

The Indiana Academy for Science, Mathematics, and Humanities
SCI04321S2.1 Botany Spring 2025

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Office hours: MWF 12:45-1:45 PM, 5-6 PM
Tuesday 10 AM-12 noon, 2-3 PM
Thursday 11 AM-12 noon

Class meetings: In Burris 211. MWF 4-4:50 PM, Lab on Tuesdays from 4-5:45

Course description:

Prerequisite: One year biology
Co-requisite: Botany Lab (SCI4321L)
Credit: 1.5 credits
Offered: Spring

This course explores the biology of plants. Topics include plant taxonomy, physiology, life history, genetics, natural selection, population and community ecology, species interactions, community structure and diversity, primary productivity and nutrient cycling, biogeography, and global carbon dynamics. Hands-on laboratory and field activities will include examination of plant tissues, cultivation of plants to investigate physiology and genetics, and characterization of natural plant communities on and near campus.

Student learning outcomes:

Upon completing this course, students will be able to describe the major characteristics of various plant groups and explain fundamental principles in plant physiology and ecology. Students completing this course will be able to apply the concepts of life history, gas exchange, respiration, photosynthesis, transpiration, heredity, natural selection, population dynamics, species interactions, community structure and diversity, primary productivity, nutrient cycling, biogeography, and carbon dynamics to discuss processes involving plants. Students who complete this course will be able to use laboratory and field techniques to investigate plants at the microscopic, physiological, genetic, and ecological scales. Students completing this course will be able to apply simple horticultural techniques to grow and propagate plants and will be able to apply taxonomic keys to characterize plant communities in the field.

Course materials:

Mauseth, James D.; and Amanda Snook. 2021. *Botany: Introduction to Plant Biology*, 7th ed. Jones & Bartlett: Burlington, MA.

Mauseth, James D.; and Amanda Snook. 2021. *Botany: A Lab Manual*, 7th ed. Jones & Bartlett: Burlington, MA.

We will supplement these texts with other relevant material throughout the semester. Each student also needs a **lab notebook** in which to record lab and field observations. This should be separate from the notebook that you use for lecture notes.

Please note that some aspects of this course may need to be changed during the term, so this syllabus is subject to revision. If the syllabus is revised during the term, the updated syllabus will be posted on Canvas. Please refer to Canvas for updated information.

Assignments

The assignments for the course are shown in the table below.

Assignment	Due date	Points	Number	Total points
Participation	Every day	40 per quarter	2	80
Lab/field investigations	Weekly (Tuesdays)	10	13	130
Homework	Weekly (Wednesdays)	10	14	140
Quizzes	Weekly (Fridays)	10	14	140
Exams during semester	February, March, April	50	3	150
Proposal for independent project	24 February	25	1	25
Report for independent project	2 May	25	1	25
Presentations for independent project	29 April	10	1	10
Lab/field notebook	At final exam	30	1	30
Final examination	To be announced	70	1	70
				800

Participation—I will subjectively assess the extent to which students participate in discussions, laboratory exercises, and fieldwork in order to award participation points.

Lab/field investigations—We will complete lab- and/or field-based investigations from the lab manual or other sources, and some studies we will design ourselves. For most investigations, each student will be expected to submit an original report that describes the background, methods, results, and findings. I will assess reports based on completeness, organization, correctness of analysis, and justification of conclusions.

Homework—Students will complete homework assignments most weeks. These may be submitted on paper or on Canvas, depending on the assignment. I will assess answers to homework questions and problems based on correctness and completeness.

Quizzes—Most weeks we will have short quizzes over recent material we have discussed, either in class or accessible on Canvas. Questions may include multiple choice, short answer, and matching. I will assess answers based on correctness and completeness.

Exams--Exams will cover material from the textbook, especially what we discuss in class. There may be additional exam questions based on discussions we have of other readings. The final exam will be comprehensive. Exam questions may include short-answer, multiple choice, or essay questions. I will grade answers based on correctness, completeness, and clarity.

Independent project—Each student will design and conduct an independent research project on a botanical question of interest to that student. Early in the semester each student should submit a proposal detailing plans for the project, so that I can evaluate the feasibility, provide suggestions, order equipment, plan field excursions, etc. This project will involve laboratory and/or field work. The report should cite peer-reviewed references and present the student's observations and data, hopefully answering the question addressed. I will assess the report based on accuracy, organization, clarity, originality, and reasoning. Students will also present their projects in class.

Lab notebook—Each student will maintain a lab notebook with observations, drawings, and data from lab and field exercises. This notebook will be submitted at the end of the semester. You may bring it to the final exam, and I will look through it while you take the exam. I will assess the notebook for neatness, completeness, and attention to detail.

Topics

Readings and activities will be announced in class or posted on Canvas. Topics for discussion may include:

Introduction to plant biology

Life and fundamental organizing principles of biology

Plant divisions and classification

Structure and function of cells

Tissues

Roots and soils

Morphology

Water movement through plants

Metabolism

Genetics

Plant breeding and propagation

Reproduction

Meiosis and alternation of generations

Growth and development

Evolution

Ecology & biomes

Vegetation types and common taxa of North America

Ethical issues regarding research, technology, publication, intellectual property rights, and biodiversity

History of botany

Phylogeny, morphology, and ecology of various plant taxa

Bacteria, archaea, and viruses

Protista and fungi

Bryophytes

Seedless vascular plants

Gymnosperms

Angiosperms
Flowering plants and civilization
Useful & poisonous plants, fungi, and algae
Biological controls
House plants and home gardening
Seedless vascular plants
Gymnosperms
Angiosperms
Flowering plants and civilization
Useful & poisonous plants, fungi, and algae
Biological controls
House plants and home gardening

Attendance

Please arrive on time to class. The instructor is required to take attendance so that all students are accounted for. If you arrive late to class, someone might start checking to see where you may be. If you are late, you may need to remind the instructor to change the absence to tardy. This will disrupt our workflow and possibly the workflow of others, so please try to avoid being late.

If you miss lecture for any reason, you are responsible for obtaining any notes, announcements, reading material, or assignments from the instructor or a classmate. If an unavoidable conflict, emergency, or illness prevents you from attending class or completing an assignment on time, please inform the instructor as soon as possible (preferably beforehand). The Academy and not the instructor determines whether an absence is excused or unexcused. No direct grade penalty is assessed for an absence. However, you will have a much greater chance of success if you are present as much as possible.

Indiana Academy Absence Policy

It is the policy of the Indiana Academy that any absence from class is unexcused, except for illness, death in the family, college or school-related activities, and extenuating circumstances. When a student is absent from a class, the instructor reports the student absence to the Faculty Attendance Coordinator in the Office of Academic Affairs. Unless the absence is excused by a school official, it is considered unexcused. The decision as to whether an absence is excused is not determined by the instructor. Four or more unexcused absences in any particular class a student takes will lead to academic and residential consequences to be determined by the Office of Academic Affairs and the Office of Residential Life that may include detention, residential groundings, parent/principal conference, among others.

Academic conduct

It is important to prepare for each class meeting by completing the reading and any assignments that are due. Assignments should be submitted on Canvas or in class, depending on the assignment. Although some activities such as labs may be completed in pairs or groups of students, each student is individually responsible for submitting assignments with original writing (not copied from your lab mate). You are encouraged to discuss answers to lab activities with other class members, but the

wording should not be the same. Do not share word processing files with each other, but make sure each student has access to the raw data for analysis.

You are expected to conduct yourself according to the Indiana Academy Student Handbook (<https://academy.bsu.edu/handbook/>), especially the Code of Conduct and the section on Academic Integrity. On writing assignments, please be sure to use your own wording and cite all sources of information, whether from the Internet or otherwise. If you are not sure how to cite something, ask the instructor. Note that language copied verbatim from a book, website, another student's paper, or any other source is considered plagiarism unless it is in quotation marks and cited. Plagiarism is a form of academic dishonesty. Please do not plagiarize or cheat in any other way. An infraction may result in a 0 for the assignment. Also, the instructor is required to report any ethics violations to the Academic Integrity Board or (the Director of Academic Affairs and your parents).

Artificial intelligence (AI) technology

Technologies referred to as “artificial intelligence” (AI) are becoming increasingly salient in our lives, sometimes with more emphasis on artificial than on intelligence. The original Turing test (Turing, 1950) for artificial intelligence is to engage in dialogue with what we would now call a “chatbot”. If the discourse is indistinguishable from that of a human, then it is considered artificial intelligence. Modern large language models such as ChatGPT (OpenAI, 2022) exemplify this approach by stringing together words from human writing to sound intelligent (without always being intelligent).

These tools can be very useful, from simple spellchecks to generating computer code. As we adopt these technologies, however, it is important to verify that information obtained is correct and to avoid presenting as our own work that was produced by software or anyone else. We can avoid these pitfalls if we use the auto-generated content as a starting point but not as a finished product. Find the original sources of information and cite those. ChatGPT has a reputation for making up references that don't exist, so don't rely on it.

References and resources on AI:

OpenAI. 2022. ChatGPT, Version 3.5. OpenAI, accessed 12 May 2024 at <https://chatgpt.com/>.

Turing, Alan M. 1950. Computing machinery and intelligence. *Mind* LIX(236):433-460, <https://doi.org/10.1093/mind/LIX.236.433>, accessed 12 May 2024 at <https://academic.oup.com/mind/article/LIX/236/433/986238?login=false>.

Classroom conduct

Please be considerate of other classmates. Keep any devices not used for classroom activities silenced or off. Use of electronic devices during class can be distracting to yourself and others and interfere with the learning process. Your phone should be put away if it's not being used for class. A new Indiana state law prohibits the use of phones in class by high school students except during an emergency or when being used for class activities with the instructor's permission. Laptops can be used in class for class activities, but repeated use for non-class activities may result in a loss of that privilege. A calculator (but not a phone) may be used for exams.

IA Wireless Device Policy:

Pursuant to Indiana Code 20-26-5-40.7, The Indiana Academy for Science, Mathematics and Humanities prohibits student use of wireless communication devices for non-instructional purposes in the classroom. As such, any and all portable wireless devices, that have the capability to provide voice, messaging, or other data communication between two or more parties, must only be used for academic purposes directly tied to the classroom activity or related educational task. Exceptions to this wireless device policy are eligible through academic accommodations, individualized education programs, or with instructor approval permitting the use of a wireless device for justification related to health, safety, and/or well-being. The improper use of a wireless device in an active classroom setting is subject to disciplinary action including but not limited to; a verbal warning, temporary seizure of said device by a school official, an unexcused absence for the class in question, written communication to parent/guardian, among other elevated consequences for repeated improper use.

Please treat each other with respect and refrain from annoying behavior. Do not interrupt another student or the instructor. If you are having difficulty getting a word in, you can raise your hand. Examples of improper conduct include having extended conversations, working on assignments for other courses, sleeping, etc. Serious and/or chronic problems may be cause for dismissal from the course.

Late work

If you are late submitting an assignment because you missed class, see the section above on attendance. If an absence is excused by the Academy, the instructor will make every reasonable effort to ensure you have the opportunity to make up any assignments associated with the absence. If you are late submitting an assignment associated with an unexcused absence or for a reason unrelated to missing class, the instructor may grade the assignment as time allows.

If an exam is missed because of an excused absence, the instructor will make every reasonable effort to ensure you have the opportunity to make it up. If the absence is unexcused, a make-up exam may be allowed at the instructor's discretion. If a lab is missed, it may be difficult to arrange for a student to make it up due to supplies and logistical constraints. If the absence was excused, the instructor may need to substitute an alternate activity.

Library research

Through your association with Ball State University, you have access to an academic research library with many useful materials. This includes online access to many peer-reviewed scientific journals through bibliographic databases to which Ball State subscribes. To access these databases, go to <https://www.bsu.edu/library>, and scroll down to "Databases". The databases are listed in alphabetical order by the first letter. Two good ones to try are Academic Search Complete under "A" and JSTOR under "J". When you click on one of these databases, you will be prompted to log into your Ball State account. You can search for articles on particular topics and then access the full text of many articles from the journal publishers' websites. Also, if you are logged into <https://my.bsu.edu>, try searching on Google Scholar at <https://scholar.google.com>. You should see "Find it at Ball State" for references available through university subscriptions.

Student accommodations and special circumstances

If you have an IEP or a 504 that provides accommodations, have emergency medical information to share, or need special arrangements in case the building needs to be evacuated, please make an appointment with me as soon as possible.

If you are struggling with study habits, stress, and/or personal issues, I encourage you to discuss the situation with your SLC and/or contact the Guidance Office for help in addressing these issues so that you can thrive at the Academy. Many resources are available for students, and important contact information is listed below:

For guidance: Meg Wright (mewright@bsu.edu), phone:765-285-7407; office: WA183.

To find a tutor: Meg Wright (mewright@bsu.edu), phone:765-285-7407; office: WA183.

For mental health: Dr. Mindy Wallpe (mcwallpe@bsu.edu), phone: 765-285-5483; office: WA 160-C.

Course evaluations

At the end of the semester, each student will have the opportunity to evaluate the course, instructor, and materials. The instructor will not see the results of the evaluations until after grades have been submitted. Your frank and constructive responses will help improve the course for future semesters.

INDIANA ACADEMY INCLUSIVE EXCELLENCE STATEMENT:

Ball State University aspires to be a university that attracts and retains a diverse faculty, staff and student body. We are committed to ensuring that all members of the community are welcome through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse as expressed in our Beneficence Pledge. As a reflection of Ball State's commitment to respect, civil discourse, and the Beneficence Pledge, Inclusive Excellence at the Indiana Academy emerges as one of the priorities of our living and learning community. We strive to exist together respectfully and compassionately, creating an environment where every member can thrive. Unfortunately, there might be occasions when something occurs that disrupts our progress toward meeting these objectives. In this case, we encourage any member of the Academy community to file a Campus Climate Report (CCR) https://bsu.qualtrics.com/jfe/form/SV_6mbRbL5acAntUTI. All reports will be taken seriously, and appropriate responses will be carried out by Academy administration.

Schedule (subject to revision as needed)

6 January	Introductions, introduction to course, introduction to botany	This syllabus, Ch. 1 (on Canvas)
7 January	Lab 1 on botany and microscopy. Lab safety homework	Posted on Canvas
8 January	Life, biology of plants, processes involving plants	Ch. 2 (on Canvas)
10 January	Introduction to plant biology, plant structure	Ch. 1, Part 2
13 January	Fundamental principles of biology	Ch. 1
14 January	Examination of plant tissues in lab	Lab 5
15 January	Plant cell structure/function	Ch. 4
17 January	Examination of monocot and eudicot stems with microscopes	Lab 5
21 January	Cultivation of plants in laboratory, horticultural techniques	botany quiz
22 January	Growth and division of plant cells, meiosis	Ch. 5
24 January	Plant tissues and primary growth of stems, growth homework	Ch. 6

27 January	Plant morphology, leaves, roots, structure of woody plants	Ch. 7-9
28 January	Lab on horticultural techniques	plant tissue quiz
29 January	Plant reproduction, life history, homework on leaves and roots	Ch. 10
31 January	Quiz on plant structure, review session for exam 1, quiz on stems & leaves	
4 February	Plant growth lab, secondary meristems & woody growth	Lab 8
5 February	Exam 1, study outline for exam 1 due	
7 February	Physiological principles, plant physiology, quiz on plant growth	Part 3
10 February	Gas exchange and energy metabolism, water movement	Ch. 11-13
11 February	Respiration lab	Lab 10
12 February	Photosynthesis, gas exchange homework due	Ch. 11
14 February	Flowers and bees, energy metabolism quiz	Ch. 10
17 February	Respiration	Ch. 12
18 February	Photosynthesis lab	Lab 9
19 February	Transpiration and transport processes, metabolism homework	Ch. 13
21 February	Soils and mineral nutrition, transpiration quiz	Ch. 14
24 February	Development and morphogenesis, independent project proposal	Ch. 15
25 February	Transpiration laboratory, Effects of mineral deficiencies	Lab 8, AP Bio Lab 11
26 February	Alternation of generations, soil homework due	
28 February	Parent-teacher conferences	
10 March	Review for Exam 2	
11 March	Genetics lab, inheritance and natural selection	Lab 14
12 March	Exam 2, study outline for exam 2 due	
14 March	Heredity, genes and genetic basis, development quiz	Ch. 16
17 March	Ethnobotany, plant breeding, Irish potato famine, house plants	Ch. 3, Lab 14 Case Study
18 March	Ethnobotany laboratory	Lab 2
19 March	Genetics, ethical issues, heredity homework due	Ch. 17
21 March	Population genetics, natural selection, and evolution, gene quiz	Ch. 18
24 March	Plant taxonomy, classification, phylogeny, and systematics	Ch. 1
25 March	Classification Lab, dichotomous keys, mobile plant ID apps	Labs 15-21
26 March	Characteristics of major plant groups, genetics homework due	Ch. 19
28 March	Algae and origin of eukaryotic cells, genetics quiz	Ch. 20
31 March	Non-vascular plants (bryophytes)	Ch. 21
1 April	Trip to the Amazon Rainforest (April Fools!)	Lab 22
2 April	Seedless vascular plants, classification homework due	Ch. 22
4 April	Gymnosperms, seedless plant quiz	Ch. 23
7 April	Course evaluations, angiosperms, plant divisions & other taxa	Ch. 24
8 April	Trip to White River to characterize plant communities	Lab 22
9 April	Review session for exam 3, study outline for exam 3 due	
11 April	Seed plant quiz, Exam 3	
14 April	Ecological principles	Part 5
15 April	Work on design for independent project	
16 April	Population dynamics, plant taxonomy homework due	Ch. 25
18 April	Species interactions, community ecology, population quiz	Ch. 26
22 April	Work on independent project	
23 April	State Envirothon Competition	https://indianaenvirothon.org
25 April	Community structure & diversity, primary productivity	Ch. 25-26
28 April	Nutrient cycling: hydrology, global carbon dynamics, N, P, etc.	Ch. 25
29 April	Independent project presentations	
30 April	Biomes and biogeography, ecology homework due	Ch. 27
2 May	Ecology quiz, review for final exam, report on independent project due	
5-9 May	Finals week, final exam time to be announced	Lab/field notebook due at exam