

BO 120

Field Botany & Plant Taxonomy

3 Credits

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Field Botany & Plant Taxonomy

Calendar Description

Native plants and communities of Alberta are studied focusing on general and applied plant botany. Students obtain practical field experience in plant community relationships while identifying, collecting, and preserving plants for further study. Students spend considerable time learning to use plant keys for taxonomic classification and for identifying plant species and families.

Rationale

This course is required for all first year students within the Environmental Sciences diploma. Environmental management requires a broad ecological background in which students need to understand basic relationships and processes of plants within ecosystems and communities. This course focuses on plants, an important component of ecological management, as well as the plant communities, as defined by ecological and climatic boundaries. Identification and classification of plant flora are essential field skills required for resource inventories and surveys, sampling, site assessments, vegetation control, habitat management, and revegetation techniques. Course emphasis on plant botany with plant community ecology incorporated into the field labs is designed to support and compliment other courses in each major and is a prerequisite for BI270 Managing Rangeland Ecosystems.

Prerequisites

None

Co-Requisites

None

Course Learning Outcomes

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

1. identify and describe local plant communities and the native flora associated with each community within sub regions.

2. analyze the vegetation appearance, composition, stratification, and growth form within plant communities in order to classify vegetation in regards to physiognomy.
3. relate vegetation to its ecological setting, and describe plant and community relationships to climate, water regime, landform, soil, wildlife and man's activities.
4. predict species composition within plant communities based on climate, soils, topography and landscape.
5. classify living organisms on the basis of Whittaker's five Kingdom system and compare the basic life forms in each.
6. differentiate between organisms in the divisions and subdivisions of the Plant Kingdom and the features that separate these from each other.
7. explain primary functions of and distinguish between the forms of plant morphology such as roots, stems, leaves, flowers and fruits.
8. demonstrate the techniques of collecting and preserving plant specimens related to the function of a herbarium by constructing a plant collection.
9. present well written, informative, and concise field notes.
10. demonstrate use of a taxonomic field guide and Flora of Alberta by classifying and identifying plant specimens through keying and plant morphology.
11. describe and recognize plant family characteristics and identify these families common to the Parkland and Boreal Forest natural regions.
12. memorize Latin names and demonstrate understanding of the significance of using binomial nomenclature in plant classification.

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

Required Textbook(s):

Johnson, D., L. Kershaw, A. MacKinnon, and J. Pojar. 2017. Plants of the western forest Alberta, Saskatchewan and Manitoba Boreal and Aspen Parkland. Partners Publishing and Lone Pine Media Publications (BC) Ltd. Edmonton, AB.

Lagroix-McLean, R. 2019. BO120 Lecture and Laboratory Supplement. Lakeland College, Vermilion, AB. (purchase if available in bookstore or may be available on D2L)

Kershaw, L and L. Allen. 2020. Vascular Flora of Alberta: An illustrated Guide. (hardcopy only, electronic not acceptable for lab activities).

Library and Internet Resources as requested by the instructor.

Reference material that supplements lecture and lab may be available in the bookstore and if so, is required.

D2L information.

Required Field Equipment:

Field Journal - Rite in the Rain All-Weather Field No. 351 (available at bookstore; waterproof pen optional)

Plant press* (you may borrow from Lakeland College, purchase online, or build your own)

Hand pruners (available in bookstore or bring a pair from home)

Suitable clothing for the field including rainwear and rubber boots. Warm coat, hat, and gloves are essential for outdoor activities. Proper footwear must provide ankle support and have gripped bottoms.

Hand lens (available at bookstore - highly recommended).

*The plant press is the property of Environmental Sciences, and must be returned by mid-semester. The date is discussed in class. Failure to return the plant press by the predetermined date results in a potential withholding of marks by the instructor.

Highly Recommended:

Harris, J.G., and M. Wolf Harris. 2001. Plant identification terminology. An illustrated glossary. Spring Lake Publishing, Spring Lake, Utah. (please note the 1994 version is acceptable)

Pojar, R., and E. Coulson. 2010. Trees and shrubs in winter. An identification guide for Northern British Columbia. Creekstone Press Ltd., Smithers, BC, Canada.
p. 182.

Tannis, K. 2004. Common plants of the Western Rangelands. Vol. 3 Forbs. Olds College, Olds, Alberta. Alberta Agriculture, Food and Rural Development, Edmonton, Alberta.

Other References

ACMIS. 2017. Alberta Plant Species List App.

<https://play.google.com/store/apps/details?id=com.ionicframework.acimsapp774258&hl=en>

Dickinson, R. and F. Royer. 2014. Weeds of North America. University of Chicago Press. London and Chicago.

Hale, G., N. Ambrose, A. Bogen, K. Spicer-Rowe, M. Uchikura and E. Saunders. 2005. A field guide to common riparian plants of Alberta. Cows and Fish Program. Lethbridge, Alberta. 63 pages. (small handbook useful for wetland plants)

Stern, K.R., J.E. Bidlack and S. H. Jansley. 2013. Introductory Plant Biology. 13th ed. McGraw Hill Higher Education, New York, USA.

Tannas, K. 2003. Common plants of the Western Rangelands. Vol. 1. Grasses and Grasslike. Olds College, Olds, Alberta. Alberta Agriculture, Food and Rural Development, Edmonton, Alberta. (great resource for forb identification).

Tannas, K. 2003. Common plants of the Western Rangelands. Vol. 2. Trees and shrubs. Olds College, Olds, Alberta. Alberta Agriculture, Food and Rural Development, Edmonton, Alberta. (great resource for all trees and shrubs in province).

Vitt, D. 2017. A Guide to Mosses and Liverworts of Alberta Peatlands. Nait Boreal Research Institute, Edmonton, AB. <http://www.nait.ca/docs/BRI-Field-Guide-Mosses-Liverworts-Alberta-Peatlands.pdf>.

Conduct of Course

This 86-hour course consists of 41 hours of lecture and 45 hours of laboratory work. The instructor discusses this time allocation as it relates to your timetable and expected hours of homework.

The lecture component is a formalized lecture situation where student questions and participation are encouraged to clarify subject areas. Handouts, D2L content, and assigned readings may supplement lecture and are considered part of the course content. Students should come to class prepared to discuss previous lecture and lab material and activities. Review of lecture content weekly is advised. Lectures support the lab by clarifying field methods and providing

background information. Lecture and lab material complement each other and should be used to complete assignments, the plant collection, and prepare for exams.

Labs are conducted in the field for the first five to six weeks for site inventory, collection and identification of plant specimens. Field labs are a critical component of the course for collecting plant specimens and field observations for the plant collection project. **Weekend field day(s) are held**, if needed, to collect plants for the plant collection, or may occur on a different weekday in lieu of the assigned lab due to weather or transportation challenges. As well, students **are required to collect specimens on their own time to complete the plant collection**, as needed. Students who study plants prior to the field lab and prepare by reading the lab procedure will complete tasks in the allotted time period. Although every effort is made to complete field labs on time, field labs may go past the allotted time period due to travel time or student efficiency, while other labs may be completed earlier than the allotted time.

Students may be asked to collect plants prior to the start date of the academic term. Information and guidance will be provided to students if this occurs. These specimens will be used in the plant collection project.

Labs are held regardless of weather and students must be prepared for adverse field conditions. This includes consideration of proper footwear and clothing, sunscreen, insect repellent, and food and water. Students are also responsible for bringing proper field equipment to the lab including the field journal, field guide, plant press, bags, pruners, and lab procedure. The remainder of the labs are in a classroom setting and focus on developing the skills required to use a taxonomic key for plant identification. Students are expected to be punctual and prepared for labs on a weekly basis, and must bring the required materials to complete the lab activity.

Exams are conducted in the time provided for students during lecture and/or lab or on D2L. One lab exam is delivered in the evening to accommodate delivery of the exam to many students in a larger classroom. Some assignments are in class assignments that must be completed in the time provided.

Being punctual for lab and lecture, regular attendance, participation, and good to excellent time management skills by the student is an integral part of student success in this class.

Evaluation Procedures

Midterm and final lecture exams may contain any or all of short-answer, true-false, multiple choice, illustrative, matching, and discussion questions. Material for the written exams is based on lecture and lab content and any other associated materials provided. The final exam is not cumulative. Formative non-graded exercises are periodically provided which give students a higher level of competence in the course material if completed. The grade referred to as "Assignment (s)" is comprised of two or three small activities that provide competency in material associated with the plant collection. Some of these assignments may be evaluated on D2L.

The **plant collection and field book** are an intensive documentation and preservation of plants studied in the field labs, and represent a significant part of the course evaluation. The student is required to identify specimens from field labs and through independent collection, preserve the specimens in a formalized manner, and document plant and ecosystem information related to the specimen. All components of this evaluation with due dates are discussed in detail in class. Students are encouraged to work weekly on the collection which is due in November.

Lab exams involve plant identification and keying. The first lab exam is a short plant identification exam and is held early in the semester to provide practise and comfort with plant identification station exams. A second comprehensive plant identification exam occurs later in the course and focuses on plant identification skills developed throughout the term. This exam is delivered in the evening. Plant identification tutorials are held weekly and although optional, students are highly encouraged to take advantage of this learning tool. A final lab exam at the end of term focuses on keying and family identification skills developed in the second half of the course in the lab and is held in the regular allotted lab time period.

Lecture

Midterm Exam	15%
Final Exam	25%

Laboratory

Plant Collection and Field Book	25%
Lab Exams I, II, III	30%
Assignment (s)	<u>5%</u>
TOTAL	100%

In order to receive full credit for this course, consider the following:

- The plant collection is an important part of the course and a significant learning component. **If not handed in, an incomplete or fail will result for the course.** Therefore, **all field labs must be attended** in the required time slot. An absence, excused or unexcused could result in a zero for the plant collection or, at the very least, a zero will be assigned to that part and any related part of the plant collection. Students are responsible for communicating with the instructor with regards to absences that may occur.
- A student who does miss a lab (excused or unexcused) is expected to **make up that lab** in consultation with the instructor. If the lab cannot be repeated, an additional or different assignment may be assigned to the student who misses the lab.
- The importance of attendance cannot be overstated. In order to receive a mark for any assigned and completed work due or handed in during that lecture or lab, students must be in attendance. Students who are absent during in-class assignments will not typically be allowed to make up these exercises for marks, but may be required to complete them for learning practice.
- The student must receive a 50% or better for the overall course evaluation.

- **Late assignments will be given a zero, although the plant collection will have 25% deducted per day from the grade unless otherwise noted. The evaluation is shown below::**

Plant Collection:

1 day late	- 25% deducted
2 days late	- 50% deducted
3 days late	- 75% deducted
4 days late	- 100% deducted

All due dates of evaluations are provided in class at the beginning of the term.

All assignments and exams are graded on a percentage (%) basis. Then, a total course percentage is calculated using the above weighting values. Finally, the total course percentage is converted to a letter grade basis using the following scheme:

The final grade is an aggregate of the following components.

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): Midterm, Goals 2, 3, 4, 7, 8; Final Exam, Goals 3, 4, 5, 6, 7, 12; Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11; Lab exam I, Goals 12; Lab exam II, Goal 12; Lab exam III, Goals 11, 12; Assignments, Goals 8, 9, 10, 11, 12
A2. by using written, spoken, and/or visual formats and media to communicate and meet needs of each particular audience
Evaluation(s)/Goal(s): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11
A3. by using libraries, Internet, technical publications, journals and other sources to find pertinent information
Evaluation(s)/Goal(s): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11

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): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11; Assignments, Goals 8, 9, 10, 11
B2. by using interpersonal skills to resolve conflict, relate to others, and assist others
Evaluation(s)/Goal(s): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11
B3. by contributing and listening to others as group determines realistic objectives, prioritizes tasks, and identifies resources and timelines
Evaluation(s)/Goal(s): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11

B4. by treating other members of the group open-mindedly and fairly
Evaluation(s)/Goal(s): NA
B5. by developing tactics/strategies to accomplish tasks
Evaluation(s)/Goal(s): Plant Collection and Field Book; Goals 1, 2, 3, 8, 9, 10, 11

C. Critical Thinking Skills

C1. by seeing critical thinking as a lifelong process of self-assessment
Evaluation(s)/Goal(s): Final Exam, Goals 3, 4, 5, 6, 7, 12
C2. by examining problems closely
Evaluation(s)/Goal(s): Final Exam, Goals 3, 4, 5, 6, 7, 12
C3. by examining beliefs, assumptions, and opinions, and weigh them against the facts
Evaluation(s)/Goal(s): NA
C4. by seeking out the truth
Evaluation(s)/Goal(s): NA
C5. by finding solutions; make decisions
Evaluation(s)/Goal(s): Final Exam, Goals 3, 4, 5, 6, 7, 12
C6. by incorporating new ideas that may not necessarily agree with previous thought on the topic
Evaluation(s)/Goal(s): NA
C7. by seeing connections between topics and use knowledge from other disciplines to enhance reading and learning experiences
Evaluation(s)/Goal(s): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11

D. Adaptability Skills

D1. by working independently or as part of team
Evaluation(s)/Goal(s): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11; Lab exam I, Goal 12; Lab exam II, Goals 12
D2. by carrying out multiple tasks or projects
Evaluation(s)/Goal(s): Plant collection and field book, Goals 1, 2, 3, 8, 9, 10, 11
D3. by being innovative and resourceful: identify and suggest alternative ways to get the job done
Evaluation(s)/Goal(s): Plant collection and field book, Goals 1, 2, 3, 8, 9, 10, 11
D4. by being open and respond constructively to change and uncertainty
Evaluation(s)/Goal(s): NA

E. Positive Attitude and Behavioural Skills

E1. by dealing with people, problems, and situations with honesty, integrity, and personal ethics
Evaluation(s)/Goal(s): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11
E2. by showing interest, initiative, and effort
Evaluation(s)/Goal(s): Plant Collection and Field Book, Goals 1, 2, 3, 8, 9, 10, 11; Midterm, Goals 2, 3, 4, 7, 8; Final Exam, Goals 3, 4, 5, 6, 7, 12; Assignments, Goals 8, 9, 10, 11, 12; Lab exam I, Goals 12; Lab exam II, Goals 12; Lab exam III, Goals 11, 12
E3. by affirming the need for positive solutions and encourage positive interaction and feedback
Evaluation(s)/Goal(s): NA
E4. by balancing personal and family activities with job-related activities
Evaluation(s)/Goal(s): Plant Collection and field book, Goals 1, 2, 3, 8, 9, 10, 11

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:

Note that the order of delivery of lecture content may be switched in order to compliment lab activities. Some material may be delivered on D2L.

Unit 1. Introduction to Field Botany

1. Botany defined and described
 - a) Plant botany defined
 - b) Plants characterized
2. Introduction to plant morphology for plant identification
3. Introduction to the Plant Kingdom - Plantae
4. Plant collecting techniques and preservation
 - a) purpose and function
 - b) collecting and pressing techniques
 - c) drying and storage
5. Field data collection protocol
6. Nomenclature - binomial system of plant names
7. Plant identification using the field guide - keying

Unit 2. Vegetative Plant Morphology for Spot Identification

1. Key terminology review
2. Leaf patterns and characteristics for plant identification
3. Variation in morphology

Unit 3. Advanced Identification and Morphology of Taxonomic Groups, Growth Forms and Species

1. Plant growth form types
2. Seeds vs. spores
3. Morphology and identification
 - a) Bryophytes: mosses, liverworts and hornworts
 - b) Pteridophytes: ferns and fern allies
 - c) Woody plants: Gymnosperm, Angiosperm, and winter form identification
 - d) Angiosperms: monocots and dicots
 - e) Aquatic growth form types
4. Kingdom Fungi: lichen growth form types
5. Artificial classification of plants
 - a) Parasitic and carnivorous plants
 - b) Weeds
 - c) Crops
5. Special topic: woody plant anatomy and growth

Unit 4. The Science of Botany: Application and Ecological Value

1. The branches of botany
 - a) general botany
 - b) applied botany
2. The ecological and societal value of plants

Unit 5. Vegetation Physiognomy

1. Biological and physical attributes of a plant community
2. Physiognomic classes described: dry lands
3. Physiognomic classes described: wetlands

Unit 6. Advanced morphology of the Angiospermae

1. Flower morphology and inflorescence types
2. Fruit types and the relationship to flowers
3. Stem types and morphology
4. Root systems
5. Leaf morphology and anatomy

Unit 7. Plant Taxonomy and Classification

1. Plant taxonomy defined
2. Classification systems
3. Units of the phylogenic classification system
4. Hierarchical ranks of taxa
5. The five Kingdom classification system described and compared

Unit 8. The Plant Kingdom: The Seedless Vascular Plants

1. Division Pteridophyta ferns and fern allies
2. Morphology
3. Spore reproduction and life cycle

Unit 9. The Plant Kingdom: The Seed Producing Vascular Plants

1. Division Spermatophyta and subdivisions
2. Seed reproduction versus spore reproduction
3. Subdivision Gymnospermae and classes
4. Subdivision Angiospermae and classes
5. Classes Monocotyledonae and Dicotyledonae compared
6. Seed reproduction and life cycles compared

Unit 10. Basic Plant Physiology and the Relationship to the Environment (delivery is based on time available)

1. Plant requirements and environmental relationships
2. Plant adaptations to the environment with special emphasis on leaf and plant morphology
3. Ecological adaptations of plants

Note: The order of presentation of the lecture units may change during the semester to coordinate lab activities with lecture content.

Laboratory Topics:

Note: The order of laboratory topics shown does not necessarily reflect the order given of labs and may change due to weather and field conditions, as well as lab scheduled holidays. Some lab topics will be combined if necessary to effectively deliver the content in a timely manner.

1. Getting to know plants: introduction into plant morphology, growth forms and collecting plants. This lab is completed independently using D2L and is to be completed prior to the first field lab. Content will be reviewed in lab and lecture but students who complete the activity will be prepared for the first and subsequent field labs.
2. Parkland Natural Region: north facing woodland: description of community related to ecology, growth forms, physiognomy, and species composition; collection of plant species.
3. Parkland Natural Regions upland and south facing slope grassland - description of community related to ecology, growth forms, physiognomy, and species composition; collection of plant species.
4. Parkland Natural Region - weeds and agronomic crops - description of community related to ecology, growth forms, physiognomy, and species composition; collection of plant species. **(self directed study and lab collection)**
5. Parkland Natural Region - pond - description of community related to ecology, growth forms, physiognomy, and species composition; collection of plant species.
6. Boreal Forest Natural Region - peatland and upland forest - description of community related to growth forms, ecology, physiognomy, and species composition; collection of plant species.

7. Parkland Natural Region- woodland - Identification of common native trees and shrubs in their winter form; **Plant Identification exam on woodland species.**
8. Introduction to keying and using the Flora of Alberta.
- 9-13. Keying of a variety of species using the Flora of Alberta from the Angiospermae (typically includes, although is not exclusive to Families Asteraceae, Onagraceae, Brassicaceae, Fabaceae, Scrophulariaceae, Labiatae, Liliaceae, Rosaceae) Gymnospermae subdivisions (Pinaceae, Cupressaceae) and Pteridophyta Division (Equisetaceae). These labs develop the skill of keying and promote the understanding of plant taxonomy, classification, and nomenclature. Identification of woody plants in their winter form is also developed.
14. Keying lab exam



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