Biology 119 Bevington
Introductory Botany Spring, 2013

COURSE SYLLABUS

TEXTS:

Evert, Ray F. and Susan E. Eichhorn. 2013. Biology of Plants. Eighth Edition. W. H. Freeman & Co. ISBN: 1-4641-1928-7

Evert, Ray F., Susan E. Eichhorn, and Joy B. Perry. 2013. Laboratory Topics in Botany. Seventh Edition. W.H. Freeman & Co. ISBN: 0-7167-6205-6

Plotkin, Mark J. 1993. Tales of a Shaman's Apprentice. Penguin Books. ISBN: 0 1401.2991

OPTIONAL:

Leopold, Aldo. 1949. A Sand County Almanac. Balantine Books. This book is optional. You may purchase it in the bookstore for about $12.00, or copies will be on reserve in Reeves Library.

COURSE OBJECTIVES:

Biology 119 is an introductory course in plant science designed to introduce you to plants as living organisms, their physiological functions, their roles in natural ecosystems, and how humans use them. We will examine the importance of plants in our every day lives. Not only do plants provide us with food and fiber, but also a broad array of important medicines, pharmaceuticals and pain killing drugs. Certain plants produce potent anticancer drugs, and it is likely that drugs from other plants will be useful in treating AIDS. Ironically, the ecosystems which contain these plants are at risk and many of them may not survive the next two decades. We will discuss the rapid loss of biodiversity and its potential effects on our lives.

Another goal of the course is to examine the historical and cultural significance of plants, particularly the pivotal role of plant domestication in the rise of civilization.

We will see how plants have been used as experimental organisms to solve important biological problems. We will explore the relationships between structure and function in higher plants, especially photosynthesis, and we will see how the photosynthetic mechanism responds to environmental changes. We will also examine how plants control their growth and development and how the control mechanisms respond to seasonal changes and pressure from herbivores. We may discuss some of the exciting new advances in plant biotechnology to see how genetic manipulation of important plant species is accomplished. Finally, we will examine representative

examples of major plant divisions to see how they reproduce. Based on differences in reproductive patterns we will discuss some of the major trends in plant evolution.

ATTENDANCE:

Plan to attend all regular classes, laboratories, and exams. Missing an exam means that the exam will be given a score of zero and averaged with other test grades for the semester. In the case where an exam is missed for a valid reason, the exam will not count against the final average and the remaining test scores will be averaged.

GRADING:

Grades are based on lecture exams, laboratory quizzes, a laboratory practical exam, and a final exam.

	Point Value	Percentage of Final Grade
Three (3) hour exams (100 points each)	300	33.3%
Three (3) laboratory quizzes (60 points each)	180	20.0%
One (1) laboratory practical exam	150	16.7%
Final exam (comprehensive)	270	30.0%
	900	100.0%

Letter grades are assigned using 10-point intervals:

90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, < 60% = F

ACADEMIC HONESTY:

The instructor adheres to the policy statement on academic integrity outlined in the current Student Handbook.

Cheating on an exam or a laboratory quiz will result in a grade of zero for the exam or quiz.

Do not bring cell phones to class on days when exams are scheduled, or to the laboratory on days when a lab quiz is to be given.

Students who wish to request accommodations in this class for a disability should contact Elaine Mara, Assistant Director of Learning Services for Academic and Disability Support at 1307 Main Street, or by calling 610-861-1510. Accommodations cannot be provided until authorization is received from the Academic Support Center.

EXTRA CREDIT:

For those who wish to do so there are extra credit videos which may be viewed in the Reeves Library. Each is worth 10 points. If you elect to do this, you must advise the instructor in advance and then go to Reeves Library to view the film. To receive credit you will need to turn in a one page written abstract (not an email) to the instructor summarizing the central ideas in the film. Your summary should be turned in within one week of viewing the film. All video summaries must be turned in to the instructor on or before **Friday 26 April**. Video summaries are not accepted during final exam week.

You may select up to <u>two</u> from the following titles (excluding any which we may have used in class or laboratory:

AMATE: The Great Fig Tree
Ecology of the Forest
Faces of the Rain Forest
Intimate Strangers: Symbiosis
Manu: Peru's Hidden Rainforest [1]
Natural Connections [2]
Pollination
Pollination: The Insect Connection
Queen of Trees [3]
Race to Save the Planet 5: Remnants of Eden [4]
Seeds of Tomorrow
Sexual Encounters of the Floral Kind [5]
Spirit of the Rainforest

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[1] A beautiful film set in the lowland rainforest of southeastern Peru where the Andes meet the Amazon. The photography is stunning. There are enchanting scenes of the Machegenga people who live in the forests of the Madre de Dios along the Rió Manu.

[2] This is a moving and compelling plea for us to preserving biological diversity not only because of its aesthetic values but also because we need it to maintain the quality of our lives.

[3] The Queen of Trees is a giant fig growing along the rivers in Africa. The tree is an ecosystem unto itself supporting a variety of animals. Insects, birds, monkeys, and giraffes depend on it for food and shelter. Unfortunately Reeves Library does not have a copy of the disc. If you want to see it, see the instructor for his personal copy.

[4] Explanations for the loss of natural ecosystems particularly tropical forests.

[5] This one should probably be X-rated. Don't tell anyone you watched it!

LECTURE SCHEDULE

Mon.	14 Jan.	Orientation; "What is a seed?"
Wed.	16 Jan.	Seed structure, germination, and seed ecology
Fri.	18 Jan.	Seedling development and its control
Mon.	21 Jan.	No class (Martin Luther King Day)
Wed.	23 Jan.	Flowers and floral anatomy
Fri.	25 Jan.	How do flowering plants reproduce?
Mon.	28 Jan.	How do flowering plants reproduce?
Wed.	30 Jan.	Pollination biology, the essence of mutualism
Fri.	1 Feb.	Plant ecology
Mon.	4 Feb.	Plant ecology
Wed.	6 Feb.	Tropical forests exemplify the principles of ecosystem structure
Fri.	8 Feb.	Tropical forests
Mon.	11 Feb.	**FIRST HOUR EXAM**
Wed.	13 Feb.	Molecular composition of plant cells
Fri.	15 Feb.	How do plants defend themselves against herbivores?
Mon.	18 Feb.	Why are plants important to us? (Or, what might life be like without them?)
Wed.	20 Feb.	Useful plants and plant products
Fri.	22 Feb.	The structure of plant cells (MID TERM)
Mon.	25 Feb. – Fri. 1 Mar.	No class
Sat.	2 Mar. - Sun. 10 Mar.	**SPRING RECESS**
Mon	11 Mar.	How do plant cells divide? Mitosis and the concept of totipotency. Totipotent cells can be used to clone useful plants.
Wed.	13 Mar.	Meiosis is all about sex. Why is sexual reproduction important in the evolution species? Can some plants survive without sex?
Fri.	15 Mar.	Cells, differentiation, and plant tissues
Mon.	18 Mar.	Plant structure: Stems and leaves
Wed.	20 Mar.	Plant structure: Leaves and roots
Fri.	22 Mar.	**SECOND HOUR EXAM**

Mon. 25 Mar. Photosynthesis: “Harvesting the Sun”
Wed. 27 Mar. The light reactions of photosynthesis

Fri. 29 Mar. - Mon. 1 Apr. **EASTER RECESS**

Wed. 3 Apr. C_3, C_4, and CAM plants
Fri. 5 Apr. Alternation of generations: the fern life cycle (fern allies if time allows)

Mon. 8 Apr. Moss life cycle as an example of bryophytes (liverworts if time permits)
Wed. 10 Apr. Liverworts
Fri. 12 Apr. The pine, a gymnosperm

Mon. 15 Apr. Plant growth and development
Wed. 17 Apr. Growth and development: hormones and tropisms
Fri. 19 Apr. **THIRD HOUR EXAM**

Mon. 22 Apr. Growth and development: How do plants see light? Phytochromes
Wed. 24 Apr. Growth and development: photoperiodism and flowering
Fri. 26 Apr. Wrap up (Last day of classes)

Mon. 29 Apr. Final exam for the course: **Monday 29 Apr @ 1:30 pm**

LABORATORY SCHEDULE

Many of the laboratory exercises come from the lab manual by Evert and Eichhorn. Others are based on handouts from the instructor. **Lab exercises are closely related to lecture topics, so plan to bring your lecture notes and text book to the lab.** You will have occasion to use both frequently. Laboratory assignments should be read BEFORE coming to the lab. Three lab quizzes, each about 15 minutes, will be given during the semester. The laboratory begins at 12:45 pm. A practical exam emphasizing structure and function is given in the last lab.

Date	Subject Material	Assignments
17 Jan.	Start *Brassica rapa* seedlings & fern gametophyte cultures	
24 Jan.	The light microscope	Topic 1-1
	Plant cells	Topic 4-1
31 Jan.	Seeds, germination, and seedling development	Handout Topic 3-1 Topic 20-2 to 20-6
	The structure of flowers	Topic 18-7 to 18-10
7 Feb.	**FIRST LAB QUIZ**	
	Plant water relations: determination of water potential of potato tuber tissue. Relevance of water potential to stomate regulation, sugar transport, and water movement in plants	Handout
14 Feb.	Enzyme lab: extraction and assay of catalase from spinach leaves	Handout
21 Feb.	Is catalase found throughout the plant Is the activity of the enzyme affected by light? Enzymes and factors affecting their action	Handout
28 Feb.	No laboratory	

Sat. 2 Mar. - Sun. 10 Mar.	**SPRING RECESS**	
14 Mar.	**SECOND LAB QUIZ**	
	Mitosis: root meristems	Topic 5-1
	Meiosis	Topic 9-1
21 Mar.	Three major tissue systems of plants and the cells	Topic 3-3, 3-4
	which comprise them	Topic 21-1
	Stems of dicots and monocots	Topic 23-1
28 Mar.	Field trip	
Fri. 29 Mar. - Mon. 1 Apr.	**EASTER RECESS**	
4 Apr.	Leaves: dicots, monocots, C_3 and C_4, abscission	Topic 24-1
	Secondary growth of stems	Topic 25-1
	Roots: root systems, primary growth, origin of	Topic 22-1
	secondary roots, dicot & monocot roots	
11 Apr.	**THIRD LAB QUIZ**	
	The fern life cycle: an example of alternation	Topic 16-4 to 16-9
	of generations with dominant sporophytes	
	Mosses and liverworts have dominant gametophyte	
	generations	Topic 14-5 to 14-7
18 Apr.	*Marchantia*, a liverwort	Topic 14-1 to 14-4
	Pine life cycle: an example of the gymnosperms	Topic 17-1 to 17-7
25 Apr.	**PRACTICAL EXAM**	

SUMMARY OF SEMESTER DEADLINES

Thursday	7 February	First lab quiz
Monday	11 February	First hour exam
Thursday	14 March	Second lab quiz
Monday	22 March	Second hour exam

Thursday	11 April	Third lab quiz
Friday	19 April	Third hour exam
Thursday	25 April	Laboratory practical exam
Monday	29 April	Final exam (1:30 pm)

TIME LINE FOR READINGS IN *TALES OF A SHAMAN'S APPRENTICE*
(Plotkin, 1993)

Topics in Plotkin's book will be discussed at several points in lecture between 11 and 15 February, so you should plan to read the book according to the following time line. We will also use it between 18 and 20 February in discussions of ethnobotany and biodiversity. In any event, be certain to complete the book prior to **Monday 18 March** since it will be included on the second exam.

Assignment	Completion Date
Foreword Chapters 1 & 2	Friday 25 January
Chapters 3 & 4	Wednesday 30 January
Chapters 5,6 & 7	Wednesday 6 February
Chapters 8 & 9	Friday 15 February

LIBRARY REFERENCE MATERIALS ON RESERVE

When you read the assignments in these books, prepare a short, one or two paragraph summary of each one and **incorporate it into your lecture notes**. These reading assignments will be included on exams.

Grube, Nikolai (Ed). 2001. MAYA. Divine Kings of the Rain Forest. Konemann Verlags-gesellschaft. Read *Maya Agriculture* (pp. 70-79) and *Tortillas and Tamales* (pp. 80-83).

Judson, Olivia, 2002. Dr. Tatiana's Sex Advice to All Creation: The Definitive Guide to the

Evolutionary Biology of Sex. Metropolitan Books. Henry Holt and Co.
Chapter 4: *Swords or Pistols* (read pp. 60-65 on fig wasps)

SEMESTER READING ASSIGNMENTS

(For Evert and Eichhorn 2013. Eight Edition)

Reading assignments are selected to supplement lecture topics and should be read **BEFORE** coming to class on the day that the topics are to be discussed. Most assignments are from the textbook. A few are from reference books on reserve in the library. For the items marked with an asterisk (*) additional reading assignments will be supplied in the form of handouts.

Lecture Topics	Assignments [6]
Orientation	EE, Ch. 1, pp. 1-15
Seeds, germination, and the development of the plant body	EE, Ch 22, pp. 530-537
Flowers, floral anatomy, and reproduction in flowering plants	EE, Ch. 19, pp. 457-476 EE, Ch. 20, pp. 477-500 EE, Ch, 22, pp. 526-530
Pollination biology	EE, Ch. 20, pp. 487-491 Judson, O. Ch. 4. *Swords or Pistols* (pp. 60-65)
Plant ecology [7] Biomes and global ecology	EE, Ch. 31, Ecology (on the Web) EE, Ch. 32, Global ecology (Web)
Molecular components of plant cells *	EE, Ch. 2, pp 18-37
Enzymes and factors which affect their action *	E, Ch. 5, pp. 94-106

6 EC = Evert and Eichhorn.

7 The two chapters on ecology are not in the text. You can download them without charge from the publisher's Web site at **www.whfreeman.com/raven8e**. Save them as pdf files on your hard drive. You will need Adobe Acrobat v. 3 or higher. The files are fairly large (4.1 and 6.3 MB), so they will take a few minutes to download.

(especially pp 99-106)

How do plants defend themselves against herbivores? *	EE, Ch. 2. Secondary Metabolites pp. 30-35 E, Ch. 20. Biochemical Evolution pp. 497-498 Handouts: Herbivore Defense in Tropical Plants *The night moves of pregnant moths*
Why are plants important to us?	Handouts: Useful Plants and Plant Products Drugs of Plant Origin EE, Ch. 21, pp. 501-523 (Read the short essay Origin of Maize, p. 510) EE, Ch. 6, pp. 118-119 (including The Botany of Beer)
Structure of plant cells*	EE, Ch. 3, pp. 38-62 EE, Ch. 4, pp. 75-91
Mitosis * Totipotency and its importance in plant biotechnology (In particular note the essay on totipotency. Top of p. 202)	EE, Ch. 3, pp. 62-74 EE, Ch. 10, pp. 198-205
Meiosis * (Note the basis for cytoplasmic inheritance, p. 168) Asexual reproduction	EE, Ch. 8, pp. 152-159 EE, Ch. 8, pp. 169-173
Cells, differentiation, and plant tissues Note in particular the structures of tracheary elements of the **xylem**, and **sieve cells**, **companion cells**, **P-protein** and the **forisome** in the **phloem**.	EE, Ch. 23, pp. 538-557
Stems * Leaves (including stem & leaf modifications)*	EE, Ch 25, pp. 579-589 pp. 590-613
Secondary growth in stems	EE, Ch. 26, pp. 614-635
Roots * [8]	EE, Ch. 24, pp. 558-578

[8] This may be abbreviated or eliminated to allow more time for another topic.

Photosynthesis * This is an **especially important** chapter, and it is integral to the mission of the course. Look over the **study questions** carefully (pp. 148-149).	EE, Ch. 7, pp. 122-149.
Systematics and the diversity of living things	EE, Ch.12, pp. 234-250
Alternation of generations *	EE, Ch. 12, pp. 250-255 (Including Life Cycles & Diploidy) EE, Ch. 17, pp. 397-398 (Fig. 17-8)
Lower vascular plants (ferns and fern allies) * Focus on the **fern life cycle** as a prototype for this group. Omit the life cycle of *Selaginella* on pp. 410-411.	EE, Ch. 17. pp. 391-429 (pp. 409-429 is the most important) See the **fern life cycle, pp**. 422-423)
Bryophytes * In this chapter concentrate on the life cycle of **mosses** (pp. 378-387) and the **liverwort *Marchantia*** (pp. 373-377)	EE, Ch. 16. pp. 366-390 In particular, the life cycle of mosses (pp. 386-387) and *Marchantia* (pp. 376-377)
Gymnosperms * Here the most important part of the chapter is pp. 437-448. **Pines** will be our only example of gymnosperms (see life cycle on pp. 442-443).	EE, Ch. 18. pp. 430-456
Plant growth and development	
Hormones *	EE, Ch. 27. pp. 638-659 (Including study questions, p. 659)
How plants respond to their environment (especially phototropism, photoperiodism, and phytochrome)	EE, Ch. 28. pp. 660-682