

Aquaculture II- FAS 6408

1 Overview

Aquaculture II will build upon the foundations of the Aquaculture I course (FAS 5015). Students will be exposed to more advanced concepts including aquaculture engineering and system design; broodstock management; live feeds and algae production; economics and marketing; as well as biosecurity. Application of principles and concepts presented in this class will be emphasized. At the conclusion of this course students should have a firm grasp of critical concepts in aquaculture and be better prepared for careers in private, state, and federal organizations as well as academia.

- 3 Credits
- Spring Semester
- 100% online, asynchronous
- <http://elearning.ufl.edu/>

Course Prerequisites: Aquaculture I (FAS 5015) is required unless permission is granted by the instructor. A strong foundation in biology, chemistry, marine science, and fish biology/ichthyology is recommended but not required.

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- Please use the Canvas message/Inbox feature for fastest response.
- Office hours: available by email or phone; office visits available by appointment.

Textbook(s) and/or readings: There is no required text for the course. Online readings will be provided for each learning topic.

2 Learning Outcomes

At the end of this course, each student will be able to:

- Design and engineer aquaculture systems for a wide variety of commercially important species.
- Explain the complex relationships between the animal and its culture environment and how these interactions influence growth, disease, survival, and reproduction.
- Describe the role of aquaculture in stock enhancement and restoration efforts.
- Formulate a comprehensive biosecurity plan for an aquaculture production site using risk identification and management strategies.
- Apply principles and concepts from this course to solve problems that may be encountered in aquaculture research and commercial production.

3 Course Logistics

This course is entirely web-based and students may access lectures, readings, and supporting materials as they become available each week.

To ensure satisfactory progress in the course, it is the responsibility of the student to access on-line lectures, readings, discussions, quizzes, and exams in a timely manner. All quizzes, assignments, discussions, and exams must be submitted by 11:59pm EST of the posted due date.

Technology Requirements:

- A computer or mobile device with high-speed internet connection.
- A headset and/or microphone and speakers; a web cam is suggested.
- Latest version of web browser. Canvas supports only the two most recent versions of any given browser. [What browser am I using?](#)
- Voicethread: <http://ufl.voicethread.com> (more instructions will be provided)

3.1 Assignments & Deliverables

Quizzes & Exams

A total of 13 quizzes will be administered online over the course of the semester covering material presented from that week. Quizzes will be multiple choice and questions will come from lecture, readings, and other supplementary materials provided by the instructor.

The mid-term exam will cover all material presented from weeks 1 through 8. The exam format may include multiple choice, short answer, and essay questions and will be administered online.

The final exam will be cumulative and cover all material presented from weeks 1 through 15. The exam format may include multiple choice, short answer, and essay questions and will be administered online.

Discussions

A total of five online discussions will occur over the course of the semester. Discussion threads will be open for two weeks and during that time students are expected to create a minimum of one original post in response to the prompt, as well as two substantial replies to posts from your peers. Discussion prompts may draw on material presented in lectures, readings, or from current events. Discussions will be graded on participation as well as the content, appropriateness, and clarity of the required posts. Where appropriate, students are encouraged to offer citations (peer-reviewed literature, websites, online media, etc.) to provide context for statements and opinions.

Project/Writing Assignment

A broad range of topics have been covered in the Introduction to Aquaculture and Advanced Aquaculture classes, but we have barely scratched the surface. This assignment gives students the opportunity to become the instructor. All students will be required to develop a 20-minute PowerPoint lecture on an aquaculture topic of their choice. The lecture should be developed as if it were an additional module for this class. Lectures should be narrated using the VoiceThread tool. Students will also be required to develop a short 5 question quiz that tests the knowledge of someone who has viewed the lecture. *More details on this assignment are provided in Canvas.*

3.2 Grades & Grading Scale

39 points Quizzes (13 @ 3 pts each)

20 points Mid-term exam

13 points Voicethread assignment

20 points Final exam

8 points Participation in online discussions (5 @ 1.6 pts each)

100 points total

For information on current UF policies for assigning grade points, see

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Grading Scale (%)

A 90-100

B+ 85-89.99

B 80-84.99

C+ 75-79.99

C 70-74.99

D+ 65-69.99

D 60-64.99

E < 60

4 Course Content

Learning Modules

Week	Module Title	Assessment	Discussion
1	Aquaculture overview; Water quality/chemistry (ponds and RAS)	Quiz 1	Discussion 1
2	Aquaculture engineering	Quiz 2	
3	Recirculating system design and considerations	Quiz 3	Discussion 2
4	Broodstock management	Quiz 4	

5	Induced spawning and captive reproduction of fishes	Quiz 5	Discussion 3
6	Larval systems/production	Quiz 6	
7	Protozoan and metazoan parasites in aquacultured fishes	Quiz 7	Discussion 4
8	Bacterial diseases and viruses in aquacultured fishes	Midterm	
9	Comprehensive and integrated aquaculture health planning	Quiz 8	Discussion 5
10	Stock enhancement; Restoration aquaculture	Quiz 9	
11	Live feeds culture	Quiz 10	None
12	Molluscan biology and aquaculture	Quiz 11	
13	Algae culture and Aquaponics	Quiz 12	None
14	Aquaculture economics	Quiz 13	
15	Peer Review of VoiceThread Presentations	None	None
16	No Lecture	Final	

Reading List

(See section #7 below)

5 Policies and Requirements

This syllabus represents current plans and objectives for this course. As the semester progresses, changes may need to be made to accommodate timing, logistics, or to enhance learning. Such changes, communicated clearly, are not unusual and should be expected.

5.1 Late Submissions & Make-up Requests

It is the responsibility of the student to access on-line lectures, readings, quizzes, and exams and to maintain satisfactory progress in the course.

Missed assignments, quizzes and exams cannot be retaken after the scheduled date without the prior written consent of the instructor.

Computer or other hardware failures, except failure of the UF e-Learning system, will not excuse students for missing assignments. Any late submissions due to technical issues **MUST** be accompanied by the ticket number received from the Helpdesk when the problem was reported to them. The ticket number will document the time and date of the problem. You **MUST** e-mail your instructor within 24 hours of the technical difficulty if you wish to request consideration.

For computer, software compatibility, or access problems call the HELP DESK phone number—352-392-HELP = 352- 392-4357 (option 2).

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>.

5.2 Communication Courtesy and Professionalism

Just as in any professional environment, meaningful and constructive dialogue is expected in this class and requires a degree of mutual respect, willingness to listen, and tolerance of opposing points of view.

Respect for individual differences and alternative viewpoints will be maintained in this class at all

times. All members of the class are expected to follow rules of common courtesy, decency, and civility in all interactions. Failure to do so will not be tolerated and may result in loss of participation points and/or referral to the Dean of Students' Office.

5.3 Semester Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning.

At approximately the mid-point of the semester, the School of Forest Resources & Conservation will request anonymous feedback on student satisfaction on various aspects of this course. These surveys will be sent out through Canvas and are not required, but encouraged. This is not the UF Faculty Evaluation!

At the end of the semester, students are expected to provide UF with feedback on the quality of instruction in this course using a standard set of university and college criteria (UF Faculty Evaluations). These evaluations are conducted online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at: <https://gatorevals.aa.ufl.edu/students/>.

Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at: <https://gatorevals.aa.ufl.edu/public-results/>.

5.4 Academic Honesty Policy

UF students are bound by The Honor Pledge which states “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Conduct Code specifies a number of behaviors that are in violation of this code and the possible sanctions. See the UF Conduct Code website for more information. If you have any questions or concerns, please consult with the instructor or TAs in this class.

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://policy.ufl.edu/regulation/4-040/>.

5.5 Inclusive Learning Environment

This course embraces the University of Florida's Non-Discrimination Policy, which reads, *The University shall actively promote equal opportunity policies and practices conforming to laws against discrimination. The University is committed to non-discrimination with respect to race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national*

origin, political opinions or affiliations, genetic information and veteran status as protected under the Vietnam Era Veterans' Readjustment Assistance Act.

5.6 Privacy Statement

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

5.7 In-class recordings

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal education use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and deliver by an instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentation such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or guest lecturer during a class session.

5.8 Services for Students with Disabilities:

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center. See the "Get Started With the DRC" webpage on the Disability Resource Center site <https://disability.ufl.edu/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

5.9 Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

6 Campus Helping Resources

6.1 Whole Gator App

The Whole Gator and website and app connects UF students with resources dedicated to supporting overall health and well-being. In addition to many of the resources below it also has strategies to practice self-care. <https://one.uf.edu/whole-gator/topics>

6.2 Health and Wellness

- U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.
- Counseling and Wellness Center: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non- crisis services.
- Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.
- University Police Department: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).
- UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.
- GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell website or call 352-273-4450.
- Student Success Initiative, <http://studentsuccess.ufl.edu>

6.3 Academic Resources

- E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.
- Career Connections Center: Reitz Union Suite 1300, 352-392- 1601. Career assistance and counseling services.
- Library Support: Various ways to receive assistance with respect to using the libraries or finding resources. Call 866-281-6309 or email ask@ufl.libanswers.com for more information.
- Teaching Center: 1317 Turlington Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.
- Writing Studio: Daytime (9:30am-3:30pm): 2215 Turlington Hall, 352-846-1138 | Evening (5:00pm-7:00pm): 1545 W University Avenue (Library West, Rm. 339). Help brainstorming, formatting, and writing papers.

6.4 Student Complaints

- Academic Complaints: Office of the Ombuds; Visit the Complaint Portal webpage for more information.

- Enrollment Management Complaints (Registrar, Financial Aid, Admissions): View the Student Complaint Procedure webpage for more information.
- Residential Course: <https://www.ombuds.ufl.edu/complaint-portal/>
- Online Course: <https://pfs.tnt.aa.ufl.edu/state-authorization-status/#student-complaint>

7 Reading List

Module 1

- Wurts, W. and Durborow, R. 1992. Interactions of pH, Carbon Dioxide, Alkalinity and Hardness in Fish Ponds. SRAC Publication No. 464
- Boyd, C. 1998. Water Quality for Pond Aquaculture. Alabama Agricultural Experiment Station Research and Development Series No. 43.
- Wilson, P.C. 2010. Water Quality Notes: Alkalinity and Hardness. University of Florida EDIS SL332.
- Wilson, P.C. 2009. Water Quality Notes: Dissolved Oxygen. University of Florida EDIS SL313.
- Wilson, P.C. 2010. Water Quality Notes: pH. University of Florida EDIS SL328.

Module 2

- Oakes, P.L., Gullet, K., and Bobowick, T. 2011. Aeration of ponds used in aquaculture. Agricultural Engineering Technical Note No. AEN-3.
- Masser, M.P. and Lazur, A. 1997. In-Pond Raceways. SRAC Publication No. 170.
- Managing Flow-Through Systems – BMP No. 20. 2004. Alabama Aquaculture Best Management Practice (BMP). Auburn University and USDA-Natural Resources Conservation Service.
- Brune, D.E., Schwartz, G., Eversole, A.G., Collier, J.A., and Schwedler, T.E. 2004. Partitioned Aquaculture Systems. SRAC Publication No. 4500.
- Tucker, C. 2005. Pond Aeration. SRAC Publication No. 3700.

Module 3

- Malone, R. 2013. Recirculating Aquaculture Tank Production Systems A Review of Current Design Practice. SRAC Publication No. 453.
- Bankston, J.D. and Baker, F.E. 1994. Selecting the Proper Pump. SRAC Publication No. 372.
- Summerfelt, S.T. and Hochheimer, J.N. 1997. Review of Ozone Processes and Applications As an Oxidizing Agent in Aquaculture. *The Progressive Fish-Culturist* 59:94-105.

Module 4

- Coyle, S.D., Durborow, R.M., and Tidwell, J.H. 2004. Anesthetics in Aquaculture. SRAC Publication No. 3900.
- Abernathy, J.W., Peatman, E., and Liu, Z. 2010. Basic Aquaculture Genetics. SRAC Publication No. 5001.
- Rottmann, R.W., Shireman, J.V., and Chapman, F.A. 1991. Capturing, Holding, Handling, Transporting, Injecting and Brood Fish for Induced Spawning. SRAC Publication No. 422.
- Neiffer, D.L., and Stamper, M.A. 2009. Fish Sedation, Anesthesia, Analgesia, and Euthanasia: Considerations, Methods, and Types of Drugs. *ILAR J.* 50(4):343-60.
- Rottmann, R.W., Francis-Floyd, R. and Durborow, R. 1992. The Role of Stress in Fish Disease. SRAC Publication No. 474.

Module 5

- Mylonas, C.C. and Zohar, Y. 2001. Use of GnRHa-delivery systems for the control of reproduction in fish. *Reviews in Fish Biology and Fisheries* 10: 463–491.
- Lubzens, E., Young, G., Bobe, J. and Cerdà, J. 2010. Oogenesis in teleosts: How fish eggs are formed. *General and Comparative Endocrinology* 165:367–389.

Schulz, R.W., de França, L.R., Lareyre, J.J., LeGac, F., Chiarini-Garcia, H., Nobrega, R.H., and Miura, T. 2010. Spermatogenesis in fish. *General and Comparative Endocrinology* 165:390–411.

Module 6

Watson, C.A., Chapman, F.A. 1996. Artificial Incubation of Fish Eggs. University of Florida EDIS FA-32.

Rønnestad, I., Yu'fera, M., Ueberscha, B., Ribeiro, L., Sæle, Ø. and Boglione, C. 2013. Feeding behaviour and digestive physiology in larval fish: current knowledge, and gaps and bottlenecks in research.

Reviews in Aquaculture 5 (Suppl. 1), S59–S98.

Ludwig, G.M., Stone, N.M., and Collins, C. 1998. Fertilization of Fish Fry Ponds. SRAC Publication No. 469.

Woolley, L.D. and Qin, J.G. 2010. Swimbladder inflation and its implication to the culture of marine finfish larvae. *Reviews in Aquaculture* 2:181–190.

Module 7

Francis-Floyd, R. and Yanong, R.P.E. 1994. Spironucleus Infestations (Spironucleosis) in Freshwater Aquarium Fish. University of Florida EDIS VM67.

Yanong, R.P.E. 2009. Cryptocaryon irritans Infections (Marine White Spot Disease) in Fish. University of Florida EDIS FA164.

Yanong, R.P.E. 2003. Fish Health Management Considerations in Recirculating Aquaculture Systems—Part 1: Introduction and General Principles. University of Florida EDIS Cir 120.

Klinger, R.E. and Francis-Floyd, R. 2001. Submission of Fish for Diagnostic Evaluation. University of Florida EDIS FA55.

Module 8

Yanong, R.P.E. 2003. Use of Antibiotics in Ornamental Fish Aquaculture. University of Florida EDIS Cir84.

Yanong, R.P.E. and Waltzek, T.B. 2010. Megalocytivirus Infections in Fish, with Emphasis on Ornamental Species. University of Florida EDIS FA182.

Francis-Floyd, R. 2011. Mycobacterial Infections of Fish. SRAC Publication No. 4706.

Kelly, A.M. 2013. Medicated Feed for Food Fish. SRAC Publication No. 473.

Module 9

Lorenzen, K., Beveridge, M.C.M., and Mangel, M. 2012. Cultured fish: integrative biology and management of domestication and interactions with wild fish. *Biol. Rev.* 87: 639–660.

Lorenzen, K., Leber, K.M. and Blankenship, H.L. 2010. Responsible Approach to Marine Stock Enhancement: An Update. *Reviews in Fisheries Science* 18(2):189–210.

Module 10

None

Module 11

Støttrup, J.G. 2006. Review on the Status and Progress in Rearing Copepods for Marine Larviculture.

Advantages and Disadvantages. Among Calanoid, Harpacticoid and Cyclopoid Copepods. En: Editores: L. Elizabeth Cruz Suárez, Denis Ricque Marie, Mireya Tapia Salazar, Martha G. Nieto López, David A.

Villarreal Cavazos, Ana C. Puello Cruz y Armando García Ortega. *Avances en Nutrición Acuícola VIII .VIII Simposium Internacional de Nutrición Acuícola.* 15 - 17 Noviembre. Universidad Autónoma de Nuevo León, Monterrey, Nuevo León, México. ISBN 970-694-333-5.

Trecece, G.D. 2000. Artemia Production for Marine Larval Fish Culture. *Artemia Production for Marine Larval Fish Culture.* SRAC Publication No. 702.

Ohs, C.L., Cassiano, E.J., and Rhodes, A. 2009. Choosing an Appropriate Live Feed for Larviculture of Marine Fish. University of Florida EDIS FA 167.

Trecece, G.D. and Davis, D.A. 2000. Culture of Small Zooplankters for the Feeding of Larval Fish. SRAC Publication No. 701.

Module 12

Whetstone, J.M., Sturmer, L.N., and Oesterling, M.J. 2005. Biology and Culture of the Hard Clam (*Mercenaria mercenaria*). SRAC Publication No. 433.

Wallace, R.K. 2001. Cultivating the Eastern Oyster, *Crassostrea virginica*. SRAC Publication No. 432.

Hadley, N.H. and Whetstone, J.M. 2007. Hard Clam Hatchery and Nursery Production. SRAC Publication No. 4301.

Wallace, R.K., Waters, P., and Rikard, F.S. 2008. Oyster Hatchery Techniques. SRAC Publication No. 4302.
Module 13

Yanong, R.P.E. and Erlacher-Reid, C. 2012. Biosecurity in Aquaculture, Part 1: An Overview. SRAC Publication No. 4707.

Yanong, R.P.E. 2012. Biosecurity in Aquaculture, Part 2: Recirculating Aquaculture Systems. SRAC Publication No. 4708.

Yanong, R.P.E. 2013. Biosecurity in Aquaculture, Part 3: Ponds. SRAC Publication No. 4712.

Module 14

Tyson, R. and Simonne, E. 2014. A Practical Guide for Aquaponics as an Alternative Enterprise. University of Florida EDIS HS1252.

Rakocy J.E., Masser, M.P. and Losordo, T.M. 2006. Recirculating Aquaculture Tank Production Systems: Aquaponics—Integrating Fish and Plant Culture. SRAC Publication No. 454.

Engle, C.R. 2015. Economics of Aquaponics. SRAC Publication No. 5006.

Creswell, L. 2010. Phytoplankton Culture for Aquaculture Feed. SRAC Publication No. 5004.