



UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF BIOLOGICAL SCIENCES
COURSE OUTLINE

1. **Course: ECOLOGY 417 – AQUATIC COMMUNITIES & ECOSYSTEMS**

Lecture Sections:	L01	MWF	11:00-11:50	SA129	Fall 2018
Course Coordinator/ Instructor:	Dr. K. Flanagan	BI 266	220-7643	kmflanag@ucalgary.ca	

Desire 2 Learn (D2L) course name: ECOL 417 L01 – (Fall 2018) – Aquatic Communities & Ecosystems
Biological Sciences Department BI 186; (403) 220-3140; biosci@ucalgary.ca

2. **PREREQUISITE(S):** Biology 313, and one of Biology 315 or Environmental Sciences (ENSC) 401.
See section 3.5.C in the Faculty of Science section of the online Calendar (<http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html>)

Learning Outcomes for the 5 Learning Bundles in ECOL 417 – In this course, outcomes are ‘bundled’ around five different course components: (1) Foundational knowledge, (2) Field and laboratory techniques, (3) Collaborative learning, (4) Scientific writing, and (5) Global water issues and applications. Successful students will be able to:

1. **Foundational Knowledge Learning Bundle**

- Use morphometric parameters and tools to describe, characterize, and classify lakes, streams, wetlands, and groundwater.
- Describe physical characteristics of water (heat capacity, surface tension, viscosity, solar adsorption) and explain implications for the structure of freshwaters, water chemistry and biological processes.
- Describe ecosystem functions and services provided by freshwaters and human impacts on those functions and services.
- Describe the cycling of key nutrients (carbon, nitrogen, phosphorus) within freshwaters and use the understanding of nutrient cycling to explain nutrient limitation and predict impacts of nutrient perturbations.
- Describe vertical gradients within lakes (light, temperature, pH, dissolved oxygen) and the implications of these vertical gradients on biological processes.
- Describe the diversity of major groups of organisms in freshwaters (bacteria, phytoplankton, zooplankton, macrophytes), ecosystem functions of these groups, and use as bioindicators
- Describe freshwater community interactions (i.e. trophic cascades, species diversity, top-down vs. bottom up regulation).

2. **Field and Laboratory Techniques Learning Bundle**

- Use and describe the Canadian Aquatic Biomonitoring Network (CABIN) field techniques (site data, site description, reach characteristics, water chemistry, benthic macroinvertebrate sampling, substrate characteristics, channel measurements) for measuring stream ecosystem health.
- Use and describe the CABIN sampling processing, taxonomy and statistical techniques for determining stream ecosystem condition by macroinvertebrate biomonitoring
- Use the CABIN data management program to enter field and lab data
- Reflect on the research process, your research skills, and science at the start and end of term

3. **Collaborative Learning Bundle**

- Work effectively as part of a team in terms of five key competencies identified as critical to team effectiveness (commitment, communication, knowledge, uphold high standards & focus).

4. **Scientific Writing Learning Bundle**

- Independently find, assess and summarize sources of scientific information
- Communicate scientific concepts and study findings effectively to an appropriate audience in a scientific paper

5. **Global Water Issues & Applications Learning Bundle**

- Describe and discuss past and present human impacts on aquatic ecosystems at global and local scales, particularly with respect to human drinking water and waste water.

Assessment of Outcomes for the 5 Learning Bundles:

For this course, you are required to complete assessments both individually and as a team. You are *not required* to complete *all* assessments; rather you will be able to *choose* which assessments and how many assessments you complete, according to the grade you are aiming to achieve (see 3. *Grading*, below).

Learning Bundle	Completed as an Individual or a Team	Assessment
1. Foundational Knowledge	Individual	3 module quizzes (in-class) - the average of these components will be equally weighted
	Team	Team assignments - to be completed as a team during lecture or lab
2. Field and Laboratory Techniques	Individual	8 Lab & Field Reading Summaries - Lab & Field Reading Summaries - typed summaries of the readings for field work and labs completed to an acceptable level as defined by the Lab & Field Reading Summaries Rubric. Field reading summaries are due BEFORE the field trip (Sept 22 or 23). Lab reading summaries are due at the start of the lab . The due dates for the Lab & Field Reading Summaries are indicated on the Tentative Course Schedule on D2L.
		Authentic Research Surveys - Completion of a survey at the start and end of term that explores your experiences with research, perspectives on the research process, and attitudes about science.
	Team	5 Demonstrations of Lab & Field Techniques - demonstration of field and/or lab techniques to the graduate Teaching Assistant, to the acceptable level defined by the <i>Field and Lab Techniques Demonstration Rubric</i> on D2L. Submission of data to the Federal database - successfully manage and organize your field site data to upload it to the federal government database.
3. Collaborative Learning	Individual	2 Peer Feedback surveys (mid-semester & final) - to be completed online through ITP metrics. These surveys will produce a <i>Peer Score</i> for each individual in the team that will be used to quantify each individual's contribution to teamwork.
4. Scientific Writing	Individual	Final Lab Project Proposal - at the start of Lab 6 you will bring an outline of your proposed final lab project and plan for the semester, completed to an acceptable level as defined by the <i>Final Lab Project Proposal Specifications and Rubric</i> on D2L
		Final Lab Project Draft and Self-Assessment - at the start of Lab 12 you will bring a draft version of your final lab project and a self-assessment of your work.
		Final Lab Project Peer-Review - during Lab 12, you will complete a peer-review of a lab mate's work. At the end of the lab, your TA will evaluate you on the quality of your peer review before it is given to your peer. Final Lab Project - including all the intermediate steps as defined by the <i>Final Lab Project Specifications and Rubric</i> on D2L. The finalized draft of the Final Lab Project is due on the last day of class (Dec 7 @ 11:59pm) in the Dropbox on D2L.
5. Global Water Issues & Applications	Individual	4 Reading Summaries of Water 4.0 - reading summaries of the book "Water 4.0" (David Sedlak 2014) completed to the acceptable level as defined by the <i>Reading Summary Rubric</i> on D2L. Due dates for each of the Reading Summaries are found on the Tentative Course Schedule on D2L.

3. Grading: The University policy on grading and related matters is described in sections [F.1](#) and [F.2](#) of the online University Calendar.

You will earn grades based on **the requirements you choose to complete (note that you do not have to do all of the requirements!)**. To earn a given letter grade, you must complete **all** the requirements listed for that letter grade.

To earn a D, you must complete the *Foundational Knowledge*, *Field and Laboratory Techniques*, and *Collaborative* learning bundles to the extent outlined in the *Assignment of Letter Grades* table below

To earn a C, you must complete the *Foundational Knowledge*, *Field and Laboratory Techniques*, and *Collaborative* learning bundles to the extent outlined in the *Assignment of Letter Grades* table below

To earn a B, you must complete the *Foundational Knowledge*, *Field and Laboratory Techniques*, *Collaborative* **and** *Scientific Writing* learning bundles to the extent outlined in the *Assignment of Letter Grades* table below

To earn an A, you must complete **ALL** the learning bundles to the extent outlined in the *Assignment of Letter Grades* table below

Assignment of Letter Grades

Assessment	Requirements for each Letter Grade**			
	D	C	B	A
3 module quizzes (in-class) - the average of these components will be weighted equally	minimum average score of 55%	minimum average score of 60%	minimum average score of 70%	minimum average score of 80%
Team assignments - to be completed as a team during lecture or lab	✓	✓	✓	✓
8 Lab & Field Reading Summaries - typed summary sheets for field and lab techniques completed to an acceptable level as defined by the <i>Lab & Field Techniques Summary Sheet Rubric</i> on D2L. Field summary sheets are due BEFORE the field trip (Sept 22 or 23). Lab summary sheets are due at the start of the lab. The due dates for the Lab & Field Reading Summaries are indicated on the Tentative Course Schedule on D2L.	Successful completion of 5/8 Lab & Field Summaries	Successful completion of 6/8 Lab & Field Summaries	Successful completion of 7/8 Lab & Field Summaries	Successful completion of 7/8 Lab & Field Summaries
Authentic Research Surveys - Completion of a survey at the start and end of term that explores your experiences with research, perspectives on the research process, and attitudes about science.	✓	✓	✓	✓
5 Demonstrations of Lab & Field Techniques -- demonstration of the field and/or lab techniques to the graduate Teaching Assistant, to the acceptable level defined by the <i>Field and Lab Techniques Demonstration Rubric</i> on D2L.	Successful demonstration of 3/5 Lab & Field Techniques	Successful demonstration of 3/5 Lab & Field Techniques	Successful demonstration of 3/5 Lab & Field Techniques	Successful demonstration of 4/5 Lab & Field Techniques
Submission of data to the Federal database -- successfully manage and organize your field site data to upload it to the federal government database.	✓	✓	✓	✓
2 Peer Feedback surveys (mid-semester & final) -- to be completed online through ITP metrics. These surveys will produce a Peer Score for each individual in the team that will be used to quantify each individual's contribution to teamwork.	✓	✓	✓	✓
	Final Peer Score of 0.60 or higher	Final Peer Score of 0.70 or higher	Final Peer Score of 0.80 or higher	Final Peer Score of 0.90 or higher
Final Lab Project -- including all the intermediate steps (proposal, draft, self assessment, peer evaluation) as defined by the <i>Final Lab Project Specifications</i> and <i>Rubric</i> on D2L. The finalized draft of the Final Lab Project is due on the last day of class (Dec 7 @ 11:59pm) in the Dropbox on D2L. The due dates for the intermediate steps for the project are found on the Tentative Course Schedule on D2L.	✗	✗	✓ minimum average score of 70%	✓ minimum average score of 80%
4 Reading Summaries of Water 4.0 -- reading summaries of the book "Water 4.0" (David Sedlak 2014) completed to the acceptable level as defined by the <i>Reading Summary Rubric</i> on D2L. Due dates for each of the Reading Summaries are found on the Tentative Course Schedule on D2L.	✗	✗	✗	Successful completion of 3/4 Reading Summaries

** Students who *exceed all* expectations *for a given* letter grade, will earn the "+" letter designation. For example, a student aiming to complete the "B" letter grade requirements who completes 8 out of 8 field/lab reading summaries to an acceptable standard (rather than 7/8) and 5 out of 5 lab demonstrations to an acceptable standard (rather than 3/5) and who meets all other requirements for the B grade, will earn a B+ letter grade.

**To earn an A+, students must exceed *all* expectations for the A grade description (e.g. complete all team lab/lecture activities, submit data to the federal database, earn a peer score greater than 0.90, complete 8/8 field/lab reading summaries, 5/5 lab/field demonstrations, 4/4 Reading Summaries, Final Lab project grade greater than 80%, and all components of the final project completed).

** Students who do not successfully complete **one (and only one)** of the specifications for the **reading summaries, field/lab reading summaries, or demonstrations** required for a letter grade will earn the "-" letter designation. This excludes the final project, all components of which must be completed for the A and B letter grades, or the % scores for the quizzes and final project grades. For example, a student aiming to complete the "B" letter grade requirements, who only completes 6 out of 8 field/lab summary sheets to an acceptable standard (rather than 7 out of 8) **or** 2 out of 5 lab/field demonstrations to an acceptable standard (rather than 3/5) will earn a B- letter grade. Students not successfully completing **more than one** of the requirements for a letter grade will be assessed as **not having met the requirements for that grade** and will drop to the next lower letter grade

** Note that a grade of F will result if students do not successfully meet **all** of the requirements for a D grade.

** Students will be given *four 'free passes'* that can be used to re-submit any written assignment to get the work to an “acceptable” standard. The free pass and re-submitted assignment must be submitted **within one week (7 days) of the graded assignment being returned or mark being posted**. There is only one re-submission per free pass and the free pass must be completed and attached to the re-submitted assignment. Re-submitted material must also be accompanied by the original graded assignment and a brief statement (approximately one paragraph) describing how the student has revised their assignment in response to that feedback. Free passes can also be used to hand-in an assignment **up to 1 week AFTER the due date**, without penalty (excluding the final project, and all components of the final project). Free passes are **not** transferable. **

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is a student's responsibility to familiarize herself/himself with these regulations. See also [Section E.6](#) of the University Calendar
5. **Scheduled out-of-class activities: Field Trip Sept 22 or 23 8:30am to 6pm**
REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.
6. **Course Materials:** There is no required textbook for this course; links to relevant and/or assigned readings will be provided on D2L.
Online Course Components: Some teamwork resources are provided by ITP Metrics, a University of Calgary-based system of secure web-based tools for forming teams and doing peer evaluations. These tools are free to all students and are not dependent on prior access.
7. **Examination Policy:** Students should read the Calendar, [Section G](#), on Examinations.
8. **Writing across the curriculum statement:** In this course, the quality of the student's writing on assignments will be a factor in the evaluation of those papers. See also [Section E.2](#) of the University Calendar.
9. **Human studies statement:** Students in the course are not expected to participate as subjects or researchers. See also [Section E.5](#) of the University Calendar. See also <http://www.ucalgary.ca/pubs/calendar/current/e-5.html>.
10. **Use of living and dead organisms:** Students will not be expected to handle organisms during this course.
11. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**
 - (a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero-tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties.
 - (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
 - (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf.

Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Biological Sciences, Dr. H. Addy by email addy@ucalgary.ca or phone 403 220-3140.
 - (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
 - (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>
 - (f) **Student Union Information:** VP Academic Phone: 403 220-3911 Email: suvpaca@ucalgary.ca SU Faculty Rep. Phone: 403 220-3913 Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca;
 - (g) **Student Ombuds Office:** 403 220-6420 Email: ombuds@ucalgary.ca; <http://ucalgary.ca/provost/students/ombuds>
Internet and Electronic Device Information: You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed during class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

(h) U.S.R.I.: At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference - please participate in USRI Surveys.

Department Approval ORIGINAL SIGNED Date _____

Department Approval
For NO FINAL EXAM: ORIGINAL SIGNED Date _____

ECOL417co F18; 8/30/2018 9:56 AM

COURSE PERSONNEL

INSTRUCTOR:	Dr. Kyla Flanagan	BI 266	403-220-7644	kmflanag@ucalgary.ca
	Office Hours: TBA, or by appointment			
LAB TECHNICIAN:	Louise Hahn	BI 264	403-220-5280	lhahn@ucalgary.ca

EMAIL COMMUNICATION: I will be working hard to answer your emails within 24 hours (except on weekends)

Welcome to Aquatic Communities and Ecosystems! Freshwater aquatic systems are essential and fascinating components of our ecosphere. During this course we will explore the physical, chemical and biological properties of lakes, streams, wetlands, and groundwaters to understand the ecosystem functions and services they provide. We will also integrate the physical, chemical and biological components of freshwaters to predict responses to perturbations including climate change and increasing demands for freshwater placed on aquatic systems by humans. In labs, we will conduct a macroinvertebrate biomonitoring study of a local river basin. Using the Reference Condition Approach (RCA) we will explore the ecosystem 'health' of the river by examining the community composition of benthic macroinvertebrates. It is my goal that in this course, you experience the lab, field, and statistical tools used by scientists in this field. I also aim to give you flexibility in this course to explore aspects of aquatic ecology that interest you and give you choice and flexibility to be creative in how you demonstrate understanding.

RESPONSIBILITIES and EXPECTATIONS:

My philosophy of teaching is that it is my responsibility to 'set the stage' for learning to occur. It is my job to ensure that the classroom environment, support materials, assessment tools used all support the conditions that allow students to learn. Feedback from students is very important in this so that we will know whether such conditions exist, how well the course is going and where problems are arising. In addition to a mid-semester and an end-of-semester course evaluation, I will also encourage that you feel free to tell me about these things at any point in the semester. In this course, we will also have **Class Representatives**. Class reps will be meeting with me weekly to discuss how the course is going, and any issues or concerns. Please feel free to contact the Class reps or me at any time. It is also my goal that, as much as possible, students will spend class time actively working with course material and applying what has been learned from the readings and lectures. This means coming to class prepared and willing to participate.

To make our time together as effective as possible, it is important that the lecture learning environment is one of mutual respect. I will do whatever I can to create and maintain that environment; my expectations of student conduct are outlined below:

- **Everyone has the right to learn as well as the responsibility to not deprive others of their right to learn.** Actions such as talking during instruction/lecturing, or using laptops and other electronic devices for non-class activities can be very distracting and affect others' learning. Please monitor your own behaviour during classes and restrict your use of laptops and other electronic devices to only those activities directly related to class to ensure that you do not distract others.
- **Please arrive at class on time.** Late arrivals and early departures can be disruptive and can result in you missing important information. I understand that there are special circumstances when you may have to arrive late or leave early; please make your arrival/departure as unobtrusive as possible and be sure to let your teammates know about your situation in advance of class.
- Please let me know right away if you are dealing with a problem or situation that is preventing you from performing at the level you want to be at in this class.
- Please treat your classmates, peer mentors and me with respect. There may be times when you are frustrated with something that is going on in the course and find it difficult to be patient. However, to maintain a respectful and constructive environment in this class, I ask that you are respectful of others in your words and actions.

What you can expect from me:

- I will treat all students with respect and do my best to make my expectations about how to succeed in this class clear.
- I will do my best to help your learning by designing clear assignments and assessments that provide you with timely feedback.
- I will start and end classes on time.
- I will be available outside of class time through office hours, appointments or email should you want to review concepts that are not clear, discuss study strategies, learn more about any topic or discuss concerns about any aspect of the course. Please note that I will aim to reply to emails within 24h, except on weekends.

Academic Integrity:

Each student in this course is expected to abide by the University of Calgary Code of Academic Conduct. You are encouraged to study together and to discuss information and concepts covered in class and assigned readings with other students, but all individual work that you submit in this course for academic credit must be your own work. In the case of team assignments, all members of the team are responsible for the honesty and integrity of the document.

Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. All work submitted for this class (whether as a draft or for final grading) is held to the strictest standards for intellectual honesty. A single offence may lead to a grade of zero for the assignment involved, disciplinary probation, suspension or expulsion. The Faculty

of Science follows a zero-tolerance policy regarding dishonesty. In addition to reading the sections of the University Calendar under "Student Misconduct", I will assume that you have read and understand the information posted on the Dept. of Biological Sciences' webpage dealing with academic honesty: https://bio.ucalgary.ca/undergraduate/current_students/academic_honesty. In particular, be sure that you understand what constitutes plagiarism—test yourself by taking the on-line quiz.

Team-Based Learning:

In this class, we will be using a Team-Based Learning (TBL) approach. In this process, you will spend many classes working in teams applying what you've learned from assigned readings/lectures. Teams in TBL are different than the kind of group work you may have done in other classes: the instructor forms the teams (as described below) which work together throughout the term to complete course assignments; team members also evaluate each other's contributions to the group throughout the term. Here are the basics:

1. Prior to the first class, I will send you a link to a web-based tool (ITP Metrics) that we will use to form the teams and to do peer assessments during the term. It is important that the teams as diverse as possible, so you will be asked to answer some survey questions about your background, your major/year, problem-solving styles and other factors that will help us form successful teams. You will meet your teammates in the first class.
2. During class and lab time you will be working together on Team Application Assignments. These application assignments are the most critical part of the course because they will involve real problems and applications of the material that I expect you to be able to do by the end of the module/course. During these activities, you will work with your teammates to bring all you've learned in the module together to solve a problem. One of my goals for you in this course is that you should be able to do something with the material you learn. These activities should help you achieve this and also allow you to see how I will examine your ability to apply the material on the quizzes, as these assignments are often sample quiz questions. All the teams will be working on the same problem and I will likely be asking teams to defend their answers in a class discussion.
3. At least two times during the semester, you will complete confidential assessments of how well your team is working together, so that any issues can be dealt with promptly. If you are having issues in your team, please don't hesitate to talk to me or the Class Representatives. Little problems can turn into big problems if not addressed. We are happy to facilitate a discussion with your team to help resolve issues.
4. The team nature of this class requires you to be in class and to do your part as a member of your Team. The nature of team assignments is such that you can't do them individually, so you can't make them up. If you miss an in-class or in-lab component for medical reasons, the only documentation that will be accepted in ECOL 417 is a completed Physician/Counsellor Statement form, which can be downloaded from: http://www.ucalgary.ca/UofC/departments/UHS/PDFs/deferred_exam_form.pdf You must provide the completed form, signed by your physician, to me within 48 hours from the date that you missed the class/quiz/test.

Specifications Grading:

As you noted from reading the first part of this syllabus, assignments in this course are graded using a pass/fail scheme (i.e. there is no partial credit for many assignments). The rationale for this approach to grading comes from research into adult learning: adults learn best when they have a flexible but challenging learning environment and when they have some choice in their learning experience. In this course, we will create a positive and challenging learning environment, in which we will uphold high expectations for work, with opportunities to revise work that does not yet meet expectations along with feedback and support from me and your teammates to achieve your best work. The specifications or requirements for a pass on each assignment are clearly stated in the rubrics for each assignment and you will have examples of work that does and does not meet the specifications.

This course provides you choice in your learning experience both in terms of the topics for some of the assignments as well as which assignments to complete. While there are some quizzes in the course, there are no traditional midterms or final exams; instead, there are a variety of assignments from which you can choose how much to do in order to meet the requirements for the grade you plan to earn. We will talk more about specifications grading in the first two classes of the term, and you will have the chance to ask any questions or discuss any concerns then.

Authentic Research Experience:

Authentic undergraduate research involves creatively using genuine scientific practices to result in discovery, an understanding of the broader relevance or importance of research, and collaboration between students and faculty. The far-reaching benefits of engaging students in authentic research are emerging, along with widespread calls for elimination of 'cookbook style' labs in favor of authentic experiences. In this course, the labs have been re-designed to be authentic, whereby you will be genuinely contributing to science beyond our classroom. We have designed this authentic research in collaboration with the federal government's Canadian Aquatic Biomonitoring Network (CABIN) and the City of Calgary. The CABIN biodiversity monitoring program measures and analyzes water chemistry and biological community metrics (e.g., types and numbers of organisms) as indicators of water body health. The data collected by our class will contribute to a federal database that monitors changes in ecosystem health due to human impacts, including climate change. The data will also support biomonitoring within the City of Calgary. Through this collaboration and research experience, you will gain essential skills in: field sampling, laboratory water quality analysis, taxonomy of invertebrates, experimental design and hypothesis testing, scientific writing and data management and entry. Contrary to cookbook labs, authentic science is messy, unpredictable and imperfect. As this is the first time having authentic research in ECOL417, be prepared for some bumps along the way! I will do everything possible to ensure you are successful as we work our way through this authentic experience.

Tentative Course Schedule ECOL 417 Fall 2018¹

Module	Date	Class	Lab	Lab Assignments	
Introduction to the Course	Sept	7 1: Introduction to Aquatic Ecology	No Lab	NO ASSIGNMENT	
Module 1: Physical Properties of Aquatic Systems		10 2: Lake Morphology & Morphometry	Lab 1: (Dry lab)	Lab Reading Summary #1 & Team Assignment #1 (due end of lab)	
		12 3: Stream Morphology and Classification	Welcome to the lab & introductions		
		14 4: Wetland Morphology and Classification			
		17 5: Properties of water -- Density & Light & Color *Reading Summary 1 due	Lab 2: (Dry lab)	Lab Reading Summary #2 & Team Assignment #2 (due end of lab)	
		19 6: Vertical gradients -- Stratification & Temperature & Mixing - Team Activity	Preparation for the field		
		21 7: Preparation for the field trip -- team activity			
		24 8: Water movement -- small and large scale	Lab 3: (Wet lab)	Lab Reading Summary #3 & Demo #1 (due in lab)	
	26 9: Hydrological cycle, groundwater & aquifers	Water Chemistry			
	28 10: Case study & review				
	Oct	1 Quiz #1	Lab 4: (Wet lab)	Lab Reading Summary #4 & Demo #2 (due in lab)	
Module 2: Chemical Properties of Aquatic Systems		3 11: Water quality measures	Water Chemistry II		
		5 12: Biogeochemistry, nutrient limitation, remineralization, & cycling			
		8 Thanksgiving -- No class	Lab 5: (Wet lab)	Lab Reading Summary #5 & Demo #3 (due in lab)	
		10 13: Oxygen in lakes and streams *Reading Summary 2 due	Macroinvertebrate ID		
		12 14: Carbon in lakes			
		15 15: Phosphorus	Lab 6: (Wet lab)	Macroinvertebrate ID Part II	Proposal & Demo #4 (due in lab)
		17 16: Nitrogen			
	19 17: Other nutrient cycles and special consideration to rivers				
	22 18: Toxicology, pollutants, responses to stress	Lab 7: (Dry lab)	NO ASSIGNMENT		
	24 19: Case study & review	Data entry & Macroinvertebrate ID			
	26 Quiz #2				
Module 3: Biological Properties of Aquatic Systems		29 20: Individuals: Bacterial	Lab 8: (Dry lab)	Lab Reading Summary #6 & Team Assignment #3 (due end of lab)	
		31 21: Individuals: Phytoplankton -- team activity	Aquatic Community metrics		
	Nov	2 22: Individuals: Zooplankton *Reading Summary 3 due			
		5 23: Individuals: Macrophytes	Lab 9: (Dry lab)	Lab Reading Summary #7 & Team Assignment #4 (due end of lab)	
		7 24: Interaction: Grazing on algae, bacteria, periphon	Statistical approaches and modelling		
		9 25: Interactions: Predation			
		12 14 16 Reading Days -- No classes	No Lab	NO ASSIGNMENT	
		19 26: Communities	Lab 10: (Dry lab)	Team Assignment #5 (due end of lab)	
	21 27: Communities: bottom up top down controversy	Scientific writing			
	23 28: Communities: species richness & diversity RCC				
	26 29: Ecosystems *Reading Summary 4 due	Lab 11: (Dry lab)	NO ASSIGNMENT		
	28 30: Ecosystems	Open Lab/TA consult			
	30 31: Ecosystems -- team activity				
	3 Case study & review	Lab 12: (Dry lab)	Draft of final project & Peer Review (during lab)		
	5 Quiz #3	Peer Review			
REVIEW			7 Last Class -- FINAL TEAM ASSIGNMENT -- Final project due		

¹ We may deviate slightly from this schedule, depending on the needs of the class. All lecture and lab material is found on D2L. Reading Summaries (Water 4.0) will be handed in via Dropbox on D2L. The Lab Reading Summaries will be handed in by hardcopy at the start of lab. There is a field trip on Sept 22 or 23.