Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: Spring
Year: 2025
Course Prefix: BOT
Course and Section #: 4200 section 001
Course Title: Plant Systematics and Lab
Credits: 3

Course Description

Principles and techniques of Plant Systematics spanning historical and modern perspectives. This class will explore different types of systematic data, including morphological and molecular characters in the context of phylogenetic analyses and taxonomic classifications. Emphases will include plant identification, evolutionary history, diversification, biogeography, and taxonomy. The 'laboratory' component will entail hands-on learning in field, laboratory, computer, and herbarium settings and will focus on plant identification and collection and analysis of systematic data using phylogenetic methodology.

Pedagogy Style: In this course, I implement a high-impact practice style of pedagogy known as Course-based undergraduate research experience (CURE). You can read more about this type of pedagogy at CUREs - University of Colorado Boulder. In this class, students will take part in a full research experience as small groups to help investigate and create novel research in plant systematics. This is real research experience and you will get a taste of what it's like to conduct research towards creating novel knowledge – and all that comes with that experience. In particular, this course follows the CURE pedagogy by focusing on the below (Auchincloss et al., 2014; Provost, 2016) and will help you develop transitional skills that are applicable in numerous life circumstances:

1. Scientific Process: conducting research in the manner of professional scientists.
2. Discovery: Investigating novel questions that are previously unknown/unpublished.
3. Relevance: Impacts go beyond the classroom via synthesis of new knowledge.
4. Collaboration: Working in teams to advance science.
5. Iteration: Learning/experiencing the iterative process of knowledge gains by building upon previous knowledge, learning by failure and retrying, and problem-solving after self-analysis and peer-critique.

The CURE will work with and incorporate learning content to meet learning objectives below:

Course Attributes

This course has the following attributes:

☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☒ Discipline Core Requirements in Program

☐ Elective Core Requirements in Program
☐ Open Elective
Other: CURE

Instructor Information

Instructor Name: Dr.

Student Learning Outcomes

1. Describe the field of plant systematics and its major components, foci, and relevance to other scientific disciplines
2. Explain the development of plant classification and nomenclature through human history
3. Describe a plant using accepted botanical terminology
4. Examine various sources of evidence used in construction of plant classifications and phylogenies
5. Analyze data towards reconstruction of the evolutionary history of a group of plants
6. Differentiate morphological characteristics that define primitive vascular plants, gymnosperms, and angiosperms in the context of evolutionary history
7. Compare and contrast distinguishing characteristics of major plant families in Utah placed in the context of evolution, historical taxonomy, and human use

Course Materials and Texts

Required Texts:

Judd, W.S., C.S. Campbell, E.A. Kellogg, P.F. Stevens, and M.J. Donoghue. 2015. *Plant Systematics: A Phylogenetic Approach*. 4th ed., Sinauer Associates, Inc. ISBN 9781605353890

In addition to these texts, additional readings from the primary literature will be posted throughout the semester on the course website on CANVAS.

Recommended Texts (available for checkout for the semester):

Harris, J.G. and Harris-Woolf, M. 2001. *Plant Identification Terminology: An Illustrated Glossary*. 2nd ed., Spring Lake Publishing. ISBN-10: 0964022168.

> This is a very good companion for learning plant characters and terminology, very helpful for learning to identify plants.

Welsh, S.L., N.D. Atwood, L.C. Higgins, and S. Goodrich. 2003, 1993, 1987. *A Utah Flora*. Brigham Young University Press. ISBN-10: 0842523138.

Arnow, L., B. Albee, and A. Wyckoff. 1980. *Flora of the Central Wasatch Front, Utah*. University of Utah, SLC, UT.

This is a good text for identifying plants of Salt Lake and Davis counties. There is also a searchable CD of this text available for purchase, courtesy of Dr. Bill Gray.

Required Supplies (available for checkout):

- 10x Hand lens
- Metric ruler, 15 cm long
- Dissecting kit

Course Requirements

Course Assignments, Assessments, and Grading Policy
Lectures: Attendance at lecture is required. Lecture will be used to cover theory of systematics as well as introduction to plant taxonomy and diversity. Lecture notes will not be posted online, so make sure to attend. Lecture is vital to fulfilling the learning objectives as theory and specifics behind what we will do hands-on in the lab.

Laboratory: Attendance at laboratory is required. Laboratory will be split between field excursions, herbarium visits, and computer analyses. Attendance is vital, as here is where we put the theory and knowledge to work.

Primary Literature Referee Reports (25 points each): Each student will be required to turn in three 2-page, referee reports on articles relevant to plant systematics from the primary literature. These will be staggered throughout the semester. Content of these reports will be discussed in class. The purpose of these reports is to expose you to the types and extent of research in plant systematics and the objective of using a phylogeny to explore relationships, evolution, and events in the discipline of plant systematics and to get students thinking about how to conceptualize and conduct their research projects. Suitable journals include: *Systematic Biology, Systematic Botany, American Journal of Botany, Molecular Phylogenetics and Evolution, Evolution, Molecular Ecology, Journal of Evolutionary Biology, BMC Evolutionary Biology, New Phytologist, Taxon, and Journal of Biogeography, Conservation Biology, Conservation Genetics*.

Plant Systematics Project (200 points): Students are to work in small groups on a project decided upon during class. The project will be centered on a plant species or related group emphasizing evolution, taxonomy, nomenclature, biogeography, conservation, morphological evolution or hybridization in the context of evolutionary relationships. The following must be a part of each project:

- Student groups will be required to turn in an outline proposing the scope, extent, and objective of their study by the end of the 4th week of class. Please discuss your proposal ideas with me prior to writing.
- Students will be expected to collect the necessary data, whether it is genetic (publicly available!), morphological, biochemical (publicly available), or other. Once sequences are

obtained, students will then be required to analyze their data in phylogenetic, morphological, or evolutionary frameworks.

- Using the resulting evolutionary relationships, students will prepare a publication-style research paper including Abstract, introduction (brief discussion outlining taxonomic history, ecology, conservation status, key morphological characters, and research objectives), materials and methods (outlining collection, molecular methods, and bioinformatic analyses), results, and discussion concerning the implications of their findings in the context of morphological evolution, biogeography, hybridization, nomenclature, or conservation.
- It is expected that students will conduct a thorough review of the primary literature concerning their plant group and topic in an effort to enrich their paper with relevant references. References to obscure webpages are not acceptable. References must be taken from the **primary literature** (i.e. periodicals and journals). *Please note:* Plagiarism is strictly forbidden and will result in a failing grade for the paper! AI generated text is not allowed in the class.
- Papers will be graded according to a rubric discussed in class which will focus on quality of background information, sampling techniques, proper choice of methods and analyses, presentation of results, depth and appropriateness of discussion, and relevance of references.
- Projects will be presented in groups as a powerpoint or poster presentation either in class or at a wider forum, such as a campus wide undergraduate research symposium.
- The individual paper is due the second to last week of class. Time may be allotted during lab sessions to work on these projects.

Team based Assessment (100 points): As plant systematics projects will be conducted and presented in teams, each person will be evaluated by each other person on the team in an effort to equalize participation. Each student will evaluate each other based on how well they feel that person contributed to the project conceptually, methodologically, presentation wise, etc. We will discuss as a class how this should be done and a rubric for evaluation will be provided.

Phylogenetics Lab Report (100 points): This group project will work through several class periods learning the methods of plant systematics using both character and molecular data. This informal yet extensive lab report will include a number of points.

Class and Lab Quizzes (150 points): A total of 12 quizzes will be given at the beginning of either lecture or lab. Each will be worth 15 points. You will be allowed to drop 2 of your lowest quiz scores. No makeup quizzes will be given. Quizzes will be on the topics learned in lecture or lab since the last quiz.

Class and Lab Exercises (TBD points): During several classes we will be doing hands-on activities working to learn about the *how* and *what* of plant systematics and may include working with herbarium specimens, live specimens, and/or computer analyses. Results of these activities must be turned in, either as a group or individually, depending on the activity.

Midterm and Final Exams (100 points each): Each exam will include portions involving both short answer and essay questions. The midterm will cover the first half of the semester; the final exam the last half. Review sessions will be held prior to each exam and a list of topics included

on the exam as well as several others will be given out prior to the exam as well. Exams will cover information learned in both lab and lecture sections.

Participation (10 points each class = 310 points): Attendance and *active* participation is expected during each class. If you are ill or need to miss class please let me know ahead of time.

Grading Scale: The following percentages will determine your final grade (a grading curve will be implemented if necessary):

94-100%	A	80-82%	B-	67-69%	D+
90-93%	A-	77-79%	C+	63-66%	D
87-89%	B+	73-76%	C	60-62%	D-
83-86%	B	70-72%	C-	below 60%	E

Required or Recommended Reading Assignments
TBD: See schedule in canvas and readings on canvas.

General Description of the Subject Matter of Each Lecture or Discussion
See schedule at the end of this syllabus.

Required Course Syllabus Statements

Biology Department Policy: Students in this class are expected to understand and use proper English grammar, sentence structure, and spelling. Use of dictionaries during quizzes and exams is NOT allowed. Students are also expected to have basic calculating skills that include fractions, decimals, exponents (e.g., squares & square roots, powers of ten) and the ability to solve simple algebraic expressions. In addition, they must be able to add, subtract, multiply, and divide small numbers without a calculator. Understanding of logarithms (logs) will be helpful. Course rigor level should be such that the average grade is about a C.

Generative AI

AI Syllabus Statement: **adapted from Temple University statement on AI in classes.*
AI programs are not a replacement for your human creativity, originality, and critical thinking. Writing, thinking, and researching are crafts that you must develop over time to develop your own individual voice, learn and develop as a person, and gain transitional skills required for job success. At the same time, you should learn how to use AI and in what instances AI can be helpful to you.

The use of generative AI tools (e.g. Grammarly, ChatGPT, Google Gemini, etc.) is permitted in this course for the following activities:

- Brainstorming and refining your ideas;
- Fine tuning your research questions;
- Finding information on your topic;
- Drafting an outline to organize your thoughts; and
- Checking grammar and style on sentences, or paragraphs. **NOTE: Grammarly use on a paper will be detected by UVU's plagiarism detection software and result in call of 100% influenced by**

AI. This will be grounds for failing the assignment and potentially failing the course. My advise – just don't use it!

The use of generative AI tools is not permitted in this course for the following activities:

- Impersonating you in classroom contexts, such as by using the tool to compose discussion board prompts/responses assigned to you or content that you put into a Teams/Canvas chat.
- Completing group work that your group has assigned to you.
- Writing any draft of a writing assignment, discussion assignment or short answer to case studies.
- Writing entire sentences, paragraphs or papers to complete class assignments.

You are responsible for the information you submit based on an AI query (for instance, that it does not violate intellectual property laws, or contain misinformation or unethical content). **Your use of AI tools must be properly documented and cited in order to stay within university policies on academic honesty.** I am aware that AI-based plagiarism can be both intentional and unintentional. However, because the UVU approved detection software does not distinguish between intents, any detection of AI will be considered intentional if not cited properly. **I reiterate – it is your responsibility to stay within the parameters of acceptable AI use as stated herein!** Consequences are at my discretion – with likely loss of points for the assignment and reporting to academic integrity office for multiple infractions.

In those rare instances where AI use is approved for an assignment, any student work submitted using AI tools should clearly indicate what work is the student's work and what part is generated by the AI. In such cases, **no more than 25% of the student work should be generated by AI**. If any part of this is confusing or uncertain, please reach out to me for a conversation before submitting your work.

Using Remote Testing Software

☒ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities

Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747. Accessibility Services is located on the Orem Campus in BA 110. Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu DHH is located on the Orem Campus in BA 112.

Academic Integrity

At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the

community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX
Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation
UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.
To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict. While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.

The syllabus and policies are subject to change at the discretion of the instructor.

Course Schedule (Subject to Change and it will change!)

Week	Date	Topics	Readings	Activities	Assignments	Quiz/ Exam
1	7-Jan	Course Outline; Introduction to Systematics	Judd 1	Systematics Brainstorm		

1	9-Jan	Plant Classification	Judd 3	History Bingo / Species Description		**Quiz 1**
2	15-Jan	Plant Classification/Methods	Judd 2	8 plant dichotomous key	**Key**	
2	16-Jan	Methods in Systematics		Character Matrix	**Char Matrix**	
3	21-Jan	Phylogenetics lab	Egan 2015,2016	PAUP with char matrix: upgma, NJ, BandB	**morph phylo trees**	**Quiz 2**
3	23-Jan	Phylogenetics lab		8-taxa NCBI data, align, PAUP, MP, ML	**DNA alignment phylo trees**	**Quiz 3**
4	28-Jan	Plant Morphology & Anatomy	Judd 4	Floral Formulae	**Ref Report 1**	
4	30-Jan	Lab: Morphology & Anatomy		Microscope work	**Lab Report**	**Quiz 4**
5	4-Feb	Types of Systematic Data with examples	Egan 2015	Morphometrics discussion; group plans		**Quiz 5**
5	6-Feb	Systematic Projects: overview and objectives		Group work	**Project outline**	
6	11-Feb	Evolution of Plant Diversity	Judd 5	Plant Evolution timeline	**Ref Report 2 Due**	**Quiz 6**
6	12-Feb	Plant Systematics Projects & Midterm		Midterm		**Midterm**
7	18-Feb	Overview of Green Plant Phylogeny	Judd 6	viewing plants		**Quiz 7**
7	20-Feb	Plant Systematics Project		Group work		
8	25-Feb	Lycophytes, Ferns and Gymnosperms	Judd 7	Botany Blitz, viewing plants, group work		**Quiz 8**
8	27-Feb	Basal Angiosperms and Magnolids (Amborella, Nymphaceae, Magnoliaceae, Lauraceae, Piperaceae, Annonaceae, Aristolochiaceae)	Judd 8: 244-262	Botany Blitz, viewing plants, group work		
9	4-Mar	Plant Systematics Project		Group work	**Ref Report 3 Due**	
9	6-Mar	Monocots	Judd 8: 263-318	Botany Blitz, viewing plants, group work		**Quiz 9**
10	11-Mar	Spring break				
10	13-Mar	Spring break				
11	18-Mar	Plant Systematics Projects		Group work		
11	20-Mar	Basal Eudicots - Eurosids 1	Judd 8:325-335	Botany Blitz, viewing plants, group work		
12	25-Mar	Plant Systematics Projects		Group work		
12	27-Mar	Eurosids I - Fabidae	Judd 8: 342-401	Botany Blitz, viewing plants, group work		**Quiz 10**
13	1-Apr	Plant Systematics Projects		Group work		
13	3-Apr	Eurosids II - Malvids	Judd 8: 402-439	Botany Blitz, viewing plants, group work		**Quiz 11**
14	8-Apr	Plant Systematics Projects		Group work		
14	10-Apr	Asterids I	Judd 8: 466-503	Botany Blitz, viewing plants, group work		
15	15-Apr	Plant Systematics Projects		Group work	**DRAFT 1 due**	

15	17-Apr	Asterids II	Judd 8: 503-549	Botany Blitz, viewing plants, group work		**Quiz 12**
16	22-Apr	Plant Systematics Project presentations		**project presentations**		
16	24-Apr	No class				
17	29-Apr	**Final exam – 9am!**		**Final exam**	**Final draft due**	