

Plant Taxonomy—BSC-416/516 Spring 2016

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Course Description: Plant Taxonomy (BSC 416/516). A study of the diversity and evolution of land plants. Lectures emphasize the comparative study of selected plant families, their relationships and the use of new information and techniques to enhance our understanding of plant evolution, as well as the modern practice of plant taxonomy as a scientific discipline. Labs emphasize more practical aspects of plant systematics such as the use of identification keys, electronic resources, study of morphological and anatomical features, recognition of common local plants, and basic phylogenetic analysis.

This course has a Service Learning component. Service Learning means that as a student, you will provide a service to a community as a way to enhance how you learn the content of this course. Our Service Learning Partner for Spring 2015 is the Marshall University Herbarium and the SouthEast Regional Network of Expertise and Collections (<http://sernec.appstate.edu/>). We will engage in a Citizen Science project for the SL part of this course.

Class Meetings: Tuesdays and Thursday 12:30 – 1:45 (lecture) and Wednesdays 9 – 11:50 (lab). In general, we will meet in **S108** (a TECI room with computers) any day that we need a good projection system or computers, or **S360** any day we don't need those resources. We will meet for labs in **S360** and either go outside or work in that room.

Office Hours: **10:30am-11:30am Monday, Wednesday and Friday** and **11:00-11:30 Tuesday and Thursday**. These hours are firm unless you are in a scheduled class during all of these times—in which case, email me to set up an alternative time. If these hours prove inadequate for us, I will add more.

Course Materials: Primary/preferred text is Vascular Plant Taxonomy (Murrell), 6th edition. On days we go outside, you will need a notebook appropriate for outdoor note-taking, rain gear, and outdoor footwear. For indoor labs, please bring a laptop if you possibly can.

Alternative texts: The Murrell text is geared toward undergraduates specifically and will be fairly easy for you to navigate. If you would like a more technical text (or already purchased one—which is fine), try these alternative texts: 1) Judd, *Plant Systematics*, 4th edition (2015) or 2) Simpson, *Plant Systematics*, 2nd edition (2010).

Grading:

- Daily/class work: homework, announced or un-announced quizzes, contributions to the class Wiki, reflections or other short assignments (35%). These will be some mixture of low-stakes and medium-stakes work designed to give you plenty of practice, self- and peer-evaluation.
- Plant collection (15%)—from your own collections or the herbarium's backlog. You will generate proper herbarium specimens (50 specimens) that will be ultimately cataloged into the herbarium collection.
- Service Learning efforts (25%)—You will contribute ~15 hours of effort to an ongoing project; details to follow.
- Individual Project (25%)—You will carry out a taxonomically relevant individual or very small group project (these will be discussed at length and the scope and content will be agreed upon fairly early in the semester). This project should be beneficial to your major/track/career plans and will be individualized to a great extent.

- Grading will be based on some combination of rubric-style grading and subjective-style grading, depending on the assignment. Peer-grading will be included where appropriate. A=truly excellent work; B=above average work; C=average work; D=unsatisfactory work; F=non-passable work.

- Attendance: I do not differentiate between excused and unexcused absences. You are expected to be in class every day unless you truly cannot be there. Every absence will lower your maximum final grade by 1%, whether excused or not. Work completed in class cannot be made up. Tardiness counts as an absence. If you find yourself in a situation where you are missing class chronically, please come see me.

Learning outcomes	Practice
<p>Understand and use classical tools, such as identification via diagnostic keys and microscopy, to identify plants.</p>	<p>We will practice skills hands-on whenever feasible, such as learning to use a diagnostic key or carrying out phylogenetic analyses.</p>
<p>Understand taxonomy as a dynamic field.</p>	<p>We will visit the Huntington museum or art plant conservatory and take field trips to see live plants and plant communities. The HMoA will also provide an opportunity to see how a living museum collection is presented to the public.</p>
<p>Understand and use modern tools, such as phylogenetic analyses and biodiversity informatics, to understand how plants have evolved.</p>	<p>We will supplement live plants with the plant collection housed in the University Herbarium.</p>
<p>Be familiar with common plant communities and how plants interact with other organisms.</p>	<p>We will introduce theoretical topics via lecture, peer presentations, and discussion.</p>
	<p>We will investigate how biodiversity data can be used by contributing to an ongoing NSF project in the University Herbarium.</p>
<p>Be familiar with the major groups of land plants and how they have evolved.</p>	<p>Assessment</p> <p>We will have regular quizzes to assess your ability to explain theoretical concepts, work through problems, use diagnostic keys, etc.</p>
<p>Be familiar with the philosophy of citizen science and contribute to it.</p>	<p>Homework will be assigned regularly to allow for low-risk exploration of various topics.</p>
	<p>Your service learning project will be assessed for the 'use-ability' of the products you generate.</p>
<p>Demonstrate an understanding of major plant groups from the view of the general public.</p>	<p>Peer-review will be a regular part of the course, in order to get feedback from multiple sources.</p>

Service Learning Project:

Biological Collections are massive repositories of vouchered biological specimens and the data associated with them. The United States has many millions of specimens housed in various biological collections. These collections provide a window into the past and opportunities to

estimate the future. The Marshall University Herbarium houses approximately 50,000 specimens of non-vascular and vascular plants, plant fossils, fungi, algae, and ethnobotanical artifacts collected between the Civil War era and the present. While the herbarium has been a well-regarded scientific collection for many years, my hope is to make it into a more accessible resource for both the scientific community and the public. The culmination of this effort will take several steps, the first of which will be addressed by our Service Learning projects.

1. **Enhancing the MU Herbarium for the scientific community:** Within the past several years, an effort has been launched to ‘mobilize’ data from biological collections such as herbaria, and to make them more easily available to scientists, land managers and other professionals, and the public. In 2014, The Marshall University Herbarium received funding from the National Science Foundation to digitize a large part of our collection. We were able to purchase a fully computerized camera system, which we are using to photograph approximately 35,000 specimens over the next several years. We will then ‘transcribe’ data from the specimens into a web-based portal and join the photograph to the data record. That fully digitized specimen will be accessible to any person with internet access for many different purposes.
 - a. One part of our SL effort will be for each student to digitize a small number of specimens. It will be necessary to confirm the identification of the specimen and make a formal annotation, as well as make any necessary curatorial repairs to the specimen. This will allow students to see how this global effort to mobilize data works, what challenges we face and how we solve problems. Then, students will transcribe the data from their specimens. Lastly, students will download available data for a species or group of species of interest to them, generate some biological hypothesis based on their interests, and conduct analyses to test their hypotheses.

Field Trip to the Great Smoky Mountains National Park Spring Wildflower Pilgrimage:

You will have the opportunity to attend the GSMNP Annual Spring Wildflower Pilgrimage as part of this class. Details and logistics will be worked out early in the term. Please see <http://www.springwildflowerpilgrimage.org/> for information (this year’s information coming soon). Attendance for some portion of the fieldtrip will enhance your grade.

Expectations:

- Read scheduled chapters, papers, peer-review assignments ahead of time and arrive prepared to discuss them.
- Come to class every day except in the event of serious illness or injury, or due to university functions.
- Be on time. Exercises and/or field trips will start on time.
- Be sure to put appropriate time into your projects in a timely fashion, in order to get helpful feedback from your colleagues.

- Participate actively in all exercises. Curiosity and support of peers is appreciated.
- Clean up after yourself, and help out others where you can. Treat our classroom and the herbarium with care. We share our classroom space with others.
- Be considerate about the use of electronics. Do not socialize electronically during class.

Academic Accommodation: Marshall University is committed to equal opportunity in education for all students, including those with physical, learning and psychological disabilities. University policy states that it is the responsibility of students with disabilities to contact the Office of Disabled Student Services (DSS) in Prichard Hall 117, phone 304-696-2271 to provide documentation of their disability. The DSS Coordinator will then send a letter to each of the student's instructors outlining the academic accommodation he/she will need to ensure equality in classroom experiences, outside assignment, testing and grading. The instructor and student will meet to discuss how the accommodation(s) requested will be provided. For more information, please visit <http://www.marshall.edu/disabled>

I strongly encourage you to seek assistance from these resources if you have any of these disabilities. Be aware that you must be evaluated by a qualified professional on- or off-campus prior to receiving these services. I cannot make these modifications outside the direction of the Office of Disabled Student Services.

Academic dishonesty—Academic dishonesty will not be tolerated, and cheating will be pursued vigorously. If work is intended to be done with a group, you will receive explicit instructions indicating that you have permission to exchange work with other students. Any appearance of cheating (looking around at other people's work during exams or quizzes, being caught with an electronic device on during a quiz or exam, etc...) will result in a zero on that assignment without discussion. More blatant forms of cheating will be referred for disciplinary action. If you have any questions, please ask, rather than take a chance.

University Policies and Procedures: Additional information can be found in the Marshall Undergraduate Catalogue at http://www.marshall.edu/wpmu/academic-affairs/?page_id=802

Tentative Schedule Spring 2016

Week #	Week of	Day	Topic(s)
1	11-Jan	T	Course intro
		W	<i>Lab: Herbarium, classroom & molecular lab orientation</i>
		R	Introduction to the SERNEC herbarium digitization project
2	18-Jan	T	1) 'Preflection' discussion and 2) Plant Blindness discussion
		W	<i>Plant Blindness projects</i>
		R	VPT Ch. 1: Intro to Plant Taxonomy
3	25-Jan	T	VPT Ch. 2: Nomenclature
		W	<i>Nomenclature & Taxonomy exercise with 'Dendrogrammaceae'</i>
		R	Peer Review of Plant Blindness Projects & Introduction to the Symbiota SERNEC Portal
4	1-Feb	T	VPT Ch. 7: Introduction to Collecting & Preserving Plants for Study; Preliminary project brainstorming
		W	<i>Specimen curation tutorial</i>
		R	VPT Ch. 3: Taxonomic Evidence
5	8-Feb	T	VPT Ch. 5 & 17: Plant Identification, introduction to hard-copy & online resources
		W	<i>Barcoding & specimen photography tutorial</i>
		R	Understanding, using and writing dichotomous keys
6	15-Feb	T	VPT Ch. 4 & 6: Systematic methods & classification
		W	<i>Lab: Phylogeny reconstruction & Guest lecturer Andrew Hart</i>
		R	Plant Conservation

7	22-Feb	T	VPT Ch. 16: Experimental Plant Systematics
		W	<i>Field trip to Huntington Museum of Art Tropical Plant Conservatory</i>
		R	VPT Ch. 8: Survey of Vascular Plants
8	29-Feb	T	VPT Ch. 9: The ferns
		W	<i>Lab: Plant Biogeography using S-DIVA software</i>
		R	VPT Ch. 10: The gymnosperms--lightning rounds TBA
9	7-Mar	T	VPT Ch. 11 & 12: Intro to Angiosperms & The early-diverging flowering plants
		W	<i>Lab: Ferns & gymnosperms</i>
		R	VPT: Ch. 15: The lily and orchid-like monocots
10	14-Mar	T	VPT: Ch. 15: The grass-like monocots
		W	<i>Lab: ANA Grade & Monocots</i>
		R	VPT: Ch. 12: The early eudicots— PLANT COLLECTIONS DUE
11	21-Mar	T	Spring Break
		W	Spring Break
		R	Spring Break
12	28-Mar	T	VPT Ch. 13: Rosids I
		W	<i>Lab: Field photography (Gillespie at ASB conference--handouts provided)</i>
		R	Project work (Gillespie at ASB conference)
13	4-Apr	T	VPT Ch. 13: Rosids II
		W	<i>Lab: Early Eudicots & Rosids</i>
		R	VPT Ch. 14: Asterids I

14	11-Apr	T	VPT Ch. 14: Asterids II
		W	<i>Lab: Asterids</i>
	R	Project Peer-Review workshop— Near-final versions due	
15	18-Apr	T	GSMNP Wildflower Pilgrimage field trip
		W	GSMNP Wildflower Pilgrimage field trip
		R	GSMNP Wildflower Pilgrimage field trip
16	25-Apr	T	Project Presentations— <i>FINAL PROJECTS DUE</i>
		W	<i>Lab: Project Presentations—FINAL PROJECTS DUE</i>
		R	Clean up, wrap up, etc...
	3-May	T	Final Exam (12:30 p.m.)— SERVICE LEARNING/CITIZEN SCIENCE DEADLINE