

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. 2005. 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. Early in the course 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.

DISABILITY POLICY:

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.

GRADING:

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

	<u>Point Value</u>	<u>Percentage of Final Grade</u>
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)	<u>270</u>	<u>30.0%</u>
	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.

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 **Monday 7 December**. Video summaries are not accepted during final exam week.

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

A Walk Through the ACEER Useful Plants Trail (in the Peruvian Amazon)
Aldo Leopold's Wilderness
AMATE: The Great Fig Tree
Ecology of the Forest
Faces of the Rain Forest
Intimate Strangers: Symbiosis
Manu: Peru's Hidden Rainforest
Natural Connections
Pollination
Pollination: The Insect Connection
Queen of Trees
Race to Save the Planet 5: Remnants of Eden
Seeds of Tomorrow
Sexual Encounters of the Floral Kind
Spirit of the Rainforest

LECTURE SCHEDULE

Mon.	27 Aug.	Orientation; “What is a seed?”	
Wed.	29 Aug.	Seed structure, germination, and seed ecology	
Fri.	31 Sept.	Seedling development and its control	
Mon.	3 Sept.	No class (Labor Day)	
Wed.	5 Sept.	Flowers and floral anatomy	
Fri.	7 Sept.	How do flowering plants reproduce?	
Mon.	10 Sept.	How do flowering plants reproduce?	
Wed.	12 Sept.	Pollination biology, the essence of mutualism	
Fri.	14 Sept.	Plant ecology	
Mon.	17 Sept.	Plant ecology	
Wed.	19 Sept.	Plant ecology	
Fri.	21 Sept.	FIRST HOUR EXAM	
Mon.	24 Sept.	Tropical forests exemplify the principles of ecosystem structure	
Wed.	26 Sept.	Tropical forests	
Fri.	28 Sept.	Molecular composition of plant cells	
Mon.	1 Oct.	Enzymes and factors affecting their action	
Wed.	3 Oct.	The structure of plant cells	
Fri.	5 Oct.	The structure of plant cells	(MID TERM)
Sat.	6 Oct.	- Tue. 9 Oct.	FALL RECESS
Wed.	10 Oct.	How do plant cells divide? Mitosis and the concept of totipotency. Totipotent cells can be used to clone useful plants.	
Fri.	12 Oct.	Meiosis is all about sex. Why is sexual reproduction important in the evolution species? Can some plants survive without sex?	
Mon.	15 Oct.	Cells, differentiation, and plant tissues	
Wed.	17 Oct.	Plant structure: Stems and leaves	
Fri.	19 Oct.	Plant structure: Leaves and roots	
Mon.	22 Oct.	SECOND HOUR EXAM	
Wed.	24 Oct.	Photosynthesis: “Harvesting the Sun”	
Fri.	26 Oct.	The light reactions of photosynthesis	
Mon.	29 Oct .	C ₃ , C ₄ , and CAM plants	
Wed.	31 Nov.	Alternation of generations: the fern life cycle (fern allies if time allows)	
Fri.	2 Nov.	Moss life cycle as an example of bryophytes (liverworts if time permits)	

Mon.	5 Nov.	Liverworts
Wed.	7 Nov.	The pine, a gymnosperm
Fri.	9 Nov.	Plant growth and development
Mon.	12 Nov.	Growth and development: hormones and tropisms
Wed.	14 Nov.	Growth and development: How do plants see light? Phytochromes
Fri.	16 Nov.	Growth and development: photoperiodism and flowering
Mon.	19 Nov.	THIRD HOUR EXAM
Wed.	21 Nov. -	Sun. 25 Nov. THANKSGIVING VACATION
Mon.	26 Nov.	How do plants defend themselves against herbivores?
Wed.	28 Nov.	Why are plants important to us? (Or, what might life be like without them?)
Fri.	30 Nov.	Useful plants and plant products
Mon.	3 Dec.	Biodiversity: How many species are present on earth, and how fast are they disappearing? Why should we worry about species extinction?
Wed.	5 Dec.	Plant domestication, the development of agriculture, and the rise of civilization
Fri.	7 Dec.	(Last day of classes)
Mon.	10 Dec.	1:30 pm FINAL EXAM

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. A practical exam emphasizing structure and function is scheduled for the last lab meeting.

<u>Date</u>	<u>Subject Material</u>	<u>Assignments</u>
28, 30 Aug.	Start <i>Brassica rapa</i> seedlings & fern gametophyte cultures	
4, 6 Sept.	The light microscope Plant cells	Topic 1-1 Topic 3-1
11, 13 Sept.	FIRST LAB QUIZ Seeds, germination, and seedling development The structure of flowers	Handout Topic 2-1 Topic 18-7 to 18-9
18, 20 Sept.	Field Trip	
25, 27 Sept.	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
2, 4 Oct.	Field Trip	
Sat 6 Oct. - Tue. 9 Oct.	FALL RECESS	
11 Oct.	Enzyme lab: extraction and assay of catalase from spinach leaves	Handout
16, 18 Oct.	SECOND LAB QUIZ Is catalase found throughout the plant? Is the activity of the enzyme affected by light?	Handout
23, 25 Oct.	Mitosis: root meristems Meiosis	Topic 4-1 Topic 8-1
30 Oct, 1 Nov.	Three major tissue systems of plants and the cells	Topic 2-3, 2-4

	which comprise them Stems of dicots and monocots	Topic 23-1
6, 8 Nov.	Leaves: dicots, monocots, C ₃ and C ₄ , abscission Roots: root systems, primary growth, origin of secondary roots, dicot & monocot roots	Topic 24-1 Topic 22-1
13, 15 Nov.	THIRD LAB QUIZ The fern life cycle: an example of alternation of generations with dominant sporophytes Mosses have dominant gametophyte generations	Topic 16-1 Topic 14-5 to 14-7
20 Nov.	Is catalase found throughout the plant? Is the activity of the enzyme affected by light?	Handout
Wed. 21 Nov. - Sun. 25 Nov.	THANKSGIVING RECESS	
27, 29 Nov.	<i>Marchantia</i> , a liverwort Pine life cycle: an example of the gymnosperms	Topic 14-1 to 14-4 Topic 17-1 to 17-6
4, 6 Dec.	PRACTICAL EXAM	

SUMMARY OF SEMESTER DEADLINES

Tue. Thurs.	11, 13 September	First lab quiz
Friday	21 September	First hour exam
Tue. Thurs.	16, 18 October	Second lab quiz
Monday	22 October	Second hour exam
Tue. Thurs.	13, 15 November	Third lab quiz
Monday	19 November	Third hour exam
Thursday	4, 6 December	Laboratory practical exam
Monday	10 December	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 19 and 26 September, so you should plan to read the book according to the following time line. We will also use it between 16 and 30 November in discussions of ethnobotany and biodiversity. In any event, be certain to complete the book prior to Monday 22 October since it will be included on the second exam.

<u>Assignment</u>	<u>Completion Date</u>	
Foreword Chapters 1 & 2	Friday	7 September
Chapters 3 & 4	Wednesday	12 September
Chapters 5,6 & 7	Wednesday	19 September
Chapters 8 & 9	Monday	24 September

LIBRARY REFERENCE MATERIALS ON RESERVE

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

Coe, Michael D. 1964. *The chinampas of Mexico*. Scientific American. 211 (1): 90-98. July

Grube, Nikolai (Ed). 2001. MAYA. Divine Kings of the Rain Forest. Konemann Verlagsgesellschaft. 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)

Leopold, Aldo. 1948. A Sand County Almanac. Ballantine Books. Read the last chapter, *The Land Ethic* (pp. 237-279).

Western, David and Mary Pearl. 1989. Conservation for the Twenty-first Century. Oxford University Press. Several chapters will be assigned. See the list of reading assignments.

SEMESTER READING ASSIGNMENTS (For Raven et al. 2005. Seventh 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.

<u>Lecture Topics</u>	<u>Assignments</u> ¹
Orientation	EC, Ch. 1, pp. 1-15
Seeds, germination, and the development of the plant body	EC, Ch 22, pp. 530-537
Flowers, floral anatomy, and reproduction in flowering plants	EC, Ch. 19, pp. 457-476 EC, Ch. 20, pp. 477-500 EC, Ch. 22, pp. 526-530
Pollination biology	EC, Ch. 20, pp. 487-491 Judson, O. Ch. 4. <i>Swords or Pistols</i> (pp. 60-65)
Plant ecology ² Biomes and global ecology	EC, Ch. 31, Ecology (on the Web) EC, Ch. 32, Global ecology (Web)
Molecular components of plant cells*	EC, Ch. 2, pp 18-37
Enzymes and factors which affect their action* (especially pp 99-106)	EC, Ch. 5, pp. 94-106
Structure of plant cells*	EC, Ch. 3, pp. 38-62 EC, Ch. 4, pp. 75-91
Mitosis* Totipotency and its importance in plant biotechnology (In particular note the essay on totipotency. Top of p. 202)	EC, Ch. 3, pp. 62-74 EC, Ch. 10, pp. 198-205
Meiosis* (Note the basis for cytoplasmic inheritance, p. 168) Asexual reproduction	EC, Ch. 8, pp. 152-159 EC, Ch. 8, pp. 169-173
Cells, differentiation, and plant tissues Note in particular the structures of tracheary	EC, Ch. 23, pp. 538-557

1 EC = Evert and Curtis.

2 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.

elements of the **xylem**, and **sieve cells**,
companion cells, **P-protein** and the **forisome**
in the **phloem**.

Stems*	EC, Ch 25, pp. 579-589
Leaves (including stem & leaf modifications)*	pp. 590-613
Secondary growth in stems	EC, Ch. 26, pp. 614-635
Roots*	EC, Ch. 24, pp. 558-578
Photosynthesis*	EC, Ch. 7, pp. 122-149.
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).	
Systematics and the diversity of living things	EC, Ch.12, pp. 234-250
Alternation of generations*	EC, Ch. 12, pp. 250-255 (Including Life Cycles & Diploidy) EC, Ch. 17, pp. 397-398 (Fig. 17-8)
Lower vascular plants (ferns and fern allies)*	EC, Ch. 17. pp. 391-429
Focus on the fern life cycle as a prototype for this group. Omit the life cycle of <i>Selaginella</i> on pp. 410-411.	(pp. 409-429 is the most important) See the fern life cycle , pp. 422-423)
Bryophytes*	EC, Ch. 16. pp. 366-390
In this chapter concentrate on the life cycle of mosses (pp. 378-387) and the liverwort <i>Marchantia</i> (pp. 373-377)	In particular, the life cycle of mosses (pp. 386-387) and <i>Marchantia</i> (pp. 376-377)
Gymnosperms*	EC, Ch. 18. pp. 430-456
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).	
Plant growth and development	
Hormones*	EC, Ch. 27. pp. 638-659 (Including study questions, p. 659)
How plants respond to their environment	EC, Ch. 28. pp. 660-682

(especially phototropism, photoperiodism,
and phytochrome)

How do plants defend themselves against herbivores?

EC, Ch. 2. Secondary Metabolites
pp. 30-35

EC, 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

EC, Ch. 21, pp. 501-523 (Read the
short essay Origin of Maize, p. 510)

Biodiversity and conservation

Leopold, last chapter of the book,
The Land Ethic, pp. 237-279.

Western and Pearl:

(1) *Overview*, pp.

(2) *Overview of Recent Extinctions*
(Jared Diamond), pp. 37-41

(3) *A Major Extinction Spasm:
Predictable and Inevitable?*
(Norman Myers), pp. 42-49

Plant domestication and development of agriculture

Coe, M: The Chinampas of Mexico
Grube, N. pp. 70-79 on *Maya
Agriculture* and pp. 80-83 on
Tortillas and Tamales