Syllabus – Biology 434, Structure and Function in Vascular Plants – Spring 2019
Morphology, anatomy, and physiology of vascular plants, stressing the interrelationships between development, growth, water relations, photosynthesis, transport, and metabolism. This course satisfies capstone project degree requirements in the Biological Sciences. 4 credits (3 + 3).

Prerequisites: BIOL F115X/F116X; MATH 107X or higher; STAT 200X; ENGL F111X, and ENGL F211X or ENGL F213X; senior standing or permission of instructor.

Lectures: MWF 10:30-11:30 am, Murie 105
Lab: M 2:15-5:15 pm, Murie 203

Instructor: Dr. Hélène Genet – hgenet@alaska.edu
Office: 128 Arctic Health Research Building
Mailbox: 311 Irving I
Office hours: W 11:30 – 1 pm or by appointment

Teaching Assistant: Diane Huebner – dchuebner@alaska.edu
Office: 118 Arctic Health Research Building
Mailbox: 101 Murie
Office hours: M 11:30 – 1 pm


Additional Useful Texts:
Physiological Plant Ecology, 3rd edition, by W Larcher, Springer, publisher
These books are available in the library.

Course goals: The overall goal of this course is to provide an understanding of the morphology, anatomy, and physiology of vascular plants: how plants function as whole organisms, and the relationships between their structure, function, and the environments in which they live.

Student learning outcomes: By the end of the course, you should
- Understand how plants function in an integrated way, as a whole organism
- Understand how plants respond to the environments in which they live, and how environment affects their function.
- Understand how plant structure both allows and constrains plant function.
Understand the quantitative principles that underlie how plants grow, photosynthesize, and take up and transport water, nutrients, and photosynthetic products. 

- Be able to apply these quantitative principles to solve problems that relate to plant function. 
- Have improved your ability to formulate hypotheses, conduct experiments, present your results, and write scientific reports.

**Instructional Methods:** This course is based on lectures, laboratory exercises, and discussion sections. Lectures cover the major topics, emphasizing and discussing the important points. Discussion sections help you figure out how to approach the problem sets, and give you a chance to clarify anything that you don’t understand from lecture. The problem sets help you understand how to apply the physical and quantitative principles that underlie how plants function. Laboratory exercises help you learn how to measure and identify plant structure and function in a hands-on way. In the laboratory you will also develop and carry out your own research project in plant physiology, and present and write-up your findings. Writing up the laboratory reports and your independent research project helps you improve your ability to write scientific reports. Your personal participation in lectures, discussion sections, and laboratory exercises is both important and required, and will help you learn the material of the course.

**Grading and class policies:**

1. Points will be awarded for performance on lecture and laboratory exercises.

2. Grades will be based on percentage of total possible points according to the following scale. UAF has instituted a +/- scale for the grades, as noted below.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Range</th>
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<tbody>
<tr>
<td>A</td>
<td>90-100% (A- = 90-92%, A+ = 97-100%)</td>
</tr>
<tr>
<td>B</td>
<td>80-89% (B- = 80-82%, B+ = 87-89%)</td>
</tr>
<tr>
<td>C</td>
<td>70-79% (C- = 70-72%, C+ = 77-79%)</td>
</tr>
<tr>
<td>D</td>
<td>60-69% (D- = 60-62%, D+ = 67-69%)</td>
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<tr>
<td>F</td>
<td>0-60%</td>
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3. Lecture and laboratory exercises (schedule subject to change):

<table>
<thead>
<tr>
<th>Points</th>
<th>Activity</th>
<th>Date due</th>
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<tbody>
<tr>
<td>TBD</td>
<td>Two mid-term exams, one hour each</td>
<td>As specified in calendar &amp; class</td>
</tr>
<tr>
<td>TBD</td>
<td>Final exam, two hours</td>
<td>As specified in calendar &amp; class</td>
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<tr>
<td>TBD</td>
<td>Seven problem sets</td>
<td>As specified in calendar &amp; class</td>
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<tr>
<td>TBD</td>
<td>2 short lab reports, lab notebook, lab quizzes &amp; miscellaneous assignments</td>
<td>As specified in calendar &amp; class</td>
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<tr>
<td>TBD</td>
<td>Ungraded diagnostic writing assignment</td>
<td>As specified in calendar &amp; class</td>
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<tr>
<td>TBD</td>
<td>Proposal for independent lab project</td>
<td>As specified in calendar &amp; class</td>
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<tr>
<td>TBD</td>
<td>Draft of Introduction &amp; Methods</td>
<td>As specified in</td>
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A significant part of each exam will involve written essays, and more than 50% of the total grade is based on written materials. If you wish to use this course to complete the capstone degree requirement in Biological Sciences, you should also register for BIOL 400 (zero credits, no cost) before the late fee registration deadline. Registration in BIOL 400 is preferred, because it gives the Biology Department a list of people who are completing capstone credit in this semester, but a petition can be filed later if need be. In order to receive capstone credit in this course, you must receive a passing grade on your independent lab project. Due dates and the course schedule may change. If so, an announcement will be made in class.

4. Attendance and punctuality at lecture and lab are expected. If you are consistently late, points will be deducted from your score. All electronic devices, except computers used for taking notes or giving presentations, should be turned off and put away before class starts. You are responsible for all materials, information, handouts, announcements and assignments made orally, electronically or in writing.

5. If you are going to miss an exam, it is essential that you contact Dr. Genet as soon as possible to discuss the reasons. Unexcused absences from exams will be recorded as a zero.

6. If you are going to miss lab, you must contact the Teaching Assistant as soon as possible to make arrangements to make up the exercises you will miss. You are responsible for mastering the material and completing assignments from a missed lab. Unexcused absences from lab will be recorded as a zero.

7. Late assignments and problem sets will lose up to 10% for each day that they are late, unless an arrangement is made with Dr. Genet in advance.

8. Academic Integrity – the UAF Student Code of Conduct is available in the UAF electronic catalog at [http://uaf.edu/catalog/current/academics/regs3.html#Student_Conduct](http://uaf.edu/catalog/current/academics/regs3.html#Student_Conduct). No collaboration among students is allowed on exams or quizzes, and although students may work together in collecting, analyzing, and interpreting data from laboratory exercises, no collaboration is permitted in writing of lab reports, lab assignments, or problem sets. Copying or paraphrasing another student’s writing is a violation of the Code of Conduct. If in doubt about whether you should cite or acknowledge someone, do so. If you are unsure of how to cite someone’s writings or ideas, ask the instructor or teaching assistant for help. Reference librarians are also a good source of information for help with citations. Violations of the Code of Conduct may result in an F for the course and/or referral to the university disciplinary committee.
9. Please seek whatever assistance you may need from the instructor and teaching assistant to successfully complete course requirements. Come to office hours, send e-mails, or leave phone messages. You have a better chance of improving your grade earlier, rather than later. We are happy to review and comment on draft papers and to offer suggestions for preparing presentations. You can also take your drafts to the Writing Center (call 5314 for an appointment) for help with organization, presentation and clarity.

10. UAF Disability Services implements the Americans with Disabilities Act (ADA) and ensures that UAF students have equal access to the campus and to course materials. We will work with UAF Disability Services (208 Whittaker; 474-5655) to provide reasonable accommodation to students with disabilities. Please talk to the instructor at the beginning of the semester if you need help or special accommodations of any kind. Retroactive accommodations are not granted by UAF Disability Services.
Biol. 434

**Course Schedule (subject to change; changes will be announced in class)**

**January**
- Introduction: overview of plant structure and overall plant growth
- Overall growth and photosynthetic energy capture
- Photosynthetic energy capture I
- Lab 1: Plant morphology
- Photosynthetic energy capture II
- Physiology of photosynthesis I
- Lab 2: Plant growth analysis

**February**
- Physiology of photosynthesis II
- Physiology of photosynthesis III
- Photosynthetic gas exchange I
- Lab 3: Photosynthesis I; introduction to independent projects
- Photosynthetic gas exchange II
- Water cost of photosynthesis
- Lab 4: Photosynthetic gas exchange & pigment extraction
- Leaf energy balance and temperature
- *First mid-term exam*
- Lab 5: Transpiration and stomatal function
- Water potential, cell osmotic relations
- Water potential, cell osmotic relations II
- Water transport I
- Lab 6: Water potential; Plant Anatomy I

**March**
- Water transport II
- *Independent Project Proposal due*
- Water transport III
- Lab 7: Plant anatomy II; discussion of project proposals
- Water uptake by roots, photosynthate translocation I
- Photosynthate translocation II
- Lab 8: Plant anatomy III; independent projects
- Mineral nutrition
- Mineral Nutrition II
- Lab 9: mineral deficiency experiment set-up; individual projects
- *Mid-term exam II*
- Toxic minerals, Ion uptake by cells

**April**
- Ion transport II
- Lab 10: score mineral deficiency experiment; individual projects
- Ion transport III
- *Draft of Independent Project Introduction and Methods due (moved back to next Monday)*
- Ion transport IV; plant respiration
- Lab 11: harvest mineral deficiency experiment; individual projects
- *Draft of Independent Project Introduction and Methods due*
- Respiration and cell walls
Cell walls and controls over growth of plant cells

Ion transport problem set due
Lab 12: Data analysis for individual projects
Plant hormones
Draft of Independent Project Results and Discussion due (moved back to next week)
Ion transport problem set due
Plant hormones II
Lab 13: Oral presentations on independent projects
Phytochrome and light responses
Draft of Independent Project Results and Discussion due
Cold and freeze tolerance I

May
Cold and freeze tolerance II
Final Independent Project Report due
Lab 14: TBD
Final exam

Readings from the textbook and supplementary handouts will be assigned in class.