

# Biology 3114 Course Outline

## COURSE INSTRUCTOR

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## Introduction

Complex interactions of many biotic and abiotic factors exist in natural plant communities. The lecture component of this course was designed to offer a theoretical understanding of these interactions. In this course broad descriptive, as well as specific quantitative approaches will be used to identify and understand the structural and functional attributes and functional mechanisms of plant communities. Dominant biotic interactions (plant-to-plant, plant-microbe, interactions such as competition, symbiosis and allelopathy) and the role of environmental factors such as fire, microclimate and soil will be studied.

A general introduction will be given before each laboratory exercise followed by an outline of objectives and methods. While some of the exercises are original, a large part of this manual contains borrowed and modified versions of published texts, unpublished manuals and handouts. I would like to thank Robin Bloom and Eric Lamb for their help with an earlier revision of this manual. Lab manuals always need changes and refinements as new knowledge comes to light. I welcome feedbacks from students and colleagues for its further improvement.

The course will begin with a general introduction to history of plant ecology followed by more advanced treatments of selected topics on the subject. It will cover the theoretical concepts of ecosystem, plant community structure and function with particular emphasis on plant community response to disturbance with some examples. These aspects will be emphasized in lectures and discussions, field and laboratory exercises, and student presentations. Lecture topics include the following:

1. Introduction of plant ecology
2. Plant geography and vegetation description
3. Association and plant community concepts
4. Descriptive classification of vegetation
5. Ecosystem concept
6. Quantitative classification of vegetation
  - i) vegetation sampling techniques
  - ii) direct and indirect gradient analysis,
  - iii) cluster analysis
  - iv) association analysis
  - v) ordination
5. Vegetation dynamics: Succession

- i) successional pathways/mechanisms
  - ii) progressive succession
  - iii) retrogressive succession
  - iv) cyclical process
6. Functional classification of plant communities
- i) vital attributes of species
  - ii) species traits (CSR model)
  - iii) R\* hypothesis
7. Species interactions
- i) competition
  - ii) allelopathy
8. Competition and allelopathy in natural and managed ecosystems
- i) fire suppression and vegetation change
  - ii) restoration ecology
9. Forest ecology and management
10. Soils
- i) classification
  - ii) soil physics
  - iii) soil chemistry
  - iii) soil biology
  - iv) soil erosion and soil conservation
11. Ecological modeling
- i) concept
  - ii) classification
  - iii) model building
  - v) model use for prediction and forest management
12. Class review for final exam.

## Schedule for Plant Ecology Labs (Fall 2020, all labs are virtual)

Week	Date	Topic	Lab report due date
1	9/14/20	Intro to Lab and Lab Instructor, Plant ID	
2	9/21/20	Field trip to Mt. McKay	
3	9/28/20	Hawkeye Lake field trip	
4	10/05/20	Succession lab	Mount McKay lab (3%)
5	10/12/20	Fall Study Week	
6	10/19/20	Ordination Lecture	Quadrat size lab (3%)
7	10/26/20	Ordination Lecture/R programing	Succession lab (7%)
8	11/02/20	Experimental Design	Ordination lab (8%)
9	11/09/20	Allelopathy lab	Ordination lab (2 <sup>nd</sup> sub)
10	11/16/20	Student presentations	Experimental design (3 %)
11	11/23/20	Student presentations	Allelopathy lab (6%)
12	11/30/20	Lab Exam	

Please be sure to regularly check your Lakehead University e-mail account for updates and unavoidable changes to the laboratory schedule.

**Mid-term (in class) exam.....Wednesday, October 6, 2020**

## Text books

### Required:

1. Ecology (5<sup>th</sup> Edition) by W.D. Bowman & S.D. Hacker, Publisher: Sinauer Associates.
2. Forest Ecology (3rd Ed) By J.P. Kimmins, Publisher: Prentice Hall

### Other Recommended Texts:

Terrestrial Plant Ecology (3rd Ed). Barbour, M.G, Burk, J.H., Pitts, W.D., Gilliam, F.S. and Schwartz, M.W. 1999., Benjamin/Cummings, Don Mills, Ontario. p.649. Out of print

Plant Ecology: Ernst-Detlef Schulze *et al.* (Eds.) 2019.Springer (free download from internet)

Ecology of Plants (2nd Ed): J. Guervitch, S. Schneir & G.A. Fox (Sinauer Associates, Inc. Massachusetts, USA)

Laboratory Manual: Plant Ecology (Biology 3114) A.U. Mallik

## Distribution of Marks

Theory component:	Marks
Active learning (class discussion)	10
A mid-term examination (Oct 6)	10
One class presentation	10
A three-hour final examination	<u>25</u>
	<b>55%</b>
Practical (labs & Lab reports)	
Lab quizzes	5
November lab examination	15
Comprehensive lab reports	<u>25</u>
	<b>45%</b>

## Mark allocation rubric

### Level 4 (90- 100%, outstanding) expectation:

Organization/Structure – Considerable evidence of original thinking; outstanding grasp of subject matter, evidence of extensive knowledge base and outstanding capacity to synthesize. Information is very well-organized with well-constructed paragraphs. Paragraphs contain appropriate introductions, and/or transition neatly from one another. Document presents logical flow of information.

Information/Detail – Writing/presentation contains appropriate level of detail for the general audience. Detail level is such that pertinent aspects are included, and less relevant components are excluded or glossed over, to preserve timing/word-count. Novel concepts are introduced at an appropriate knowledge depth.

Presentation skills/Slides – Presentation speed is easy to follow. Presenter can make eye contact with the audience, and appears to be engaging. Presentation is of appropriate length. Slides contain only pertinent details, and are succinctly worded. Visuals are present, and are easy to follow.

### Level 3 (80-90%, very good) expectation:

Organization/Structure – Evidence of grasp of subject matter, evidence of critical thinking and understanding of relevant issues; evidence of familiarity with the literature. Information is organized with well-constructed paragraphs. Paragraphs contain appropriate introductions, and/or transition neatly from one another. Document presents logical flow of information.

Information/Detail – Writing/presentation usually contains appropriate level of detail for the general audience. Detail level is such that pertinent aspects are present. Novel concepts are introduced at a knowledge depth appropriate for most audiences.

Presentation skills/Slides – Presentation speed is easy for most of the audience to follow. Presenter can make some eye contact with the audience. Presentation is of appropriate length. Slides contain only pertinent details and contain appropriate word count. Visuals are present.

### Level 2 (70-80%, good) expectation:

Organization/Structure – Evidence of good understanding of the subject matter, ability to articulate ideas and concepts clearly. Information is relatively organized. Paragraphs may or may not contain introductions, and usually transition well from one another. Document mostly presents logical flow of information.

Information/Detail – Writing/presentation usually contains appropriate level of detail for the general audience. Sufficient detail is included such that most of the pertinent aspects are present. Novel concepts are introduced at a knowledge depth appropriate for most audiences.

Presentation skills/Slides – Presentation speed may be too fast or too slow. Presenter can make some eye contact with the audience, but may also be reading off the slides at times. Presentation is slightly long or short. Slides contain pertinent details, but are somewhat wordy. Visuals are limited.

**Level 1 (50-70% marginal, in graduate course 70% is a passing mark) expectation:**

Organization/Structure – Evidence of minimally acceptable understanding of the subject matter. Information is disorganized. Paragraphs do not transition well from one another.

Information/Detail – Writing/presentation usually contains a level of detail that is overtly simplified, or too complicated for a general audience, though crucial points are included.

Presentation skills/Slides – Presentation speed is too fast or too slow, and presenter is usually reading off of the slides. Presenter is unable to engage the audience. Presentation is overtly long or short. Slides are excessively wordy.