Course Syllabus, Spring 2013

BE 7381 ADVANCED AQUACULTURAL ENGINEERING

Dr. Hall, Spring 2013, Evening TBD, 115 E.B.Doran

Credit Hours: 3 (3 hours lecture/lab with design/project component)

Course Description: *Prerequisites: BE4380 (Aquacultural Engineering) or Permission of Instructor*. Engineering principles applied to aquacultural systems; water chemistry; fluid mechanics; aquacultural pumping plants; fish pond design; recirculating aquacultural systems; water filtration; disinfection; aeration and degassing; instrumentation in aquacultural systems; biological, ecological and environmental aspects of aquacultural engineering design.

Objectives: Students will develop knowledge, practice and communication of the unique aspects of engineering in aquacultural systems. They will start with basics of design of aquatic systems under a variety of theoretical and applied conditions, including recirculating, flow through, coastal and pond systems, then add review of primary literature and application of advanced concepts to cutting edge aquacultural engineering. Students will recognize and include biological, economic and environmental aspects in design of aquatic ecosystems and communicate in written, spoken and technological modes to convey their findings and designs.

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TAs Matt Byrum (mbyrum1@lsu.edu) Jake Farlow (jfarlo1@lsu.edu)
Office hours: 9-10AM M,W or by appointment.

Required Text: Timmons and Ebeling, 2010. Recirculating Aquaculture Northeast Regional Aquaculture Center. 001-10, Cayuga Aqua Ventures 2010. 975pp.
References: J. Aquacultural Engineering, Environmental Science and Technology, Biological Engineering and other primary literature. See attached list.

Criteria for determining grade:

Midterm proposal		25%
Final project:		50%
Report, proj	35%	
Presentation	15%	
Final Exam		25%

Final course grade will be determined from the following scale:
A: 90-100%; B: 80-89%; C: 70-79%; D: 60-69%; F: 0-59%

Late policy: One letter grade reduction each late day after an assignment is due.

Missed exams: At the discretion of the instructor.
No Cheating: Absolutely no cheating will be tolerated on exams. Collaborative work is expected on projects.

BE 7381 Advanced Aquacultural Engineering Course Schedule
2013

Date Week of	Topic	Work Due
1/21/2013 = MLK Day		
Classes begin 1/22/2013		
1/21/2013	Introduction, Syllabus, Grading, Schedule	(First Assignment)
Review Ch. 1-2 and you tube video: http://www.youtube.com/watch?v=pNmwy76AXqE		
1/21	Culture and Biology of Aquatic Organisms (See Aqua Lab)	**(Ch. 1 and 2, Timmons)**
1/28	**Biological Engineering in Aqua-systems**	**(bio,eng, proposal)**
1/28	Water Quality Parameters	(Ch 2, Timmons)
1/28	Publications and Inventions, Aquaculture in Louisiana	
2/4	Recirc I: Mass Balances	(Ch 3, Timmons) (assign 2 due)
2/4	**Aquaculture In Open Systems (ARS)** (Ch 16 Timmons; Ref. Lekang)	**{Choose Project Topics}** {Proposal Draft Due}
2/11	Fluid Mechanics: Open Channel Flow	(Ch 12, Timmons) (hw 3)
2/10-2/12	**Mardi Gras**	
2/11	Fluid Mechanics: Pipe Flow	
2/18	Culture Units	(Ch. 4 Timmons)
2/18	Material Selection: Corrosion and Fouling	(hw due Fridays)
2/18	Equipment Selection: Filters	(Ch. 5)
Feb 21-25	No class: Dr. Hall at Aquaculture America 2013, Nashville	

2/28	The cutting edge: Dr. Hall's review of Aquaculture America 2013	
2/28	Waste Management	(Ch 6)
{Proposals Due}		
3/7	Marine Systems	(Lekang)
3/7	Biofiltration (Saidu)	(Ch. 7,8) {Prelim. Project Report}
3/7	**<u>Proposal Reviews and Presentations</u>**	
3/14	Biofilter Design (Saidu, Malone)	(Ch 8, 9)
3/14	Recirculating Systems II	
3/21	Gas Transfer	(Ch 10)
3/21	Environmental/Trophic Issues Discussion Day	(Hutchinson)
3/28	Disinfection: Ozone, etc.	(Ch. 11)
3/28	System Monitoring and Control	(Ch. 13)
3/29-4/7	**Spring Break – more fishin! (or 'gator wrestlin'?)**	
4/11	Building Environmental Control	(Ch 14)
4/11	Recreational Systems: Water Gardens, Aquaria	
4/18	**Student Presentations**	**(<u>Final Projects Due</u>)**
4/18	{Student Project Presentations}	
4/25	System Management and Operations	(Ch 15)
4/25	Fish Health Management	(Ch. 16)
5/2	Economics and Management	(Ch. 17)
5/2	Processing (Lekang); Fish Nutrition and Feeds (Ch 18)	
5/2	Course Wrap-Up, Evaluations and Fun	

5/13-18 Final Exams

Official Date of Final Examination TBA

Communication Intensive Course

BE 7381 is a communication intensive course. Project 1 (proposal) and Project 2 (Paper and presentation), as well as at least one guest lecture will each be required. The two focus modes are written and spoken, but we will also use some technological communication. Specific activities for each mode are as follows:

Mode 1: Written Communication

Informal activities for Writing Mode: Writing: lab notebooks will be kept and reviewed; written reviews of primary literature (e.g. scientific journal articles) and written discussion in blog and/or chat formats will each contribute to development of writing skills.

Formal activities for Writing Mode: Two major written projects will be required. Project 1 will involve review of and assimilation of primary literature and development of a written proposal for funding of a project related to aquacultural engineering. Project 2 will involve writing and documentation of a novel aquacultural engineering research and/or design project. Papers will be prepared to be submitted to a peer reviewed journal.

Mode 2: Spoken Communication

Informal activities for Spoken Mode: This course is a graduate course with a seminar component. Each student will present at least one guest lecture and review of primary literature during the semester.

Formal activities for Spoken Mode: Formal presentations of both proposal (project 1) and final project (project 2) will be assessed with a standard rubric to enhance presentation and speaking skills.

Graduate students need to develop writing and speaking skills for academic conferences and research publications. Each of these will be part of what is developed, critiqued and improved in this course. Each of the major projects will have a draft-feedback process, and the spoken components will have a specified rubric for feedback and improvement. Student feedback to other students, as well as instructor feedback will be made available to students. Students are encouraged to access the resources of the CxC studios, including the equipment and staff in the Engineering CxC studio.

BE 7381 Course Project

An aquacultural engineering design project will be incorporated into the course. This will have theoretical and practical design components, with students calculating and designing a relevant aquacultural system or component, and then building and testing that device if possible.

Final Report: 25%

A final report should summarize the engineering design calculations, relevant literature review (who has done similar work before), actual system or component designed and built, and operational testing.

Final Presentation: 10%

A final presentation will be made during the last weeks of the course by each group (groups should consist of 1-3 students), which should present this information in a clear fashion in approximately 20 minute presentation. You may use powerpoint, multimedia, props as available.

Grading of Project Components

The final report should summarize the project fully but succintly, and will be worth 25% of the course grade. Grading will depend heavily on work done, applicability, design relevance and report excellence. The final presentation will be worth 10% of the final course grade, and should include all the above, plus be appropriate for the audience. Web-based or html format presentation are encouraged. All work should be submitted, in electronic format (by file attachment or on disk) if possible.

Project Ideas

Projects provide an opportunity to learn about the design process; about real-world constraints such as economics; and also to serve and educate others. Projects should have a real impact in a research, education or service area. Ideally, some design, analysis, construction and testing should be included. Possible project areas are outlined below. Please see Dr. Hall regarding project specifics.

Including new ideas for 2013:

- Crawfish toxicity by nanoparticles (Farlow, Hayes, Romaire)
- Crawfish ecosystem simulation (Farlow et al.)
- Automated Vehicles for Plant Harvest (Smith et al.)
- Automated Vehicles for Environmental Measurement (Smith et al.)
- Alligators!! Energy Efficiency (Hall et al.)
- Alligators!! Housing Improvements (Reigh at ARS, Hall, Malveaux, Rivet)

- Oysters: toxicity, salinity studies
- Oysters: as components of architectural systems (Byrum et al.)
- Oysters: growth on re-covered crab traps…
- Automation: Build an Automated System for data acquisition (Gators, WQ)
- Autonomous vehicles: help develop such products to reduce bird depredation, measure water quality or do other functions: fleet building; logic; etc. (Smith)
- Waste Management: Develop a composting system for aquacultural wastes (including alligator waste) (Hall)
- Aquaponics: Motsenbocker, Gilliam
- Measure water quality (Callegari, Env Eng or Aqua Rsch Station - Carney)
- Hydroponics: Build a simple hydroponic system which incorporates animal and plant species with an aquatic environment (Gilliam)
- Instrumentation in aquaculture
    - Automated measurement system for research aquaculture: improve and document design/build of lab scale system (Farlow)

Projects should focus on a particular component or system. However, these systems should be integrated into existing systems and/or with other systems under present or future development. For example, waste management and hydroponics could be considered together, even if a single group's project focuses only on one or the other. In addition, educational components (e.g. a poster or explanation, website or other educational device) should be included. University tours, high schoolers or members of the public may visit these devices, whether here at the department or on a farm. Explanations should include some technical information, but should be simple enough that an interested layperson or high school students can understand the basic principles of a system's operation. In the project as a whole and in the final report, you should be both technically excellent, including all relevant calculations and schematics; as well as creative, thinking of system aesthetics and convenience in your design. In other words, your design should be sound, robust, and beautiful, and should aim for excellence.

Additional References, BE 7381 Aquacultural Engineering

(Should be at Library)

Lekang, Odd-Ivar, 2008. Aquaculture Engineering, Blackwell Publishing, 340 pp.

Reference Text: Lawson, Thomas, 1995. Fundamentals of Aquacultural Engineering. Chapman and Hall.

Hutchinson, Lawrence, 2005. Ecological Aquaculture. Permanent Publications, 149 pp.

Huguenin, J.E. and Colt, J., (1989), Design and operating guide for aquaculture seawater systems, Elsevier Scientific Publishing Co., Amsterdam, 264 pp.

Timmons, M.B., Losordo, T.M., editors, (1994), Aquaculture water reuse systems: engineering design and management, Elsevier Scientific Publishing Co., Amsterdam, 333 pp.

Wheaton, F.W., (1977), Aquacultural Engineering, Wiley, New York, 708 pp.

(Websites)

Handouts from Dr. Hall

C-I course statement: *This is a certified Communication-Intensive (C-I) course which meets all of the requirements set forth by LSU's Communication across the Curriculum program, including*

- *instruction and assignments emphasizing informal and formal [mode 1] and [mode 2];*
- *teaching of discipline-specific communication techniques;*
- *use of draft-feedback-revision process for learning;*
- *practice of ethical and professional work standards;*
- *40% of the course grade rooted in communication-based work; and*
- *a student/faculty ratio no greater than 35:1.*

Students interested in pursuing the LSU Distinguished Communicators certification may use this C-I course for credit. For more information about this student recognition program, visit www.cxc.lsu.edu.