FAS 6339C
Advanced Quantitative Fisheries Assessment
4 credits Spring 2016

INSTRUCTOR
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Assistant Professor
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Hours: I maintain an open door policy for students requiring assistance. Distance student can contact me via email to determine the best method for communication (Skype, phone, etc.). Set times for electronic meetings can be established for distance students and will be discussed at the beginning of the term.

COURSE LOCATION & HOURS
Lecture Period Tuesday 3-4 9:35-11:30 McCarty C 426
Lab Periods Thursday 3-5 9:35-12:35 McCarty C 426

COURSE DESCRIPTION
"How should scientists operate when they must try to explain the results of history, those inordinately complex events that can occur but once in detailed glory?" -Stephen Jay Gould

Advanced Quantitative Fisheries Assessment is a graduate course offered by the Program in Fisheries and Aquatic Science covering topics related to fisheries stock assessment and management. This course will focus on modern stock assessment models, computational techniques, why these methods work, why they sometimes fail, and how they can be improved and used in evaluating management decisions.

The aim of this course is to provide students with concepts, methods, and tools needed to work effectively as a consultant or government scientist on common problems in applied fisheries assessment. These problems range from the analysis of fish habitat or population status as they relate conservation, environmental management, and ecosystem assessment needed for sustainable harvest management.

The course is organized as two meetings each week, a two-hour lecture/tutorial session on a broad topic then a three-hour lab session to demonstrate specific assessment or gaming methods. All lab sessions are computer-based where students will learn spreadsheet, R, ADMB and other methods for data analysis. Students are expected to have experience with basic fisheries management concepts and calculations and an interest in building computer models to evaluate trade-offs in management decisions.

CREDIT HOURS

This is a 4 credit "C" course, which means there is a lab associated with this course. Two credits of lecture equate to two hours of contact time per week, and one credit of lab throughout the entire semester. We will have 3 hours of lectures per week, and 3 lab hours.

FORMAT

This is a 4-credit course, consisting of instruction in both the classroom and computer lab. We will use the class meeting time for formal instruction including a combination of lecture, discussions, class activities, and computer labs. You are expected to actively participate during classes- expect to be called upon to answer questions, perform calculations, and work on group activities. The computer labs will reinforce and strengthen concepts learned in class through hands-on activities. During the computer lab you will develop assessment or simulation models aimed at providing advice to management (see description of assignments below).

LEARNING OUTCOMES

By the end of the course, students should be able to demonstrate an understanding of the following concepts and techniques:

- Representing state dynamics in both single and multispecies models using various model structures
- Capturing spatial processes in using both spatially explicit and spatially implicit.
- Common problems in developing appropriate observation models and the methods required to meet model assumptions
- Likelihood and Bayesian methods for evaluating model credibility and parameter uncertainty
- Methods for forecasting and evaluating risk of management options
- Developing simulations to evaluate management strategies.
- Identify potential problems with data sets.
- Identify appropriate state dynamics model, observation model, and statistical methods for evaluating population or ecosystem attributes of interest.
- Develop computer code to perform these evaluations and present the results in an appropriate manner.
- Develop ecosystem models in the EwE framework.

COURSE ESSENTIAL QUESTIONS & OBJECTIVES

1. What is the current state of global and local fisheries and why we manage fisheries?
    a. Develop and understanding of the polarized debate over the status of fisheries around the world.
    b. Develop and understanding of the role that fisheries assessment plays in the management of fisheries.
2. What fundamental ecological principles that allow for sustainable harvest?
    a. Develop an understanding of the processes that lead to compensatory responses in natural population and how these processes are represented in mathematical models.
3. What are the underlying biological principles and statistical challenges related to developing stock-recruitment relationships?

   a. Develop an appreciation for the scale at which density-dependent interaction occur.
   b. Develop and understanding of the statistical challenges faced when developing recruitment curves: error-in-variable, time series bias, and multiplicative error structure.
4. How is natural mortality estimated?
   a. Understand how to derive mortality estimates for meta-analyses.
   b. Understand how natural mortality can be estimated from mark-recapture data.
5. What are the fundamental approaches to estimating natural population abundance?
   a. To be able to identify when specific methods are appropriate for estimating population abundance.
   b. To identify what abundance estimation methods are generally used in stock assessment.
6. What information can be extracted from specific data sources and what assumptions must be made to extract certain information form specific data sources.
   a. Develop and understanding of how specific population level phenomenon appear in data streams such as composition information and relative abundance trends.
7. What strategies and tactics are appropriate to meet management objectives?
8. What are the socio-economic drivers that influence fishing effort in bot h commercial and recreational fisheries?
9. How do we address spatial issues in fisheries assessment?
10. What is adaptive management?
11. How do we model ecosystem interactions?
   a. Understand the variety of approached available to model ecosystem interactions.
   b. Develop and understanding of how to use EwE for ecosystem model development.

REQUIRED MATERIALS

Much of the lab work done in FAS 6339C is conducted on computers. All participants are expected to have access to a computer that they can bring to lab sessions. Computers are expected to have a version of Microsoft Excel with Solver installed, a text editor with syntax highlighting, the R statistical software (*www.**r**-project.org*), Ecopath with Ecosim 6 (*www.ecopath.org*), and AD model builder (*admb-project.org*).

Text editors: Text pad http://www.textpad.com/, Tinn-R http://www.sciviews.org/Tinn-R/, R-studio http://www.r-studio.com/, Sublime www.sublimetext.com/, Emacs

You should also bring a laptop to each class. There is no required text for the course. Below are a number of suggested information sources. Additional readings will be provided on the course Canvas site.

Hilborn, R and C J Walters 1992. Quantitative fisheries stock assessment. ISBN 0412022710
Walters, C. J. 2001. Adaptive management of renewable resources. ISBN1930665431
Walters C.J. and S. J. D. Martell 2004. Fisheries Ecology and Management. ISBN 0691115451

All participants are encouraged to read Hilborn R. and M. Mangle 1997 The Ecological Detective. ISBN 0691034974.

ELECTRONIC COMMUNICATIONS

Course materials will be available through the Sakai e-learning site. You will find a link for handouts (syllabus, assignments, lab data) and for all presentations. Presentations may not be available prior to class and it is your responsibility to take notes. On occasion, an email will be sent to your UF email address regarding updates to the syllabus, clarifications of assignments, or changes in due dates. If you aren't doing so already, you should be checking your UF email on a regular basis. Assignment and final projects for individuals taking the class on campus are to be handed in during class times at any time before or on the date they are due. Individuals taking the class via distance can turn assignment in via email to the instructor before or on the day they are due.

EVALUATION AND PERFORMANCE CRITERIA

Evaluation Method	**Points / % of total**	
Assignments	80 pts	60%
Final Report	20 pts	20%
Exam	20 pts	20%

Letter grades will be assigned as follows: A (90-100) GPA 4, B (80-89) GPA 3, B+ (88-89) GPA 3.33, B (83-88) GPA 3, B- (80-82) GPA 2.7, C+(77-79) GPA 2.3, C (73-76) GPA 2, C-(70-72) GPA 1.7, D+(66-69) GPA 1.3, D (63-65) GPA 1, D- (60-62) GPA 0.7, E (<60) GPA 0

A complete explanation of the UF Grading policies can be found at: http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html

At the very minimum, the student is expected to attend class, complete all assignments on time, and actively participate during class discussions. Students who complete the minimum requirements (i.e., just answering the assignment questions asked) should not expect to receive and A in the class. Student wishing to receive and A should go beyond the minimum required questions. Excuses for late work and absences—Assignments turned in on paper at the start of the class period or by 5 pm are considered on time. After that, late assignments will lose value at the rate of 10% for the first late day and 5% for each subsequent late day. Arrangements to hand in assignments late due to conflicts with absence due to field work and conferences must be made prior to the assignment due date. Failure to make arrangement will result in lost marks.

Assignments

Assignments will generally consist of exploring some aspect of population/ecosystem assessment. There will be 6 assignments over the course of the term. Assignments will generally follow the material presented in class. You will be required to submit a summary report of your findings. Students expecting an A are expected to go beyond the basic questions you are asked to explore and provide a broader analysis of the topic explored. Assignment reports are expected to be in a specific format and an example of which can be found on the Canvas site.

Final Reports

At the beginning of the term you will be asked to gather the available data for a stock of interest. It is important to acquire this data early. You will then answer the three fundamental assessment questions: 1) what is the current stock status? 2) what was the historical mean productivity? 3) how have the components of net production changed over time? for your stock using a variety of single species assessment models ranging for structurally simple to structurally complex. Your results comparing the various assessment methods and findings will be presented in a final report.

DESCRIPTION OF CORNERSTONE TASKS

Assignment 1

Assignment 1 asks you to develop an age structured reference model to explore how basic biology fishery operations impact standard management reference points. You will present your findings in a brief report.

Assignment 2

Assignment 2 asks you to use your age structured model to simulate time series data and then see if you can recover the parameters used to simulate the data in an assessment model.

Assignment 3

Assignment 3 you will explore aspects of parameter estimation issues for Stock recruitment relationships and time series data.

Assignment 4

Assignment 4 you will explore open loop optimization to assess optimal management strategies under a suite of environmental variability and well as the basics of closed loop optimization.

Assignment 5

Assignment 5 you will perform a virtual population assessment (VPA) and an statistical catch-at-age model of the Straight of Georgia Herring population.

Assignment 6

Assignment 6 you will develop an EwE model to explore ecosystem responses and the biology necessary to result in cultivation-depensation.

Exam

The online exam is intended to test you knowledge of basic equation used to represent fisheries and the species that they target as well as basic terminology used in stock assessment.

Term Project

For your term project you will assess perform a full stock assessment using data for one of the recreationally or commercially important species in the Gulf of Mexico. Your assessment will utilize some form of a simple production model as well as an age structured model.

ONLINE COURSE EVALUATION PROCESS

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at https://evaluations.ufl.edu. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results.

ACADEMIC HONESTY

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity."* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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*."

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). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. 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: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

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.

SERVICES FOR STUDENTS WITH DISABILITIES

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students

Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, **www.dso.ufl.edu/drc/**

CAMPUS HELPING RESOURCES

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575,* **www.counseling.ufl.edu/cwc/**

Counseling Services
Groups and Workshops
Outreach and Consultation
Self-Help Library
Wellness Coaching

- *Career Resource Center,* First Floor JWRU, 392-1601, **www.crc.ufl.edu/**

DISTANCE STUDENTS

Should you have any complaints with your experience in this course please visit http://www.distance.ufl.edu/student-complaints to submit a complaint.

Class Schedule

	Day	Topic / Learning Experience	Tasks Due
Week 1	Tu Jan 5 Lec	Introduction to fisheries issues	
	Tu Jan 5 Tut	Basic Equations	
	Th Jan 7 Lab	Age structured Modeling in Excel	
Week 2	Tu Jan 12 Lec	Fundamental ecological principles	
	Tu Jan 12 Tut	Fundamental equations - dusting off the calculus	
	Th Jan 14 Lab	Age structured modeling in Excel	
Week 3	Tu Jan 19 Lec	Stock Recruitment	Assignment 1
	Tu Jan 19 Tut	Fitting Models	
	Th Jan 21 Lab	Recruitment simulator	
Week 4	Tu Jan 26 Lec	No Class - NFMSS	
	Tu Jan 26 Tut	No Class - NFMSS	
	Th Jan 28 Lab	No Class - NFMSS	
Week 5	Tu Feb 2 Lec	Natural Mortality	Assignment 2
	Tu Feb 2 Tut	Likelihoods	
	Th Feb 4 Lab	Assessing natural mortality	
Week 6	Tu Feb 9 Lec	Estimating Abundance	
	Tu Feb 9 Tut	Parameter Uncertainty	
	Th Feb 11 Lab	Length based assessments	
Week 7	Tu Feb 16 Lec	Information in data	Assignment 3
	Tu Feb 16 Tut	Cpue Standardization	
	Th Feb 18 Lab	COD VAP	
Week 8	Tu Feb 23 Lec	Harvest Strategies and tactics	
	Tu Feb 23 Tut	Bag and size limits	
	Th Feb 25 Lab	COD SCA	
Week 9	Tu Mar 1 Lec	No Class - Spring Break	
	Tu Mar 1 Tut	No Class - Spring Break	
	Th Mar 3 Lab	No Class - Spring Break	
Week 10	Tu Mar 8 Lec	Effort dynamics	
	Tu Mar 8 Tut	Tricks and tips	
	Th Mar 10 Lab	Effort Models	
Week 11	Tu Mar 15 Lec	Spatial issues in fisheries	Assignment 4
	Tu Mar 15 Tut	EDOM	
	Th Mar 17 Lab	Spatial Optimizations	
Week 12	Tu Mar 22 Lec	Adaptive management	
	Tu Mar 22 Tut	Bayesian Statistics	
	Th Mar 24 Lab	Bayesian Statistics	

Week 13	Tu Mar 29 Lec	Modeling Ecosystem	Assignment 5
	Tu Mar 29 Tut	Ecosystem modeling with Ecopath with Ecosim	
	Th Mar 31 Lab	Ecosystem management with Ecopath with Ecosim	
Week 14	Tu Apr 5 Lec	Advanced modeling ADMB	
	Tu Apr 5 Tut	Advanced modeling ADMB	
	Th Apr 7 Lab	Advanced modeling ADMB	
Week 15	Tu Apr 12 Lec	Advanced modeling ADMB	Assignment 6
	Tu Apr 12 Tut	Advanced modeling ADMB	
	Th Apr 14 Lab	Advanced modeling ADMB	
Week 16	Tu Apr 19 Lec	No Class - End of term	Term Project
	Tu Apr 19 Tut	No Class - End of term	