BI 205

Limnology: Lakes & Rivers

3 Credits

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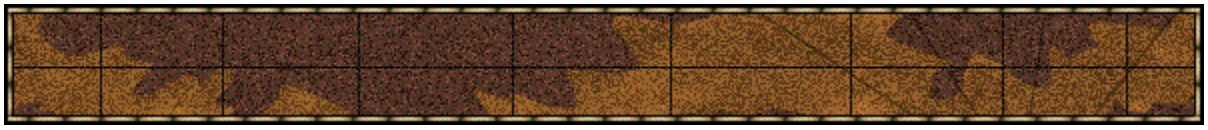
Created: 01/07/1997

Revised: 04/12/2019

Approval: 21/01/2020

The Implementation Date for this Outline is 01/01/2020

BI 205 Version: 16



Limnology: Lakes & Rivers

Calendar Description

This course covers various physical, chemical, and biological properties of both standing and running freshwater systems. Students are introduced to various techniques used in the collection and analysis of limnological data, and how to use these data to assess the health of freshwater ecosystems.

Rationale

This course is required for first year students within the Environmental Sciences diploma. The course is designed to introduce students to various physical, chemical and biological aspects of both standing and running freshwater systems, and to examine the complex interactions between these different parameters and how they affect the health of our freshwater resources. It provides a basis for the proper understanding of management, monitoring and conservation issues related to freshwater habitats and the plants and animals living in and around freshwater systems.

BI 205 is a prerequisite for taking:

BI 405 - Bioassays and Biomonitoring.

ZO 213 - Fisheries Biology and Techniques.

ZO 225 - Aquatic Organisms.

and is desirable as an introduction to:

SC 301 - Water Resources.

Prerequisites

BI 110

Co-Requisites

None

Course Learning Outcomes

Upon successful completion of this course, students will be able to

1. explain physical, chemical, and biological interactions in both standing and running freshwater systems.
2. operate field equipment designed to collect data on dissolved oxygen, pH, salinity, conductivity, and temperature.
3. interpret data collected on the parameters listed in 2, and present these data using appropriate graphs and tables.
4. collect water samples useful for subsequent field and/or laboratory analyses.
5. determine the concentration of various chemicals and nutrients present in a water sample.
6. identify and explain where and how various types of sampling equipment can be used for the collection of biological data from aquatic systems.
7. identify some representative members of the freshwater phytoplankton and zooplankton community.
8. use area measurement techniques to evaluate various parameters of aquatic systems.
9. construct and interpret a bathimetric map.
10. conduct a water sample analysis to determine the concentration of Chlorophyll a in the sample and use these results to determine the trophic state of the freshwater system.

Essential Employability Skills

Essential employability skills are critical for workplace success and lifelong learning. Lakeland College prepares its graduates for the workplace and lifelong learning by integrating and promoting essential employability skills development in its curricula. Each credit course offered at Lakeland College emphasizes one or more of the following five essential employability skills:

A. **Communication Skills** that enable individuals to listen, interpret, express, and convey knowledge and ideas so that they are received and understood.
B. **Teamwork Skills** that enable individuals to respect the thoughts and opinions of others as they work together to plan activities, meet deadlines, complete projects, and contribute to an organization's goals.
C. **Critical Thinking Skills** that enable individuals to conceptualize and analyze issues from various perspectives while rationally evaluating the strengths and limitations of each perspective and deciding what action to take.
D. **Adaptability Skills** that enable individuals to respond quickly, willingly, and positively to new conditions and changing times.
E. **Positive Attitude and Behavioural Skills** that enable individuals to be confident about themselves and to deal with people, problems, and situations with honesty, integrity, and personal ethics.

Please refer to the Knowledge/Skills Matrix of this course outline to review the essential employability skills emphasized in this course.

Resource Materials

There is no required text for this course. Various books on limnology are available in the library.

Conduct of Course

This course is presented using a combination of lectures and laboratory (3-0-2). Students are encouraged to ask questions and participate in discussion throughout the course.

Evaluation Procedures

The final mark for this course is calculated according to the following weighting scheme:

Midterm examination	35%
Final examination	35%
Laboratory assignments	30%
Total	100%

Lecture exams may contain discussion-type, short answer, true/false justify, and/or multiple choice questions.

Knowledge/Skills Matrix

Students apply and demonstrate their knowledge and skills to use

A. Communication Skills

A1.	**by listening, reading, interpreting information, and communicating effectively**
	Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 3, 6, 7, 8, 9, 10; Laboratory Assignments labs 1, 2, 3, 4, 5, 6.
A2.	**by using written, spoken, and/or visual formats and media to communicate and meet needs of each particular audience**
	Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 2, 3, 6, 7, 8, 9, 10; Laboratory Assignments labs 2, 5.
A3.	**by using libraries, internet, technical publications, journals and other sources to find pertinent information**
	Evaluation(s)/Goal(s): Goals 2, 6, 10; Laboratory Assignments lab 5.

B. Teamwork Skills

B1.	**by using interpersonal skills to create an atmosphere that maximizes the strengths of group members to accomplish tasks**
	Evaluation(s)/Goal(s): Goals 2, 10; Laboratory Assignments labs 2, 3, 4, 5.
B2.	**by using interpersonal skills to resolve conflict, relate to others, and assist others**
	Evaluation(s)/Goal(s): Goals 10; Laboratory Assignments labs 2, 3, 5.
B3.	**by contributing and listening to others as group determines realistic objectives, prioritizes tasks, and identifies resources and timelines**
	Evaluation(s)/Goal(s): Goals 10; Laboratory Assignments labs 2, 3, 5.

B4. by treating other members of the group open-mindedly and fairly
Evaluation(s)/Goal(s): Goals 10; Laboratory Assignments labs 2, 3, 5.
B5. by developing tactics/strategies to accomplish tasks
Evaluation(s)/Goal(s): Goals 10; Laboratory Assignments labs 2, 3, 5.

C. Critical Thinking Skills

C1. by seeing critical thinking as a lifelong process of self assessment
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 3, 6, 7, 8, 9, 10; Laboratory Assignments labs 1, 2, 3, 4, 5, 6.
C2. by examining problems closely
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 2, 3, 5, 6, 7, 8, 9, 10; Laboratory Assignments labs 1, 2, 3, 4, 5, 6.
C3. by examining beliefs, assumptions, and opinions, and weigh them against the facts
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 3, 6, 7, 8, 9, 10; Laboratory Assignments labs 1, 2, 3, 4, 5, 6.
C4. by seeking out the truth
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Laboratory Assignments labs 1, 2, 3, 4, 5, 6.
C5. by finding solutions; make decisions
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Laboratory Assignments labs 1, 2, 3, 4, 5, 6.
C6. by incorporating new ideas that may not necessarily agree with previous thought on the topic
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 3, 6, 7, 8, 9, 10; Laboratory Assignments labs 2, 3, 5.
C7. by seeing connections between topics and use knowledge from other disciplines to enhance reading and learning experiences
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 3, 6, 7, 9, 10; Laboratory Assignments labs 1, 2, 3, 4, 5, 6.

D. Adaptability Skills

D1. by working independently or as part of team
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Laboratory Assignments labs 2, 3, 5.
D2. by carrying out multiple tasks or projects
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Laboratory Assignments labs 2, 3, 4, 5.
D3. by being innovative and resourceful: identify and suggest alternative ways to get the job done
Evaluation(s)/Goal(s): Goals 1, 2, 3, 4, 5, 6, 8, 9, 10; Laboratory Assignments labs 2, 5.
D4. by being open and respond constructively to change and uncertainty
Evaluation(s)/Goal(s): Goals 2, 3, 4, 5, 6, 10; Laboratory Assignments labs 2, 3.

E. Positive Attitude and Behavioural Skills

E1. by dealing with people, problems, and situations with honesty, integrity, and personal ethics
Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 2, 3, 4, 10; Laboratory Assignments labs 2, 3, 4, 5.

E2.	**by showing interest, initiative, and effort**
	Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Laboratory Assignments labs 2, 3, 4, 5, 6.
E3.	**by affirming the need for positive solutions and encourage positive interaction and feedback**
	Evaluation(s)/Goal(s): Written Midterm and Final Exam; Goals 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Laboratory Assignments labs 2, 3, 4, 5.
E4.	**by balancing personal and family activities with job-related activities**
	Evaluation(s)/Goal(s): Goals 10; Laboratory Assignments lab 5.

Grade Equivalents and Course Pass Requirements

A minimum grade of D (50%) (1.00) is required to pass this course.

Letter	F	D	D+	C-	C	C+	B-	B	B+	A-	A	A+
Percent Range	0-49	50-52	53-56	57-59	60-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	1.00	1.30	1.70	2.00	2.30	2.70	3.00	3.30	3.70	4.00	4.00

Students must maintain a cumulative grade of C (GPA - Grade Point Average of 2.00) in order to qualify to graduate.

Attendance

Classroom and laboratory attendance is considered vital to the learning process and as significant to the students' evaluation as examinations and reports, therefore absenteeism is recorded.

a. Students having a combination of excused and/or unexcused absence of 20 percent or higher for the scheduled course hours can be required to withdraw and would then automatically receive a "RW" (required withdrawal) for the course, regardless of any other evaluation results. (RW is a failing grade).
b. An excused absence is one that is verified with your instructor. Verification should be prior to the absence or the next class day following the absence. Verification of the absence may take the form of a note from your doctor/College nurse regarding illness, or a note from another instructor regarding a field trip or other activity, or authorization by your instructor following an in-person meeting. Be sure to contact your instructor and ask what they will require from you as verification of each absence. An unexcused absence is anything NOT verified by the instructor prior to the absence or the next class day following the absence.

NOTE: Any exceptions to the above attendance policy (e.g. timetable conflicts, work-related issues) must be approved in writing by the Department Chair prior to the beginning of the course.

It is the students' responsibility to know their own absentee record.

Normal hours are 8:30 a.m. to 6:30 p.m., with potential for evening courses, exams or extended field trips. Students are expected to be available for classes during these times.

Course Units/Topics

Lectures

1. Properties of water

2. Physical limnology
   a) light in aquatic systems
   b) temperature and thermal stratification

3. Chemical limnology
   a) oxygen in aquatic systems
   b) nitrogen and phosphorus in aquatic systems, and eutrophication
   c) pH in aquatic systems and acidification problems
   d) hardness, conductivity, and salinity in freshwater systems

4. Biological limnology
   a) freshwater ecosystems and their components
   b) biological zonation and habitats in standing and running freshwater systems
   c) introduction to riparian zones
   d) introduction to freshwater food webs, bioaccumulation and biomagnification
   e) introduction to the biology and ecology of aquatic plants (algae and macrophytes)
   f) introduction to the biology and ecology of freshwater zooplankton
   g) introduction to freshwater benthic invertebrates

Laboratories/Field Material

1. Identification and selection of sampling equipment for limnological research, and an introduction to quantitative data analysis.

2. Interpretation and construction of bathimetric maps. Area measurements, and applications for freshwater systems, and interpretation and analyses of light, temperature and oxygen data in relation to the distribution of aquatic organisms.

3. Collection of water samples, and subsequent analyses for Chlorophyll *a* concentration to determine the trophic status of the freshwater system sampled.

4. Chemical analyses of water samples using various field and lab techniques.

5. Collection, analysis, interpretation, and presentation of limnological data in a form acceptable for a scientific report.

6. An introduction to some representative forms of freshwater phytoplankton and zooplankton.

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