

## A. RATIONALE AND OBJECTIVES:

BECAUSE we believe that...

1. ...**God created** the Earth and various kinds of plants, animals, and microbes which **belong to Him** (Psalm 24:1), and He has committed them to our care as **His stewards** (Genesis. 1:27-30; 2:15).
2. ...stewards who prepare well for a **profession** in the biological sciences in this biotechnological age must have sufficient understanding of life processes of **autotrophic organisms** and how they support the “web of life” on Earth (Genesis 2: 4-20).
3. ...**botany** is an important component of **biology** because it helps us understand the life processes of autotrophs and how they interact with animals and microbes to sustain the **biotic community**.

...THEREFORE, botany students will demonstrate proficiency according to the following objectives:

1. **ECONOMIC BOTANY:** Discuss ways in which autotrophs support and enrich human life; and present a biblical basis for appropriate valuing and stewardship of plants and other autotrophs.
2. **PLANT TAXONOMY:** Demonstrate the ability to identify common plant species from memory and with the assistance of taxonomic keys; and, assign common plants and other autotrophs to the appropriate taxonomic kingdom and phylum, based upon morphological characters.
3. **PLANT COMMUNITY ECOLOGY:** Explain how different plant communities are characterized with respect to the physical environment; and the spatial distribution and diversity of plant species.
4. **PLANT ORIGINS:** Explain the origin of plants and other autotrophs based on the presuppositions and claims of the creation and evolution models.
5. **PLANT REPRODUCTION:** Explain the generalized reproductive cycle and the variations that are characteristic of each of the major phyla of autotrophs.
6. **PLANT ANATOMY and PHYSIOLOGY:** Distinguish the major tissues of leaves, stems, and roots; and explain the complementary relationship of each structure to its function (physiology) as expressed in plant-soil-water relationships, photosynthesis, and plant growth and development.
7. **INVESTIGATIVE AND INTERPERSONAL SKILLS:** Select a particular botanical research problem, and develop and test a hypothesis related to plant biology using scientific reasoning, experimental design, data gathering and analysis, and logical interpretation and reporting of the data; while contributing as a member of a cooperative group intent on accomplishing the objective at hand.

...AND THEREBY advance in the profession of biology through perspectives gained from the “autotrophic (“botanical”) world.

## B. IMPLEMENTATION...IN SUPPORT OF OBJECTIVES:

**SCHEDULE:** Lecture: 9:00 MWF ENS 345      Laboratory: Sec 1 T 2:00-4:50 pm ENS 106  
 Sec 2 W 2:00-4:50 pm ENS 106  
 Sec 3 R 2:00-4:50 pm ENS 106

**TEXTS AND RESOURCES:**

Stern, K.R., J.E. Bidlack, S.H. Jansky. 2008. *Introductory Plant Biology*. 11<sup>th</sup> ed. McGraw-Hill, Boston.  
 Molles, M.C. Jr. 2008. *Ecology: Concepts and Applications*, 4<sup>th</sup> ed. McGraw-Hill, Boston, MA  
 Barnes, B.V. & W.H. Wagner, Jr. 1981/2004. *Michigan Trees*. U. of Michigan Press, Ann Arbor, MI.  
 Silvius, J.E. 2010. *General Botany Laboratory Manual*. Cedarville University.  
 Silvius, J.E. 2009. *General Botany Study Guide*. Linked at the BIO 2500 Home Page. Go to  
<http://www.cedarville.edu/employee/silviusj/index.htm>, select "Course Syllabi & Study Aids", then "General Botany", then, "Course Schedule and Study Guides" resembling page 5 of this Syllabus; but with links to the Guide.

**INDIVIDUAL STEWARDSHIP:**

1. **Commitment** to God, to professor, and to our class as a "community of learners" will be emphasized.

CHALLENGE: See Phil. 2:3-4 and Col. 3:23-24. A FRUIT of this commitment is a willingness to value the course objectives enough to accept personal responsibility to achieve them.

2. **Responsibility** is demonstrated by an active participation in four learning settings:

- a. **Out-of-Class** reading/study is an essential preparation for and reinforcement of the other learning settings. The *Study Guide* will stimulate reasoning, aid retention, and provide a record for review.  
CHALLENGE: Personally commit yourself to regular completion of reading/study assignments which require an average of 2 hours "out-of-class" for each "in-class" hour. Pray for an alert, inquiring mind; then do your part. For a good means of accomplishing the "three R's" above, see SUGGESTED STUDY APPROACH (page 3) and COOPERATIVE LEARNING (page 4).

b. **Laboratory** represents the core of our study through the following:

- ☼ **FIELD BOTANY** trips to study plants in the context of their habitats within the biotic community, to learn observation-identification skills, and to become familiar with species studied later in lab.
- ☼ **GROWING / STUDYING** live plants, and studying preserved specimens and micro-slides for first-hand exposure to plant structures and processes.
- ☼ **EXPERIMENTATION**, involving hypothesis testing, experimental design, data gathering and record-keeping, data analysis, and communication.

CHALLENGE: Come to lab with an attitude of inquiry, prepared by completion of any "pre-lab assignments." Review content of the previous lab. During lab, actively pursue the investigations so as to gain hands-on experience. Follow instructor's guidelines for suitable laboratory attire as deemed appropriate for comfort, safety, and testimony.

**ASSESSMENT:** Assessment and feedback regarding your laboratory progress will be based upon:

1. *Pre-Lab Assignments* or *Lab Prep. Quizzes* which will occasionally be collected.
2. *Lab Practical Quizzes* will be given periodically  $\geq 1$  week following a given lab.
3. *Lab Report* featuring statistical analysis of data and brief written interpretation.
4. *Lab Drawings* may be collected at the start of the next lab after the one in which you completed them; assessment criteria: completeness, accuracy, and neatness.

c. **Class Discussions** will facilitate your learning by **INTEGRATING** out-of-class and laboratory learning experiences, and by **REINFORCING** learning by oral discussion and clarification. Usually, you will encounter concepts in lab before lecture, thus providing first-hand experience in support of learning. **COOPERATIVE LEARNING GROUPS** will be utilized in some class discussions and in lab. See p. 4.

- CHALLENGE:** Attend lecture faithfully, arrive on time, having prepared to receive and give. Make good lecture notes and add to them ("fill gaps") as soon as possible after class.
- ASSESSMENT:** *Cooperative Group Work* and *Take-at-Home Quizzes* involve 10% of your grade because of the importance of your faithful attendance, participation in group and class discussion (in class and via WebCT). This approach also provides feedback to you and me on your progress. Questions on quizzes and exams (See "EXAMS" below) are derived from questions and outlines in the [General Botany Study Guide](#).

d. **Office Conferences** may be scheduled to provide additional assistance and counsel.

- CHALLENGE:** Please come by ENS 272, or call 7948, or e-mail me [or call 766-1331 (8 to 10:00 pm)] if I can help you or your group academically, or personally.

### INDIVIDUAL EVALUATION

Your learning will require your personal response to each "CHALLENGE" above. Assessment of your learning will occur according to the means noted in "ASSESSMENT" statements above and on page 5. Although I will not collect your complete Botany Journal for grading, the achievement level of many previous students on exams can be correlated with the quality of their journals. I encourage you to merge what you have already found to be a successful study approach with the "study guide and journal-based" study approach outlined on page 4 and in the "Reading and Study Plan" *BOTANY REVIEW* on CedarNet provides interactive quiz questions to test your comprehension in botany after your thorough study.

**EXAMS** will provide feedback to you (and me) on your progress, and enhance your learning through the challenge of answering a variety of objective and short essay questions (identical to or similar to "Study Guide" questions). Exams III and IV will measure your comprehensive grasp of botany and are weighted more heavily. Make-up exams are given for legitimate reasons and only after prior arrangement.

### GRADE CALCULATION

Point Distribution:

Letter Grades:

Exam I, II @125 -----	250	A. = 900 - 1000	Plus (+) and minus (-) grades
Exam III (@200), IV(@150)--	350	B = 800 - 899	are awarded for the upper and
Quizzes /Coop. Group	100	C = 700 - 799	lower 20 points of each grade
Laboratory -----	150	D = 600 - 699	interval, respectively. e.g. 880-899 = B+
Inquiry Project (BLIP)*	150		
TOTAL -----	1000		

\*Inquiry Projects (Botany Lab Inquiry Projects, BLIP's) are explained in Laboratory Manual, Exp. #15.

### SUGGESTED STUDY APPROACH:

Like other sciences, botany focuses upon structures, functions, processes, and relationships. Therefore, meaningful learning requires that you take responsibility to *read*, *reason*, and *record* responses to questions. You must also learn to *recognize* structures and relationships by studying drawings and models. A consistent effort will propel you from *recognition* and *definition* to being able to *interrelate* and *apply* to a conceptual framework.

The [General Botany Study Guide](#) (refer back to page 2) is intended to help you maximize your efforts and efficiency in learning. It includes a "[Reading and Study Plan](#)" which includes instructions for organizing your "Botany Journal," from a 1.5" 3-ring binder. Then, the *Study Guide* explains each assignment, provides additional questions and outlines that reflect my approach to the concepts, and guides your use of the text.

**COOPERATIVE LEARNING GROUPS:**

**Background:** During the past decade, several factors have influenced my approach to teaching:

1. Today's digital technology gives both students and faculty greater access to information, causing me to see my role more as a facilitator of learning, not simply a disseminator of information. Through cooperative learning, I engage you in developing biological literacy, hence applying what you are learning from your personal study guided by the *Study Guide*.
2. The educational literature is providing abundant evidence that students learn more effectively in a setting wherein cooperative learning is used – *i.e.* “the instructional use of small groups so that students work together to maximize their own and each other's learning” (Johnson, 1993. *Cooperative Learning and College Teaching Newsletter* 3(2): 6-9).
3. Finally, you will gain valuable experience in group work which will prepare you for most vocations where team efforts are so vital to success. Here is how we will proceed.

**Group Formation:** During one of our first meetings, I will assign each student to a cooperative learning group of three or four students. Groups will be formed at random but with both genders included.

**Your Responsibility** as a student will be to exercise commitment to God, to professor, and to your peers as outlined on pages 2-3 of this syllabus. Thus, even though you may not have chosen to be in this group, you will allow God to use you as an effective member of that team as you enhance your interpersonal skills and future career prospects. See “Quality Factors” below.

**Group Activities:** I am excited about using of cooperative learning in BIO 2500 again in the following ways:

1. Botany Laboratory Inquiry Projects (BLIP) have been utilized for over twenty years. Your group will choose a research topic, design and conduct an experiment, analyze the data, and report results as described in *Laboratory Manual*, Exp. #15.
2. Cooperative Effort in Laboratory: In some labs, division of responsibility within your group will be followed by each member explaining/teaching other members.
3. Cooperative Learning in Class Discussion: We will sometimes use part of the class meeting time for cooperative group discussion and reporting.
4. Discussion on WebCT will provide a “room” for out-of-class group preparation

**Quality Factors:** You will be encouraged to develop skills in the following elements of cooperative learning:

1. Positive Interdependence: My responsibility is to give your group a clear task or group goal which demands cooperation to complete a task. Your success as a group will grow as you learn to cooperate and draw upon the strengths of each member.  
ASSESSMENT: *e.g.* your group will be asked to report results in writing or orally.
2. Individual Accountability means each member makes the effort to contribute. Commit yourself to making your group successful. ASSESSMENT: Learning effort measured by quality of your summary, or your contribution to a discussion thread, quiz, *etc.* Faithful attendance, prompt arrival in class, and active participation is essential.
3. Teamwork Skills: Leadership, decision-making, trust-building, communication, conflict-management– these skills must be learned just as science content is learned. Each member should be godly and gracious to accept and encourage fellow members.  
ASSESSMENT: Be honest and talk to each other about strengths, weaknesses, *etc.* I will be glad to meet with your group to help resolve any conflicts in a biblical manner. You may be asked as a group to report on how “group dynamics” are going.  
OBSERVED BEHAVIOR – active participation and encouragement by all members. Some who are gifted in “sparking discussion” will be complemented by others who can analyze and distill ideas toward a productive outcome. How will you contribute? ☺

**SPECIAL PROVISIONS:**

**TECHNOLOGY:** Use of calculators may be permitted during exams for computations, but must not contain related information that is expected to be provided from memory. Wireless or remote electronic access technology may be used during class sessions (not during exams) as long as the usage enhances your interaction with the subject of the class meeting and does not distract others. Violation of this policy will constitute reason for denial of the privilege of using the technology in class in the future. Before class, please switch your cell phone to *off* or *vibrate* mode.

**ACADEMIC ASSISTANCE:** It is my goal to assist you in every way possible to achieve your academic goals. If you have special needs for which I should make an allowance, please let me know. You should also inform the [Academic Enrichment Center](#) (“The Cove”), located in the Center for Biblical & Theological Studies Room 218, directed by Mrs. Kim Algrim, to partner with us. For more information, call 937-766-PIER. If you believe you may need support in managing the impact of a disability, please contact Amy Frey in Disability Services section of “The Cove.”. My faculty colleagues and I rely on Disability Services to verify the need for academic accommodations and to identify reasonable accommodation strategies. Examples of disabilities are hearing, vision, AD/HD, learning disabilities, psychological, orthopedic, and a health impairment.

**ACADEMIC DISHONESTY POLICY** is enforced in accordance with the spirit and procedures outlined in the Student Handbook, [Appendix A](#).

**TEACHER EDUCATION PROGRAM UNIT AND PROGRAM ASSESSMENTS ASSIGNED TO COURSE**

Unit Outcome	Program Outcome	Decision Points	Assessment
Competence	NSTA Std 1a.	4	#1 Content Knowledge
Competence	NSTA Std 1a.	1, 2, 3, 4	#2 Content Knowledge
Competence	NSTA Std 1d	3	#7 Content Knowledge – Research and Investigation
Competence	NSTA Std 1e	3	#7 Content Knowledge – Research and Investigation

**BIO 2500 LECTURE AND LABORATORY SCHEDULE -- FALL, 2010 \***  
**STUDY ASSIGNMENT (SA)**

Date	Number	Topic
		<b>Part I – Field Botany and Ecology</b>
August 25	SA #1	“People Matters” – Because People Do Matter
August 27	SA #2	Course Introduction
August 30	SA #3	Botany and Stewardship of “The Green World”
Aug. 31, Sep. 1,2	<b>LAB #1:</b>	<b>Field Botany – Introduction</b> [ <i>Manual</i> , Exp. #1]
September 1	SA #4	Botany and Stewardship – Tapping the Botanical Knowledge Base
September 3	SA #5	Botany/Ecology & Human Culture – Roundup-Ready Soybeans (BLIP choices due)
September 6		<i>Labor Day</i> (No Classes)
Sept. 7, 8, 9	<b>LAB #2:</b>	<b>Woody Plants and Sampling Plant Populations</b> [ <i>Manual</i> , Exp. #2]
September 8	SA #6	Ecology – Investigating Life in Context
Sept. 10, 13	SA #7-8	Characterizing Biotic Communities
Sept. 14,15,16	<b>LAB #3:</b>	<b>Prairie Community Structure and Diversity</b> [ <i>Manual</i> , Exp. #3]
Sept. 15, 17	SA #9-10	Scientific Investigations and Data Analysis
September 20	SA #11	Prairie Community Data Analysis and Discussion
Sept. 21,22,23	<b>LAB #4:</b>	<b>Autotrophic Prokaryotes &amp; Protists</b> [ <i>Manual</i> , Exp. #7, A to B.2.]
September 22		<i>Day of Prayer</i> (No Lecture)
September 24	SA #12	Concluding Discussion / Review

September 27	<b>Exam I</b> – [SA #1 to SA #12 and Labs #1–#3] <b>Part II – Survey of “Simpler Autotrophs”</b>
Sept. 28,29,30	<b>LAB #5: Autotrophic Protists</b> [ <i>Manual</i> , Exp. #7 parts B.3. to D.]
Sept. 29, Oct 1	SA #14-15 Plant Origins and Classification
October 4 ,6	SA #16-17 Autotrophic Prokaryotes: Cyanobacteria and Chloroxybacteria
October 5, 6, 7	<b>LAB #6: Bryophytes</b> [ <i>Manual</i> , Exp. #8 parts A, B.]
October 8, 11	SA #18-19 Autotrophic Protists: Algae
Oct. 12,13,14	No Structured Labs [BLIP Consultations as Necessary on Nov. 12, 13]
October 13	SA #20 Plant Cells, Cell Walls, and Cytokinesis
October 14-17	<i>No Classes – Fall Break</i>
October 18	SA #21 Bryophytes and Origin of Land Plants
Oct. 19,20,21	<b>LAB #7: Seedless Vascular Plants and Gymnosperms</b> [ <i>Manual</i> , Exp. #8-C, D and #9]
October 20	SA #22 Botany, Agriculture, and Mission
October 22	SA #24 Fern and Seedless Vascular Plants (Part) and Review
October 25	<b>Exam II</b> – [SA #14 to SA #21 and Labs #4, 5, and 6] <b>Part III – Vascular Plant Phyla</b>
Oct. 26,27,28	<b>LAB #8: Angiosperms</b> [ <i>Manual</i> , Exp. #10]
October 27	SA #24 Fern and Seedless Vascular Plant Reproduction (cont’d)
October 29	SA #25 Gymnosperms: Origin of Seeds
November 1	SA #26 Plant Tissue Types
Nov. 2, 3, 4	<b>LAB #9: Plant Cells, Roots and Water Relations</b> [ <i>Manual</i> , Exp. #11, 12]
November 3	SA #27 Angiosperms: Flower to Fruit and Seeds
November 5	SA #28 Plant Growth: Apical and Lateral Meristems
November 8	<b>Exam III</b> [SA#14– #26, Exp. #4 through #8] <b>Part IV – Plant Anatomy and Physiology</b>
Nov. 9,10,11	<b>LAB #10: Stems and Histology</b> [ <i>Laboratory Manual</i> , Exp. #13]
Nov. 10,12	SA #30 Introduction to Plant Water Relations
Nov. 15, 17	#SA 31-32 Movement of Water in Plants – “SPAC” [including “Stems”]
Nov. 16,17,18	<b>LAB #11: Leaves and Leaf Adaptations to Environment</b> [ <i>Manual</i> , Exp. #14]
Nov. 19, 22	SA #33-34 Photosynthesis I – Photochemical Reactions
November 24	Lecture BLIP Consultations (Meeting as Necessary)
Nov. 24 (1 pm) – Nov. 29	<i>No Classes Thanksgiving Break</i>
Nov. 30, Dec 1,2	<b>LAB #12: BLIP Completion</b> – Consultation & Interviews [ <i>Manual</i> , Exp. #15]
December 1	SA #35 Photosynthesis II – Biochemical Reactions
December 3	SA #36 Photosynthesis II – Biochemical Reactions (continued)
December 6	Transition Lecture Conclusion; BLIP Oral Presentations [ <i>Manual</i> , Exp. #15, p. 15.3 ff]
December 7, 8, 9	<b>LAB #13: BLIP Completion</b> – Consultations & Interviews [ <i>Manual</i> , Exp. #15]
December 8	Oral Reports: BLIP Presentations [ <i>Manual</i> , Exp. #15, p. 15.3 ff]
Dec. 10, 13	Oral Reports BLIP Presentations [ <i>Manual</i> , Exp. #15, p. 15.3 ff]
Dec. 17, 8:00 am	<b>Exam IV</b> [SA#27– #36, Lab Ex. #9 – 12]

\* Subject to change in the event of unforeseen circumstances.