Freshwater Biology

Bio 464

Fall, 2010

This course provides an introduction to freshwater biology, with an emphasis on temperate-zone lakes and streams. In it you will study freshwater species, populations, and communities to learn how organisms in freshwater systems interact with each other and with physical and chemical factors in their environment. The course includes a semester-long laboratory project in which everyone in the class will work together to do an in-depth analysis of a local waterway. In this way, integration of information from lecture and laboratory will provide a comprehensive overview of the important organisms and processes that occur in freshwater lakes and streams and the positive and negative effects of humans on those systems.

INSTRUCTOR Dr. Ann Throckmorton, Professor of Biology

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Office hours: Monday 11:30-12:30
Wednesday 12:50- 1:50
Friday 10:30-11:30
or by appointment

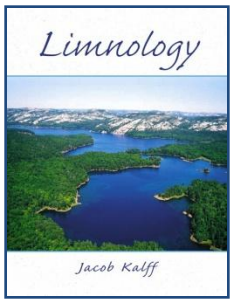
LECTURE 9:20 – 10:50, Tuesday/Thursday 150 Hoyt Science Center

Attendance in lecture is expected. Because your success in this course is strongly dependent on your presence in class and your participation, you should make an effort to be present at all class sessions. Absence may be excused for personal emergencies or health-related problems. If you miss class, it is your responsibility to contact me and to obtain lecture notes and assignments that were given during your absence.

LABORATORY 2:00 - 5:00 Monday 316 Hoyt Science Center

Attendance in laboratory is required. You must notify me ahead of time if you know that you cannot be in lab. Almost all of our lab work will take place outside, so in most cases it won't be possible for you to make up a missed lab. Come prepared to go outside, no matter what the weather.

RESOURCES



Textbook: *Limnology* by Joseph Kalff (Academic Press, 1st edition, 2002).

Laboratory: You will need two things for lab: a quad-ruled lab book and a pair of boots or hip waders. There is no lab manual. If there are lab handouts or materials for you to read before lab, I will post the them on the r-drive or place them on reserve in the library.

At times, we may discuss reports and articles about current issues in freshwater biology. The resources for those discussions may be found on the Internet, posted on the r-drive, or placed on reserve in the library. Because of copyright restrictions, I cannot make copies for everyone in the class. For that reason, you will be responsible for locating the materials and copying them yourself.

PURPOSE OF THIS COURSE

1. To explore the relationships between aquatic species and their environments and to investigate the factors that determine the distributions, abundances, and behaviors of living organisms in aquatic environments. To discover general ecological principles that shape the aquatic world.
2. To investigate the freshwater resources surrounding Westminster College and to determine what biotic, abiotic, and anthropogenic factors have the greatest effect on local water resources.
3. To explore the many ways that humans affect the quality and quantity of water in the natural world and the effect that this has on the aquatic organisms that rely on it.
4. To demonstrate how limnologists use the scientific method and what its capabilities and limitations are within the field.
5. To present some of the methods used by limnologists in the laboratory and in the field, and to show how these methods are used to develop test and investigate theories. This includes:
    a) development of a familiarity with some important techniques and equipment used by limnologists doing field studies;
    b) collection of data;
    c) analysis of data using appropriate techniques;
    d) development of conclusions based on data analysis; and
    e) the use of experimental methods of observation and measurement.
6. To stimulate you to think critically and logically, by designing experiments and scientific studies, collecting data, and analyzing and interpreting data.

METHODS OF INSTRUCTION

1. **Lectures and discussion**: This will follow the tentative schedule printed below. I expect you to attend class, pay attention, and participate actively in the discussion by answering questions, asking questions, and making appropriate comments. The textbook that I have chosen provides a good overview of the subject of freshwater biology. You will get more out of the lecture and discussion if you have read the material in the textbook ahead of time, as those readings will augment the lecture and provide material for discussion. Bring your textbook to class every day.
2. **Assignments**: Occasionally you will be given small assignments to supplement particular lecture topics and highlight information or skills to be applied in lab.
3. **Laboratories**: This is a very important part of the course. All lab work will be focused on one goal – to perform an in-depth analysis of McClure's Run, the small stream that runs through campus. Four years ago, students in this course performed an in-depth analysis of the stream, to determine how healthy it was and to identify possible sources of pollutants or stress. You will perform the same analysis and compare your results to theirs, to determine how the water quality has changed, if at all. This is truly a group project; any data that are collected should be initially recorded in your lab book, then saved on the r-drive. The final lab report will be written incrementally. When you learn a new technique, you will write an Introduction and Methods for that material only. Once you have completed an analysis, the Results and Discussion for that section will be turned in. At the end of the semester, you will take all of those files, revise them, add to them, and create one lab report presenting a detailed analysis of this particular freshwater environment.
4. **Pre-lab quizzes:** you will be given material to read to prepare you for each week's lab activities. Small pre-lab quizzes will be used to evaluate how well you have read and understood that information.

GRADING

Grades will be based on exams, assignments, laboratory work (i.e., pre-lab write-ups, results, and discussion), and your final lab report, weighted as follows:

lecture exams (four)	= 50% of final grade
assignments	= 5% of final grade
laboratory work	= 15% of final grade
final lab report	= 20% of final grade
pre-lab quizzes	= 10% of final grade

Your final grade will be based on the following scale:

Above 93%: A	87% - 90%: B+	77% - 80%: C+	67% - 70%: D+	below 60%: F
90% - 93%: A-	83% - 87%: B	73% - 77%: C	63% - 67%: D	
	80% - 83%: B-	70% - 73%: C-	60% - 63%: D-	

POLICY ON EXAMS AND ASSIGNMENTS

You must take the exams at the scheduled time unless you have talked to me prior to the exam and been excused. Valid excuses include such things as serious illness or injury and personal and family emergencies. I will give make-up exams *only* if you have notified me personally before the day of the test.

All assignments must be turned in by 5:00 p.m. on the day that they are due unless you are absent the day that the assignment was due and had a valid excuse. Points will be subtracted from assignments that are turned in late. Occasionally, assignments may be due in class but I will let you know ahead of time if this happens.

You may turn in assignments, labs books, and lab write-ups in three ways:

1. hard copy: the least desirable method, except for lab books. Hand the paper to me, slide it under my office door, or give it to someone to deliver to me. *Do not use campus mail.*
2. in the Assignments folder on the course r-drive: if you save a file to the r-drive, the name of the file must contain your name and some indication of what it contains (e.g., the name of the file could be "Smith, Assignment 5"). You must save the file to another drive, then save it to the r-drive. If you try to save directly to the r-drive, the network will only write a blank temporary file and you will lose all of your work. Once you have saved something to the Assignments folder you will be unable to retrieve it, open it, or delete it.
3. as an e-mail attachment. Again, the name of the file must contain your name and some indication of what it contains. You can find out if I have received your messages by looking in the Sent Items folder in your mailbox.

ACADEMIC INTEGRITY

Academic integrity is central to the purpose and pursuit of any academic community. In this class, I expect you to adhere to the principles of academic integrity stated in the Westminster College handbook and to maintain the highest standards of academic honesty and integrity, in keeping with the philosophy and purposes of the College.

> "Academic dishonesty is a profound violation of this expected code of behavior. It can take several forms, including, but not limited to, plagiarism, cheating, purposely altering the work of another (without that person's permission), misrepresentation of attendance in class or at a College event, misrepresentation of work, facts or experimental results, unauthorized use of or intentional intrusion into another's computer files and/or programs, intentional damage to a computer system, unauthorized use of library materials and privileges, or engaging in any activity which attempts to alter or harm another's academic standing."

I encourage you to work together and discuss your assignments with other students, but all material that you turn in must be your own work. If you violate the Academic Integrity Policy, you will receive a score of zero for that assignment and a written report will be sent to the Dean of Academic Affairs. More than one violation may result in an F for the course.

TENTATIVE SCHEDULE OF LECTURE TOPICS AND READINGS

DATE	Topic	Reading (Kalff, 2002)
08/31	Introduction to the course What is limnology?	Chapter 1, section 1.2, pp. 8-10
09/02	Characteristics of water	Chapter 3, pp. 35-40
09/07	Water resources	Chapter 4, page 41-52
09/09	Hydrology	Chapter 5, section 5.1-5.3, pp. 53-59
09/14	Hydrology (continued)	Chapter 5, section 5.5-5.8, pp. 63-71
09/16	Lakes	Chapter 7, pp. 85-93
09/21	Rivers and streams	Chapter 8, section 8.1-8.3, pp. 94-106
09/23	Rivers and streams (continued)	Chapter 8, section 8.4-8.8, pp. 106-121
09/28	**Exam #1**	
09/30	Phytoplankton	Chapter 21, section 21.1-21.2, pp 309-319
10/05	Phytoplankton (continued)	Chapter 21, section 21.3-21.7, pp. 319-332
10/07	Phytoplankton (continued)	Chapter 21, section 21.8-21.15, pp. 333-348
10/12	Bacteria	Chapter 22, section 22.1-22.5, 349-360
10/14	Bacteria (continued)	Chapter 22, section 22.6-22.11, pp. 360-375
10/19	Monday classes meet **Exam #2**	
10/21	Zooplankton	Chapter 23, section 23.1-23.3, pp. 376-384
10/26	Zooplankton (continued)	Chapter 23, section 23.4-23.9, pp. 384-398
10/28	Zooplankton (continued)	Chapter 23, section 23.10-23.14, pp. 398-407

DATE	Topic	Reading (Kalff, 2002)
11/02	Benthic plants	Chapter 24, section 24.1-24.6, pp. 408-421
11/04	Benthic plants (continued)	Chapter 24, section 24.7-24.11, pp. 421-434
DATE	**Topic**	**Reading (Kalff, 2002)**
11/09	Zoobenthos	Chapter 25, pp. 435-450
11/11	Fish and birds	Chapter 26, pp. 451-463, 475-477
11/16	**Exam #3**	
11/18	Temperature and stratification	Chapter 11, section 11.1-11.8, pp. 154-168
11/23	Stratification and heat budgets	Chapter 11, section 11.9-11.12, pp. 168-178
11/25	Thanksgiving break	
11/30	Acidification of waterways	Chapter 27, section 27.1-27.7, pp. 478-487
12/02	Acidification of waterways (continued)	Chapter 27, section 27.8-27.12, pp. 487-499
12/07	Contaminants	Chapter 28, section 28.1-28.6, pp. 500-513
12/09	Contaminants (continued)	Chapter 28, section 28.7-28.9, pp. 513-522
12/17, 8:00 – 10:30	Final exam	

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