Fish Population Dynamics

Course: Water 353/553, Fall 2019, 4 credits

Description: Mathematical analysis of fish population dynamics and demographics. Use of sampling and models for estimating survival, growth, recruitment, and abundance in fish populations.

Lectures: Tuesday, Thursday, & Friday, 9:00-9:50, TNR 359

Laboratory: Tuesday, 2:00-3:50, TNR 322, Advanced Computer Lab (ACL)

Instructor: Joshua K. Raabe, PhD

Contact Information: jraabe@uwsp.edu, TNR 174, 715-346-2689 (office phone)

Office hours: Wednesday, 9:00-11:00; by appointment (e-mail first); or if door is open

Goal: My overall goal is for students to understand why studying population dynamics is important and to develop basic skills to answer applied fisheries and ecological questions.

Objectives: By the end of the semester, students should be able to:

1. Describe the key concepts of population dynamics
2. Explain how and why different methods are used to answer questions
3. Run basic models and statistics in computer software
4. Interpret output from basic models and statistics

Communication: Students are expected to routinely check their UWSP e-mail and Canvas course site for updates and materials.

Canvas: https://uwstp.instructure.com/courses/222164

Text: Guy, C. S., and M. L. Brown. 2007. Analysis and interpretation of freshwater fisheries data. American Fisheries Society, Bethesda, Maryland. (Text Rental)

Additional Materials: Additional lecture and lab materials will be available on Canvas. Students may view handouts online or print on their own. Text and handouts should be read *prior* to attending lecture and lab. Computers are provided for use in the lab.

Lecture Attendance: I will not take attendance for lectures, outside of paper discussion days. However, I have noticed that the quality of your educational experience and success in this course will be directly related to the amount of time you invest in preparation and your extent in classroom discussions and activities. I will post lecture notes onto Canvas after class, but not in-class activities.

WATR 553: Graduate students will be held to a higher standard for grading, have additional tasks/assignments, and be expected to assist undergraduate students.

Scientific Papers: To encourage learning from real studies, four times (20 points total) over the course of the semester each student will find a peer-reviewed scientific paper related to specific topics, upload a PDF of the article and a short summary to Canvas (3 points), post under another student's paper (1 point) and discuss in class (1 point).

Exams: Four 100-point in-class exams will each cover one-fourth of the lecture & lab material; the final exam is not comprehensive. To allow for adequate time, each exam will be taken: 1., during a 2-hour laboratory (optional review during normal class period prior to exam) or 2., during the final exam period. Each exam must be taken at the scheduled time or a score of zero will be assigned. Illness, family emergency, or scheduling issues may be cause for re-scheduling an exam, but only if you notify me *prior* to the exam period (email and voice-mail have date and time stamps).

Laboratory Attendance: To ensure each student is understanding and completing lab materials, attendance is required and worth 1 point per lab. Lab attendance is worth 10 points, with two potential bonus points for attending all labs. Please contact me prior to a lab period if there is an emergency or major conflict. Expect all labs to go to 3:50.

Laboratory Assignments: Laboratory assignments will occur throughout the semester and be *worth 120 points*. All labs should be completed, as they will relate to topics covered on the exams. The assignments will require you to complete analyses and interpret the results. You may need to do additional research to answer questions.

Assignments should be submitted onto Canvas by 11:59 PM on the due date (stated on Canvas and on assignment). ***All homework assignments will be deducted 15% for each day late*** *(e.g., 1.5 points/day for 10 point assignment)*, so please turn in assignments in a timely manner to avoid point reductions or a score of zero.

Grade Breakdown: Grades will be determined based on student's total points from lecture exams and laboratory at the end of the semester. The table below shows point totals broken down by category and associated grades with +/- determinations. Participation and effort can be factored in for the student's benefit in final course grade.

Category	Points
Lecture	
Exam 1	100
Exam 2	100
Exam 3	100
Exam 4	100
Papers	20
Lab	
Assignments	120
Participation	10
Total	550

Grade	Points	Percentage
A	511 - 550	93 - 100%
A-	495 - 510	90 - 92.9%
B+	478 - 494	87 - 89.9%
B	456 - 477	83 - 86.9%
B-	440 - 455	80 - 82.9%
C+	423 - 439	77 - 79.9%
C	401 - 422	73 - 76.9%
C-	385 - 400	70 - 72.9%
D+	368 - 384	67 - 69.9%
D	330 - 367	60 - 66.9%
F	$\leq$ 329	$\leq$ 59.9%

Classroom Environment: I want everyone to feel comfortable and willing to participate in this course and will work to keep a positive classroom environment. Please contact me if you have any issues with a classmate or me. In addition, UWSP values a safe, honest, respectful, and inviting learning environment. In order to ensure that each student has the opportunity to succeed, they developed a set of expectations for all students and instructors, known as the *Rights and Responsibilities* document. Additional information:

http://www.uwsp.edu/dos/Documents/Right%20and%20Responsibilities.pdf

Student Feedback: To help improve this course and my teaching throughout the semester, I will ask for feedback during class periods, through surveys, and you can always talk to / email me or you can provide *anonymous* feedback through an online survey (link below and also on Canvas). I will try to incorporate all constructive, well-stated suggestions and critiques. I also greatly appreciate completed UWSP course evaluations at the end of the semester.

https://www.surveymonkey.com/r/HZCL85X

Academic Integrity: I expect all students to strictly adhere to the high level of conduct and academic integrity at UWSP. All forms of plagiarism, cheating, and academic dishonesty are prohibited; violations will follow UWSP procedures. I reserve the right to use plagiarism software on assignments. The minimum penalty for a violation of academic integrity is failure (score of zero) of the assignment, but penalties can be stricter. For more information, please see the UWSP "Student Academic Standards and Disciplinary Procedures" section of the *Rights and Responsibilities*, Chapter 14:

https://www.uwsp.edu/acadaff/Orientation/AcademicMisconductRulesAndProcedures_booklet.pdf

Disability Policy: If you are a student with disabilities, please contact me at the beginning of the semester. We will work together to accommodate any disabilities according to UWSP policies and the Americans with Disabilities Act (ADA), a federal law requiring educational institutions to provide reasonable accommodations for students with disabilities. Students must register with UWSP Disability and Assistive Technology Center and provide proper documentation. For more information, please visit the links below and the Disability and Assistive Technology Center, located on the 6th floor of the Learning Resource Center (the Library).

http://www4.uwsp.edu/special/disability/

Safety Procedures: *Medical emergency*: call 911 or use the hallway red emergency phone, offer assistance if trained and willing, guide emergency responders to victim. *Tornado warning:* remain in our room until advised otherwise. *Fire alarm:* calmly evacuate building, meet in courtyard near library stairs, notify me or emergency command personnel of any missing individuals. *Active shooter*: Run/Escape, Hide, Fight. If trapped hide, lock doors, turn off lights, spread out and remain quiet. Follow instructions of emergency responders. Additional details and information: www.uwsp.edu/rmgt

Lecture, Reading, & Assignment Schedule

This is a **TENTATIVE** topic, reading, and assignment schedule that may change during the semester. I will inform the class of changes and also update this schedule on Canvas.

Date	Topic	Reading	Assignment
3-Sep	Intro, Sampling Designs	Chapter 3, esp. bolded title sections	Entry Survey
5-Sep	Math & Stats	Chapter 1, especially 1.1 - 1.4.1.2	
6-Sep	Math & Stats	Chapter 1, especially 1.1 - 1.4.1.2	
10-Sep	Math & Stats	Chapter 1, especially 1.1 - 1.4.1.2	
12-Sep	Selectivity	7.1-7.3.5 and 9.3	Post Art. 1
13-Sep	Catchability	7.1-7.3.5 and 9.3	
17-Sep	Catchability	7.1-7.3.5 and 9.3	Math & Stats Lab
19-Sep	Power Analysis	1.4.1.2- 1.4.1.3	
20-Sep	Power Analysis	1.4.1.2- 1.4.1.3	Discuss Art. 1, Select & Catch Lab
24-Sep	***Review (Exam 1)***		Exam 1
26-Sep	Size Structure	Chapter 9, esp. 9.1, 9.2, 9.5, 9.6	
27-Sep	Body Condition	Chapter 10	
1-Oct	Body Condition	Chapter 10	
3-Oct	Age & Growth	Chapter 5	
4-Oct	Age & Growth	Chapter 5	
8-Oct	Fecundity & Maturity		Size & Body Lab
10-Oct	Fecundity & Maturity		Post Art. 2
11-Oct	Abundance	Review 7.1-7.3.5	
15-Oct	Abundance	8.1-8.4, Pine et al. 2003	Maturity & Growth Lab
17-Oct	Abundance	8.1-8.4, Pine et al. 2003	
18-Oct	Community Indices	Chapter 15	Discuss Art. 2, Abundance 1 Lab
22-Oct	***Review (Exam 2)***		Exam 2
24-Oct	Abundance	8.1-8.4, Pine et al. 2003	
25-Oct	Abundance	8.1-8.4, Pine et al. 2003	
29-Oct	Exponential Growth		
31-Oct	Exponential Growth		
1-Nov	Logistic Growth		
5-Nov	Logistic Growth		Abundance 2 lab
7-Nov	Mortality	Chapter 6	Post Art. 3
8-Nov	Mortality	Chapter 6	
12-Nov	Mortality	Chapter 6	Pop growth lab
14-Nov	Movement & Migrations	Chapter 14	
15-Nov	Movement & Migrations	Chapter 14	Discuss Art. 3, Mortality Lab
19-Nov	***Review (Exam 3)***		Exam 3
21-Nov	Recruitment	Chapter 4 and 13.2.3.3	
22-Nov	Recruitment	Chapter 4 and 13.2.3.3	
26-Nov	Surplus Production	8.5 and 13.2.3.1	
28-Nov	***No Lecture - Thanksgiving***		
29-Nov	***No Lecture - Thanksgiving***		
3-Dec	Surplus Production	8.5 and 13.2.3.1	Recruitment Lab
5-Dec	Yield Per Recruit	13.2.3.2	Post Art. 4
6-Dec	Yield Per Recruit	13.2.3.2	
10-Dec	YPR, Dynamic Pool	13.2.3.2	Surplus Production Lab, Exit Survey
12-Dec	Harvest Management		
13-Dec	Management, Review (Exam 4)		Discuss Art. 5, YPR Lab
17-Dec	**Exam 4, Tuesday, 10:15-12:15**		Exam 4

Lecture & Lab Schedule

This is a **TENTATIVE** lecture & lab schedule. I will consult the class regarding any major changes and inform of minor changes along with updating on Canvas.

Week	Tuesday	Thursday	Friday	Tuesday-Lab
3-Sep	Intro, Sampling Designs	Math & Stats	Math & Stats	Math & Stats, Software
10-Sep	Math & Stats	Selectivity	Catchability	Basic Stats
17-Sep	Catchability	Power Analysis	Power Analysis	Selectivity & Catchability
24-Sep	*Review*	Size Structure	Body Condition	**Exam 1**
1-Oct	Body Condition	Age & Growth	Age & Growth	Size & Condition
8-Oct	Fecundity & Maturity	Fecundity & Maturity	Abundance	Maturity & Growth
15-Oct	Abundance	Abundance	Community Metrics	Abundance 1
22-Oct	*Review*	Abundance	Abundance	**Exam 2**
29-Oct	Exponential Growth	Exponential Growth	Logistic Growth	Abundance 2
5-Nov	Logistic Growth	Mortality	Mortality	Population Growth
12-Nov	Mortality	Movement & Migrations	Movement & Migrations	Mortality
19-Nov	*Review*	***No Lecture***	***No Lecture***	**Exam 3**
26-Nov	Recruitment	Recruitment	Surplus Production	Recruitment
3-Dec	Surplus Production	Yield Per Recruit	Yield Per Recruit	Surplus Production
10-Dec	Dynamic Pool YPR	Harvest Management	Harvest Management	YPR, Dynamic Pool
17-Dec	**---------- Exam 4, Tuesday, December 17, 10:15-12:15 ----------**			