

FORESTRY 431 – Functional Tree Biology
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Course overview:

The lecture portion of the class will focus on physiological processes and the laboratory portion will focus on tree structure. When possible, the laboratory sessions will coincide with material presented in the lectures. Lecture presentations and outside reading assignments will be posted in Canvas under FOR 431.

This course aligns with the following UWSP Forestry Program Learner Outcome:

- (1.) Demonstrate broad knowledge of forest ecology and biology by:
- (a.) identifying tree species and associated basic silvics of Lake States tree species, and
 - (b.) applying basic principles of forest ecology.

Text:

The “text” will consist of a compilation of materials including outside readings from various books and journals.

List of books:

- The Physiological Ecology of Woody Plants. T. Kozlowski, P. Kramer, and S. Pallardy
- The Physiology of Woody Plants. T. Kozlowski and S. Pallardy.
- Plant Physiology. L. Taiz and E. Zeiger
- **A New Tree Biology. A. Shigo**
- Plant Biomechanics. K. Niklas
- Trees: The Mechanical Design. C. Mattheck.
- Plant Defense. D.R. Walters

Learner Outcomes:

At the end of the semester students will be able to:

1. Detail the development of a tree’s above- and below-ground structure over time.
2. Provide descriptions of the processes trees use to:
 - capture and transfer solar energy
 - manufacture compounds to support growth, respiration, and defense.
 - acquire and transport water, essential mineral elements, and manufactured compounds
3. Identify, at the tissue level, the components of a tree’s vascular system and differentiate between common types of vascular systems.
4. Describe the external forces that act upon a tree and growth/development adaptations to these forces.

Grading:

Grades will follow the University scale (i.e. A = 90-100, B = 80-89, etc.). The instructor reserves the right to adjust the scale downwards. Exams constitute 70% of your grade in the class. There are 3 exams during the semester and an optional, comprehensive final exam. The average score (%) for your exams will be multiplied by 70. The remaining points are from the 5 quizzes that will be administered during the lab session throughout the semester and one field assignment at the end of the semester (average x 30).

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|----------------------------|-----|
| Exams (3/4) | 60% |
| Quizzes (6 + 1 assignment) | 40% |

| Date | Lecture Topic | Date | Lecture Topic |
|----------------------------------|---|------|---|
| 1/24 | Course Introduction | 1/26 | What is a Tree? |
| 2/1 | How did Trees Evolve? | 2/3 | How did Tree Evolve? |
| 2/8 | How do Trees Grow? | 2/10 | How do Trees Grow? |
| 2/15 | How do Trees Grow? | 2/17 | How do Trees Grow? |
| 2/22 | Exam 1 | 3/3 | How Big Can Trees Get? |
| 3/1 | How Big Can Trees Get? | 2/26 | How Big Can Trees Get? |
| 3/8 | How Big Can Trees Get? | 3/10 | How Big Can Trees Get? |
| 3/15 | How do Trees Acquire and Use Resources? | 3/17 | How do Trees Acquire and Use Resources? |
| 3/22 | SPRING BREAK | 3/24 | SPRING BREAK |
| 3/29 | How do Trees Acquire and Use Resources? | 3/31 | Exam 2 |
| 4/5 | How do Trees Defend Themselves? | 4/7 | How do Trees Defend Themselves? |
| 4/12 | How do Trees Defend Themselves? | 4/14 | Why do Leaves Change Color? |
| 4/19 | Why do Leaves Change Color? | 4/21 | How do Trees Survive Winter? |
| 4/26 | How do Trees Survive Winter? | 4/28 | Why can we tap trees for sap? |
| 5/3 | Why can we tap trees for sap? | 5/5 | Do Trees Pollute? |
| 5/10 | Open | 5/12 | Exam 3 |
| Final Exam (Optional) TBA | | | |

Attendance and Expectations:

Although attendance will not be recorded, there is an expectation that students will be prepared (i.e. outside reading assignments completed) to attend all online lectures and lab periods. There is an expectation, unless instructed otherwise, that students will turn in original work. Failure to meet this expectation will be viewed as academic misconduct and will be addressed per Chapter 14 of the Wisconsin Administrative Code, Rules of the Board of Regents of the University of Wisconsin System.

Lab:

Lab worksheets will be made available at the start of each new topical area. The majority of the lab periods will involve the dissection and examination of tree tissue samples. In most cases, samples will be prepared using a microtome. However, in some instances there will be a need to prepare the samples yourself using razor blades or an Xacto knife. You are to develop a detailed drawing illustrating the various tissues. To accomplish this, please purchase the following for use during the lab periods:

- Very sharp knife, X-acto knife with replaceable blades or similar.
- Colored pencils (to distinguish between cell types)
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We will be using chemicals to highlight cell types. I have placed copies of the Material Safety Data Sheets (MSDS) for each of the chemicals in Canvas and a copy of the sheets is maintained in the lab.

LAB MATERIAL IS INCLUDED IN THE EXAMS!

| Week | Lab Topic | Quiz Material |
|-------------|--|----------------------|
| 1 | Lab Introduction – 3 Dimensions of Trees | |
| 2 | Buds & Primary Growth | |
| 3 | Secondary Growth/ Vascular Systems (Conifer, Diffuse) | Buds/Primary |
| 4 | Secondary Growth/ Vascular Systems (Ring, Grape/Vines) | |
| 5 | Bark, Pith and Heartwood | Secondary Growth |
| 6 | Branches - Lateral | |
| 7 | Branches – Co-dominant | |
| 8 | Tree Defense – CODIT | Branches |
| 9 | Spring Break – NO CLASS | |
| 10 | Tree Defense – Wound Wood | |
| 11 | Tree Defense – Whole Tree | |
| 12 | Adaptive Growth | Tree Defense |
| 13 | Roots – Dissection | Adaptive Growth |
| 14 | Roots (Field - Schmeekle)* | |
| 15 | *Field Assignment Due | |

SOCIETY OF AMERICAN FORESTERS CODE OF ETHICS

Principles and Pledges

1. Foresters have a responsibility to manage land for both current and future generations. We pledge to practice and advocate management that will maintain the long-term capacity of the land to provide the variety of materials, uses, and values desired by landowners and society.
2. Society must respect forest landowners' rights and correspondingly, landowners have a land stewardship responsibility to society. We pledge to practice and advocate forest management in accordance with landowner objectives and professional standards, and to advise landowners of the consequences of deviating from such standards.
3. Sound science is the foundation of the forestry profession. We pledge to strive for continuous improvement of our methods and our personal knowledge and skills; to perform only those services for which we are qualified; and in the biological, physical, and social sciences to use the most appropriate data, methods, and technology.
4. Public policy related to forests must be based on both scientific principles and societal values. We pledge to use our knowledge and skills to help formulate sound forest policies and laws; to challenge and correct untrue statements about forestry; and to foster dialogue among foresters, other professionals, landowners, and the public regarding forest policies.

5. Honest and open communication, coupled with respect for information given in confidence, is essential to good service. We pledge to always present, to the best of our ability, accurate and complete information; to indicate on whose behalf any public statements are made; to fully disclose and resolve any existing or potential conflicts of interest; and to keep proprietary information confidential unless the appropriate person authorizes its disclosure.
6. Professional and civic behavior must be based on honesty, fairness, good will, and respect for the law. We pledge to conduct ourselves in a civil and dignified manner; to respect the needs, contributions, and viewpoints of others; and to give due credit to others for their methods, ideas, or assistance.

Forestry Anti-harassment Statement

Introduction

In adopting this statement, the forestry discipline within the College of Natural Resources (CNR), at the University of Wisconsin-Stevens Point (UWSP) has expectations for professional behavior of its students, staff, faculty, and other associated parties. Anyone who has a reasonable belief that they, or another student, staff, faculty or guest, have been the victim of harassment, bullying, or discrimination, or any other violation in the statement herein, are encouraged and expected to report the conduct. See reporting options and guidelines at the end of this document.

The forestry discipline within the College of Natural Resources is committed to creating a safe, inclusive, and professional environment. The forestry discipline operates under the UWSP harassment, discrimination, and retaliation prevention guidelines, copied here:

“The University of Wisconsin-Stevens Point (UWSP) is committed to fostering an environment that is safe, respectful, and inclusive to all and to educate all employees on these important issues. In addition, we are obligated, under Regent policy and federal regulations, to ensure our employees are informed on the issues of unlawful discrimination, harassment, and sexual violence.”

Statement

The forestry discipline, following the lead of the Society of American Foresters which accredits the B.S. forestry degree, believes we all have a responsibility in creating a safe, inclusive, professional environment in all forestry-related activities and events. All forms of discrimination, harassment, and bullying are prohibited. This applies to all participants in all settings (online and in-person) and locations (on- and off-campus) where forestry classes and associated activities are conducted, including student organization events and activities, committee meetings, workshops, conferences, and other work and social functions where employees, volunteers, sponsors, vendors, or guests are present.

Discrimination is prejudicial treatment of individuals or groups of people based on their race, color, creed, religion, age, sex, sexual orientation, gender identity or expression, national origin, ethnicity, ancestry, disability, pregnancy, marital or parental status, veteran status, or any other category protected by law.

Sexual harassment is unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature that creates an intimidating, hostile, or offensive environment. Sexual harassment constitutes discrimination and is illegal under federal, state, and local laws.

Bullying is unwelcome, aggressive behavior involving the use of influence, threat, intimidation, ridicule, hazing or coercion to dominate others in the professional environment. Bullying behavior may go beyond characteristics

protected by applicable laws, including but not limited to, political views, dress, or other outward physical appearances.

Other types of harassment include any verbal or physical conduct directed at individuals or groups of people because of their race, ethnicity, color, national origin, sex, sexual orientation, gender identity, age, religion, disability, veteran status, or any other characteristic protected by applicable laws, that creates an intimidating, hostile, or offensive environment.

The following list, while not exhaustive, includes examples of unacceptable behavior: slurs, jokes, threats, or derogatory comments relating to the characteristics noted above. Examples of inappropriate physical harassment that violate this statement include, but are not limited to: assault, unwanted touching, or impeding or blocking movement. In addition, no individual may be denied admission to, or participation in or the benefits of, any UWSP-associated events. Similarly, the display or circulation of derogatory or demeaning posters, cards, cartoons, emails, texts, videos, and graffiti which relate to characteristics noted above violate this statement.

Reporting

Students, staff, faculty, or guests associated with Forestry-related programming who experience or witness incidents of harassment are strongly encouraged to report the incident. The Forestry discipline strongly urges the prompt reporting of complaints or concerns so that rapid and constructive action can be taken.

Reporting can be done online or in person, to a faculty or staff member, and/or the UWSP Dean of Students. Anonymous reporting is available.

The UWSP Title IX Website is the home for all information related to harassment and discrimination, including reporting options, student and employee resources, and information about what happens after a report is submitted:

<https://www.uwsp.edu/titleix/Pages/default.aspx>