195. Course requirements for GAQF 5195 include having a committee meeting where the student's advisory committee develops a program of study. Offered spring and fall semesters every year.

**GAQF 5198 Graduate Research Problems (1 credit hour)**

**GAQF 5298 Graduate Research Problems (2 credit hours)**

**GAQF 5398 Graduate Research Problems (3 credit hours)**

This project-oriented course offers advanced studies in aquaculture and fisheries. The course provides the opportunity for students to obtain specialized skills or undertake research in areas outside the scope of the student's thesis research. Class activities would be arranged in advance with instructors amenable to supervising this course. The amount of credit offered for this course will vary from 1-3 credit hours and depend upon the scope of the project. Credit offered for the course and scope of the project would be determined prior to registration. A research problems outline approved by the course supervisor, advisory committee, and graduate coordinator must be submitted with the program of study (Form 12).

**GAQF 6V10 Research and Dissertation - (variable credit hours)**

**GAQF 6V20 Research and Dissertation – (variable credit hours)**

**GAQF 6V30 Research and Dissertation – (variable credit hours)**

**GAQF 6V40 Research and Dissertation – (variable credit hours)**

**GRADES**

The letters A, B, C, D, F, I, P, and W are used in grading, indicating the following qualities: A-Excellent, B-Good, C-Fair, and D or F-Failure, I-Incomplete, P-Pass, and W-Withdrawal. Except in the case of Research and Dissertation an incomplete grade not removed within one semester will be recorded as "F". A summer session counts as a semester.

A student who drops an individual course will receive a grade of W in the course. The final date for dropping individual courses is listed in the course schedule each semester. It is usually the end of the eighth week of classes. A student withdrawing from a course must have the written permission of the advisor and the department chair.

For the purpose of computing cumulative grade point averages, grade points are assigned as follows: A-4, B-3, C-2, D-1, F-0. A student's grade point average is computed by multiplying the



number of hours of credit of each grade by the grade points assigned to that grade and dividing the sum of these products by the total number of hours in which the student was enrolled.

### **ACADEMIC PROGRESS, PROBATION AND DISMISSAL**

A cumulative grade point average of 3.0 or better on a 4-point scale must be maintained during the student's academic career. If a student's GPA falls below a 3.0 they are placed on academic probation during the following semester. If at the end of their probationary semester, the student's GPA is still below a 3.0 they will be dismissed from the Doctoral Degree program. The dismissal may be appealed to the advisory committee, graduate coordinator and the department chair.

### **DISPUTED GRADES**

A student's grade should represent the instructor's good faith judgment of the student's performance in the course based on the informed use of appropriate measurement and evaluation instruments. If a student disagrees with a grade he/she has received, the following procedure should be followed until the problem is resolved. These steps must be followed in order and appropriate documentation of each step (including notation of the date, time, location, length, content and final outcome of the discussion) must be provided in order to proceed to the next step.

1. The student should discuss the disputed grade with the instructor of the course. This should normally take place during the instructor's posted office hours.
2. If the dispute is not resolved in step one, the student should request a meeting with the chairperson of the department offering the course. The instructor of the course will also attend this meeting.

### **PRELIMINARY EXAMINATIONS**

When the student completes his/her core coursework, he/she will schedule his/her preliminary examinations. The student must pass his/her preliminary examinations at least one year prior to graduating. The preliminary examinations will test a student's overall competence and ability to think critically and synthesize information. Students should meet with each committee member to determine the content covered by the preliminary examinations in order to prepare properly. The preliminary examinations will include written and oral portions. The written portion of the preliminary examinations will consist of five separate 0.5-day exams. One 0.5-day exam will be the departmental exam. The Ph.D. student and his/her advisory committee will jointly decide on the topics the other four 0.5-day exams. The departmental exam will be graded by two members of the departmental exam committee and by the advisor. Each of the remaining four 0.5-day exams will be graded by one committee member and the advisor. Grading will be pass/fail. The oral portion of the preliminary examinations will take place with the student's advisory committee after the five written exams have been completed. While there is no specific time frame for the oral portion, it should be completed within two weeks of completing the written portion. Following the oral portion, each committee member will indicate an overall pass or fail of the preliminary examinations (both written and oral portions). One dissenting vote (other than that of the advisor) from the committee is allowed for the student to pass his/her preliminary examinations. Students who do not successfully complete the preliminary examinations on their

first attempt will be notified in writing by their advisor and may be required to conduct more coursework or independent study prior to attempting the preliminary examinations a second time. Students who fail the preliminary examinations twice will be dismissed from the program.

Notification of successful completion of the preliminary examination must be made known to the department and to the registrar by the committee (Form 09).

### **PETITION TO GRADUATE**

Students should submit application for graduation (Form 14) with the Academic Records by May 6 for Fall Semester (December) graduation and by Sep 16 for Spring Semester (May) graduation. Students and their advisors should ensure that all the courses listed on programs of study have been taken and, if necessary, submit substitution forms (Form 08) if changes need to be made. During the final semester, students must take final examinations early (see schedule for graduating seniors) and instructors must submit final grades according to the same schedule. Also during the final semester, students must submit the Graduation Clearance Form (Form 13) to the Cashier's Office.

All requirements for the Doctoral degree must be satisfied within seven calendar years of a candidate's beginning of a course of study toward a degree. Credit hours older than 84 months will not be counted toward a Doctoral degree. A minimum of 42 credit hours and at least a 3.0 cumulative GPA are required to graduate. All necessary paperwork must be submitted to the graduate coordinator at least 2 weeks prior to commencement ceremonies.

### **RESIDENCE REQUIREMENTS**

The candidate must complete a minimum of 28 hours in residence in order to receive the Doctor of Philosophy degree from the University of Arkansas at Pine Bluff.

### **FOREIGN LANGUAGE**

There is no formal requirement for a foreign language for the Doctor of Philosophy Degree in Aquaculture/Fisheries. However, the department recognizes the international nature of aquaculture research and the increasing frequency with which international collaboration is occurring. For this reason we encourage students to become familiar with at least one foreign language.

### **PREPARATION OF THE DISSERTATION**

Format specifications are outlined in the "Department of Aquaculture and Fisheries Thesis/Dissertation Preparation Guidelines". The style and format for the thesis must follow the "manuscript preparation" guidelines for American Fisheries Society or World Aquaculture Society journals. If specific formats are not covered by the manuscript preparation instructions, students must follow the style and conventions espoused in the CBE Style Manual (Council of Biological Editors, Chicago).

### **DISSERTATION SEMINAR, DEFENSE, AND SUBMISSION**

The final milestone for the student is the successful completion and defense of the dissertation. The dissertation must consist of original research developed and implemented by the student.

The dissertation will be presented in seminar format. The student's advisor and advisory committee must concur that the dissertation is ready for defense. At least one week's notice to all faculty, staff and students is required. The student will give a 30-40 minute overview of his/her research and results followed by audience questions (total time ~60 minutes). The student's advisor will serve as moderator of the seminar. Following the seminar, the student and committee will meet for the dissertation defense. Upon completion of the defense the student will be excused while the committee determines the outcome of the defense (pass/fail). One dissenting vote is allowed for the student to pass his/her dissertation defense as long as it is not the major advisor. The student will be notified immediately following the defense of his/her success or failure and what changes must be made before the dissertation will be given final written approval by the committee. The advisor will provide written notification of the defense outcome to the student and the graduate coordinator. If the student fails the dissertation defense, the student will be given the opportunity to defend a final time at least 30 days after the first defense. If the student fails the second defense, he/she is dismissed from the program.

After making the recommended changes to the dissertation, the student will secure written approval from each committee member (signature page). Signatures of each committee member, the graduate coordinator, and the Aquaculture and Fisheries Department Chair are required on the signature page. After receiving the proofread dissertation with completed signature page, the advisor notifies the graduate coordinator that the dissertation requirement has been fulfilled (Form # 11) and also provides a copy of the cover and signed signature page. **Notification that the dissertation is complete must be made two weeks prior to commencement to be included in the program.** Six copies of the proofread dissertation must be printed on proper bond paper (25% cotton), copied as a PDF file, and must be submitted to the Aquaculture/Fisheries Research and Education Library technician for their signature (Form 11). Watson Memorial Library will ensure that the paper is the correct bond, ensure that photographs are glued properly, and submit the six copies to the binder. One bound copy is for the student, one copy is for the advisor, two copies are for the library, and two copies are for the department. The cost for reproduction is the responsibility of the student. The cost for binding is the responsibility of the library.

### **EXIT INTERVIEW FORM**

Prior to graduation, graduating students must fill out and submit an exit interview (Form 16). The form is available online under the graduate program and should be submitted to the Graduate Coordinator.

### **REGISTRATION STATUS OF STUDENTS**

Students should always be enrolled, i.e., be registered until graduation. When a student completes all requirements of credit hours for coursework, Research and Dissertation, and Graduate Seminar, but is yet to complete the dissertation, the student is required to register for one (1) credit hour in "Research and Dissertation". If any graduate student is not registered at any time during the regular semesters of fall and spring and one summer term, the student will be considered to have withdrawn from the program and cannot graduate (see "Withdrawal from the Graduate Program" below). A student who withdraws and wants to graduate has to apply for readmission (see readmission requirements below).

## **WITHDRAWAL FROM THE GRADUATE PROGRAM**

Students voluntarily withdrawing from the Doctoral Degree program during a session must submit written notice to the department and the University. This process must be completed at least seven days prior to the beginning of the final examinations.

1. Secure a withdrawal slip from Academic Records.
2. Secure approval from the department chair, dean of the college, and the Vice Chancellor for Academic Affairs.
3. Secure clearance from the Student Accounts office.
4. Return the approved slip to Academic Records.

Students who cease to attend classes without submitting written notice of withdrawal will automatically receive an “F” in all courses in which they were enrolled.

## **READMISSION**

Application for re-admission to the Aquaculture/Fisheries Doctoral Degree program should include:

1. The Application for Admission to the Graduate Program in Aquaculture/Fisheries.
2. Three letters of recommendation.
3. One copy of transcripts from all schools attended since the student was enrolled in the Aquaculture/Fisheries Doctoral Degree program.
4. GRE scores (if scores are more than five years old)