**Biology 224**

**Plant Form, Function, and Adaptation (AKA EXTREME PLANTS)**

**RF 1:10 – 4 pm**

**Room 215/219**

**Fall 2017**

**Instructor: *Dr. Megan B. Rothenberger***

Office: 15 Kunkel Hall

Phone: 330-5459 (office)

Email: rothenbm@lafayette.edu

Office Hours: ***USUALLY*** Mondays 4 – 5 pm, Tuesdays 11 – noon, Thursdays 9 – 10 am, Fridays 10 – 11 am, or by appointment if necessary (but typically not on Wednesdays).

**Teaching Assistant: *Sofia Reitsma***

Email: reitsmas@lafayette.edu

Office Hours: TBA

**Course Description and Objectives:** Plants are much more interesting and diverse than you probably ever imagined. In this course, we will be discussing the novel anatomical solutions to growth and reproduction in extreme environments for these plants and many others. You will learn not only what plants look like inside and out, but also how plant morphology and anatomy is an evolutionary response to their function and physiology. For instance, have you ever wondered why many desert plants are covered in spines, how certain species of orchids can grow on rocks or the bark of trees, or what makes some plants carnivorous?

This course will be organized into two sections. During the first section, we will cover the general structure and organization of the plant body, and, during the second part of the course, we will explore the varied architectural alternatives that plants have evolved with respect to both form and function of growth and reproduction in each of the major terrestrial and aquatic biomes. For each biome/habitat, we will discuss the unique environmental challenges plants face and the mechanisms plants have evolved to cope with these challenges. Since many well-known drugs and medicines are derived from chemicals that plants produce in response to environmental challenges such as herbivory, we will also spend some time discussing the medical value of plants.

The course is comprised of lectures, discussions, laboratories, presentations, and field trips, and one of the most important skills that you will get to practice is the communication of plant science to diverse audiences. Lecture and laboratory are integrated in the time allotted for this class.

**Student Learning Outcomes:**

SLOs are simply statements that specify what you will know or be able to do after successfully completing a course. The SLOs in this course can be sorted into 3 groups – those that relate to **KNOWLEDGE** of plant structure, function, and evolution, those that relate to **SCIENTIFIC METHOD** and **ANALYSIS** of primary literature, and those that relate to the **COMMUNICATION** of plant science to diverse audiences. After successfully completing this course, you will be able to:

* recognize and describe features of plant anatomy at the cell, tissue, and organ levels,
* use microscopy tools to investigate cell and tissue features of plants and the relationship between plant structure and function,
* describe the physiological and anatomical adaptations of plants to various environments, with particular attention given to the role of evolution in shaping plant life.
* critically read, summarize, synthesize, and present information from literature in the field of plant anatomy, morphology, and functional ecology,
* possess skills to communicate what you learned in this course to diverse audiences both verbally and visually.

**Required Items:**

* **Text:**

PART 1: I will make available or upload to Moodle relevant textbook material for those of you who like to use a textbook to study. However, this part of the course will be driven by information provided during lectures and laboratory.

PART 2: *The Nature of Plants: Habitats, Challenges, and Adaptation*s by John Dawson and Rob Lucas

* **Lab/Practicum Handouts:** There is no required lab manual. However, you will be given handouts or asked to print handouts from Moodle before field or lab activities, and any handouts that I provide during class or on Moodle are required material.
* **Other supplies:** composition notebook (required), drawing pencils and colored pencils (optional)

**Required Readings:**

The required readings are listed in a separate document available on Moodle. After we have selected journal articles from the list (i.e., one per biome), you will be able to access these articles as .pdf documents on Moodle.

**Course Resources**:

* rothenbm@lafayette.edu is a way to contact me if you want to ask a question or make an appointment, although I would much prefer to interact with you in person.
* Lecture slides, supplementary course readings, and other information relevant to the course will be posted on Moodle, which you can access using your Lafayette Network ID (username) and password at [http://moodle.lafayette.edu](http://moodle.lafayette.edu/).

**Grading:**

* You can earn 700 points in this course. The final breakdown is as follows:

|  |  |  |
| --- | --- | --- |
| **EVALUATION** | **POINTS** | **PERCENTAGE** |
| “Quizams” | 3 @ 50 | 22% |
| Final Exam | 75 | 11% |
| Laboratory Notebook | 50 | 7% |
| Journal article discussion (as leader) | 75 | 11% |
| Journal article discussions (as participant) | 50 | 7% |
| Lafayette Campus Plant Information Signs |  |  |
|  Rough Draft | 50 | 7% |
|  Final Draft | 100 | 14% |
| Cheston Elementary School Lesson |  |  |
|  Rough Draft (practice) | 50 | 7% |
|  Final | 100 | 14% |
| **TOTAL** | **700** | **100%** |

* **“QUIZAMS”:** You can think of these either as long quizzes or short exams! Because of the large amount of botanical terminology and memorization of concepts in this course, former students have preferred more frequent BUT shorter exams. Either way, the “quizam” dates are noted on the schedule. All of the exams will include the traditional multiple choice, true/false, and short answer questions. However, the exams on material learned in the first part of the course will also have a **lab practicum portion** where students will be expected to identify plant structures and interpret slides. Exams on material learned during the second part of the course will include information from lectures, field trips, and the journal article presentations (see below). The last exam, given during finals week, will be **cumulative**.

* **LAB NOTEBOOK:** You will need to purchase a bound composition notebook specifically for the purpose of keeping a laboratory journal – a workbook in which your observational skills are repeatedly and continuously tested and sharpened. A lab/field journal is a permanent record of observations and, if it is to fulfill its purpose, should be useful and comprehensible to other people. In the first part of the course, you will be making at least one entry per practicum activity (i.e., each time “PRACTICUM” is denoted on the schedule; a total of 6 entries). The specific structure and format of each journal entry will depend on what you are learning, and I will provide more detailed instructions regarding what to include in your lab handouts. However, journal entries corresponding to laboratory activities must contain the following information unless otherwise indicated:
1. Date and time
2. A brief summary of the activity’s objective and procedures.
3. Tables to present and summarize numerical values. Tables should be numbered consecutively in the order they are referred to in the text. Each table must have a caption ABOVE that includes all the information necessary to make it understandable.
4. Figures to illustrate important patterns, trends, or relationships (NOTE: I will ask you to construct and include specific figures). Like tables, figures should be numbered consecutively in the order they are referred to in the text, but unlike tables, captions should be BELOW the figure. Include axes descriptions and measurement units.
5. A brief summary of results and conclusions. In this part of your entry, be sure to answer any questions posed at the end of the practicum handout.

To help you with this assignment, I will provide examples of successful journals from past students in class. You must also include a table of contents at the beginning of your journal. Your journals will be collected for a grade only once at the end of the first unit (see schedule for specific dates); however, I strongly encourage you to complete each entry within 24 hours of practicum. Otherwise, you may forget the details of your experience, AND you will have an enormous amount of work to do if you wait until the last minute to write all your journal entries at once. You may also want to consider taking rough notes on a separate sheet of paper that you can transfer, more neatly, to your journal notebook after practicum.

* **JOURNAL ARTICLE PRESENTATION:** From the 11 biomes/habitats/topics on the lecture schedule (in green) for which we are going to discuss plant adaptations and challenges, you will choose three that interest you to lead a class discussion. I will make every attempt to give each of you one of your choices. For each habitat/topic, I have chosen several articles from the primary literature, and the links to these articles will be posted to the Moodle website.You and a partner (of my choice) will be assigned a topic and ***one*** article by the second week of class. With the paper that you and your partner are assigned, you will need to lead the class in the discussion of your article. We will discuss the format and details of this assignment later in the semester, and I will lead the class in the discussion of the first article so that you know what to expect. Refer to the schedule to determine the date that you will be leading the class in discussion of your article. You will also be required to read and participate in discussions of the articles being presented by other student pairs in the class.

**NOTE:** Because we have a small class this semester, I may give you a second opportunity to present for an improved grade.

* **CLASS PARTICIPATION:** Participation means regular attendance and active engagement. Please refer to the section below for a description of my expectations regarding attendance. Participation includes listening carefully, thoughtfully, and respectfully to what others have to say and responding accordingly. The quality of our sessions depends a great deal on the level of preparation students bring to the class. It is important that students complete the readings in time, reflect on them and be ready to engage in a discussion. Expression of students’ questions and opinions plays an important role in making class a stimulating experience for everyone. There is a strong distinction between attendance and participation. ***Attending every class, without ever speaking up, does not constitute participation.***To receive full credit for participation, students are required to ask questions, raise issues, express opinions, and respond to questions. Here are some guidelines for evaluating students’ class participation:
1. ***Basics:***Does the student demonstrate a sensitive understanding of the assigned material?
2. ***Creativity:***Did the student come up with some interesting ideas or questions for all of us to consider? Did his/her comments take opposing arguments into consideration?
3. ***Comparative aspect:***To what extent were the readings previously discussed during this course considered for the materials presently under review?
4. ***Argumentation:***How well was evidence used to support the claims?
5. ***Flow of discussion:***Did the student offer comments that encouraged others to participate? Were the comments useful in keeping the discussion on track?
* **CAMPUS PLANT INFORMATION SIGNS:** One of your primary projects in this class will require that you synthesize knowledge gained in this course about plant adaptation so that you can design educational signs for two campus locations featuring plants. Your overall goal for this project is to create signs that successfully bring visibility to these botanical locations, educate Lafayette’s visitors about plant adaptation and ecology, and communicate the college’s commitment to sustainability. You will be divided into two teams, and each team will create signage for one location.

The first location will be a newly established native pollinator garden in March Field that is in need of signage highlighting the ecological interactions between these plants and their pollinators. Marie Fechik-Kirk, Lafayette’s new Sustainability Director, is one of the individuals spearheading this initiative, and she will be visiting during class to share with you her vision for these signs. The second location is the Fisher Quad bioretention area. Bioretentionbasins are landscaped depressions or shallow basins used to slow and treat on-site stormwater runoff. Stormwater is directed to the basin and then percolates through the system where it is treated by a number of physical, chemical and biological processes. Lafayette students planted native plants in this area under guidance and direction of Professor David Brandes. However, the site is in need of signage highlighting the wetland plants and their ecological benefits. Prof. Brandes will also visit during class to give you more information about the site and his vision for the sign.

The information you receive from both Marie Fechik-Kirk and Prof. Brandes will get you moving in the right direction, but our visit to Longwood Gardens is also meant to be a source of creative inspiration for this project. Longwood Gardens is filled with signs that successfully educate the public about the biology, ecology, and economic importance of plants. Paying special attention to the signage at Longwood Gardens will be a critical part of the drafting stage for this project. Please refer to the course schedule for rough and final draft due dates. It is incredibly important that you take this project seriously because these signs will be displayed by the college to educate visitors about the plants at these two locations. You can think of yourself as a specialized contractor engaged by the college to perform a botanical job!

* **CHESTON ELEMENTARY SCHOOL PLANT LESSON:** Your second project in this course will require that you develop a plant biology lesson for elementary school students. This course module was developed in association with the Lafayette Center for Community Engagement, which aims to support student leadership through community service initiatives. For this activity, we will be paired with Krista Yetter’s 5th grade class at Cheston Elementary School, and she typically introduces plant biology as part of her natural science curriculum. This project is meant to be a mutually beneficial one – you will benefit by getting an opportunity to practice communicating science to a young audience, and Krista Yetter and her students will benefit as a result of the incorporation of your new module on plants into their science curriculum.

Your job will be to design and deliver an educational module on the plant topic of her choice to her 5th grade students. You will need to transform the college-level understanding of plants that you get from taking BIOL 224 into an engaging lesson for an elementary school audience. You will also need to devise a structured lesson plan, communicate the goals and context of your lesson to the students, create a supportive and interactive classroom culture, and present them with an appropriate challenge. Because this is no small task, Krista and I will provide you support and additional materials throughout the process. You will also get an opportunity to practice your lesson during one class period, and receive feedback from both me and Krista during a *graded* dress rehearsal. Please refer to the course schedule for rehearsal and lesson dates.

* Please keep all evaluated material until final grades are turned in and understand that you are responsible for knowing your grade at all times.
* Approximate grading scale:

 **A+ = 100%**

 A = 93%-99%

1. = 90%-92%

B+ = 87%-89%

 B = 83%-86%

1. = 80%-82%

C+ = 77%-79%

 C = 73%-76%

 C- = 70%-72%

 D = 60% - 69%

F < 60%

* Extensions for out of class assignments are only given due to extreme circumstances. You must contact me before the due date, if possible, or within 48 hours afterwards.
* *THERE IS NO EXTRA CREDIT, SO PLEASE DO NOT WASTE YOUR TIME ASKING!!!!* If you cannot manage the regular assignments, you do not have time for extra.

**Attendance:**

* Class attendance is expected. If you miss a class, you must get notes from a classmate. I do not supply copies of my notes.
* You may miss 2 classes without being penalized. However, each additional unexcused absence will result in a loss of 5 points from the class participation component of the grade.
* Even though you may miss 2 classes without being penalized, you are still responsible for turning in assignments when they are due (see schedule below) *unless* you provide me with persuasive documentation demonstrating your inability to complete assignments on time.
* Keep in mind that successfully completing the assignments for this course will require information and data obtained during the practicum portion of the course. This includes the Saturday field trip to Longwood Gardens.
* There will not be make-up exams for exams, unless extremely extenuating circumstances arise and you provide me with persuasive documentation in a punctual fashion. Otherwise, you will receive a mark of zero for the missed mid-term exam.
* Make-up exams will be different from the exam taken by the rest of the class. Only ONE exam may be made up per semester.
* For exams, particularly, be present and on time. If the College is closed for any reason on the day of a scheduled exam, that exam will be given in the next regularly scheduled class.

**Special needs:** Students with special classroom or testing needs should contact me as soon as possible so that appropriate accommodations may be arranged. Students must register during the first two weeks of the semester with the Office of the Dean of the College for disability verification and for determination of reasonable academic accommodations. If you are unsure about what constitutes special needs, contact the Office of Disability Services in 302 Hogg Hall at 330-5098.

**Academic Integrity Policy:** Academic dishonesty is defined as cheating of any kind, including misrepresenting one’s own work, taking credit for the work of others (including that of a fellow student) without crediting them and without appropriate authorization, and the fabrication of information. In case of doubt, please consult the “Principles of Intellectual Honesty” in the *Student Handbook* and feel free to discuss your concerns with me and/or reference librarians. Please also refer to the *Biology Department’s Statement on Academic Honesty* posted on Moodle. Your continued enrollment in this course is your agreement to abide by this policy.

**Commitment to an Inclusive Learning Environment:** It is my intent that students from diverse backgrounds and perspectives be well served by this course, that students’ learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

**Hints for success:**

* Attend every class.
* Read your text and take notes BEFORE coming to class (e.g., write down the key concepts, learn vocabulary, and copy any major diagrams into your notes to bring to class).
* Use the lecture outlines and study guides provided.
* Consider forming a study group. You can even ask me to help!
* Re-write/transcribe your notes by formulating your own questions and answers.
* Realize that if I write it on the board, display it on the screen, or demonstrate it in class, it is probably important.
* Understand the diagrams in the text that are relevant to learning the material.
* Keep up with the work and reading for the course – try not to get behind.
* Use your TA as a resource – I selected her because she has already successfully completed the course. She can help you!
* Come see me if you’re having problems. SOONER IS BETTER THAN LATER!!!!

**PLEASE NOTE:** The course syllabus serves as a contract between the instructor and the students. Your continued presence in the class beyond the first lecture signifies that you understand and accept the course policies on attendance, demeanor, exams (including excused absences and the make-up exam) and grading.