Biology 119             Bevington
Introductory Botany        Spring, 2010

COURSE SYLLABUS

TEXTS:


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. Plan on reading the last chapter, The Land Ethic, for our discussion on biodiversity.

COURSE OBJECTIVES:

Biology 119 is an introductory course in plant science designed to introduce you to plants as living organisms. One of the principal goals is to examine the importance of plants in our everyday lives. Not only do plants provide us with food and fiber, but also a broad array of important medicines, pharmaceuticals, and pain killing drugs. Recent research has shown that certain plants produce potent anticancer drugs, and it is likely that drugs from tropical 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.

A second goal will be for us to 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 environmental changes. Some time will be devoted to how plants respond to stress, in particular to how they defend themselves against herbivores. We may discuss some of the exciting new advances in plant biotechnology to see how genetic manipulation of important plant species is accomplished.
Another goal will be to examine a few representative examples of major plant divisions and see how they reproduce. Based on differences in reproductive patterns we will discuss some of the major trends in plant evolution.

Finally, we will look at the historical and cultural significance of plants, particularly the pivotal role of plant domestication in the rise of civilization.

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. Exams and quizzes are arranged so that in a given week only one item is scheduled.

<table>
<thead>
<tr>
<th>Point Value</th>
<th>Percentage of Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three (3) hour exams (100 points each)</td>
<td>300</td>
</tr>
<tr>
<td>Three (3) laboratory quizzes (60 points each)</td>
<td>180</td>
</tr>
<tr>
<td>One (1) laboratory practical exam</td>
<td>150</td>
</tr>
<tr>
<td>Final exam (comprehensive)</td>
<td>270</td>
</tr>
<tr>
<td></td>
<td>900</td>
</tr>
</tbody>
</table>

ACADEMIC HONESTY:

The instructor adheres to the policy statement on academic integrity outlined in the current Student Handbook.
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 need to advise the instructor in advance and then go to Reeves Library to locate the video cassette or DVD. To receive credit you will need to turn in a one page abstract 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 received by the instructor on or before Friday 30 April at 4:00 pm. Video summaries are not accepted during final exam week.

You may select no more than two from the following titles (excluding any that we might have used in class or laboratory):

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. 18 Jan. Orientation; “What is a seed?”
Wed. 20 Jan. Seed structure, germination, and seed ecology
Fri. 22 Jan. Seedling development and its control

Mon. 25 Jan. Flowers and floral anatomy
Wed. 27 Jan. How do flowering plants reproduce?
Fri. 29 Jan. How do flowering plants reproduce?

Mon. 1 Feb. Pollination biology, the essence of mutualism
Wed. 3 Feb. Why are plants important to us? (Or, what might life be like without them?)
Fri. 5 Feb. Useful plants and plant products

Mon. 8 Feb. Molecular composition of plant cells
Wed. 10 Feb. Molecular composition of plant cells
Fri. 12 Feb. FIRST HOUR EXAM

Mon. 15 Feb. Enzymes, catalysts of life. Factors which affect their action
Wed. 17 Feb. The structure of plant cells
Fri. 19 Feb. The structure of plant cells

Mon. 22 Feb. How do plant cells divide? Mitosis and the concept of totipotency. Totipotent cells can be used to clone useful plants.
Wed. 24 Feb. Meiosis and sexual reproduction
Fri. 26 Feb. Cells, differentiation, and plant tissues (MID TERM)

Mon. 1 Mar. Stems and leaves
Wed. 3 Mar. Leaves and roots
Fri. 5 Mar. Plant growth and development: hormones and tropisms

Sat. 6 Mar. - Sun. 14 Mar. SPRING RECESS

Mon. 15 Mar. Growth and development: How do plants see light? Phytochromes
Wed. 17 Mar. Growth and development: photoperiodism and flowering
Fri. 19 Mar. How do plants defend themselves against herbivores?

Mon. 22 Mar. SECOND HOUR EXAM
Wed. 24 Mar. Principles of plant ecology
Fri.  26 Mar.  Plant ecology

Mon.  29 Mar.  Plant ecology
Wed.  31 Mar.  Plant ecology

Fri.  2 Apr - Mon.  5 Apr.  EASTER RECESS

Wed.  7 Apr.  Alternation of generations: the fern life cycle (fern allies if time allows)
Fri.  9 Apr.  Moss life cycle as an example of bryophytes (liverworts if time permits)

Mon.  12 Apr.  Liverworts
Wed.  14 Apr.  The pine, a gymnosperm
Fri.  16 Apr.  Photosynthesis: “Harvesting the Sun”

Mon.  19 Apr.  The light reactions of photosynthesis
Wed.  21 Apr.  C_3, C_4, and CAM plants
Fri.  23 Apr.  THIRD HOUR EXAM

Mon.  26 Apr.  Ecological adaptations of photosynthesis
Wed.  28 Apr.  Biodiversity: How many species are present on earth, and how fast are they disappearing? Why should we worry about species extinction?
Fri.  30 Apr  Plant domestication, the development of agriculture, and the rise of civilization  (Last day of classes)

Mon.  3 May - Sat.  8 May  Final Exam Period

Tue.  4 May 1:30 pm  Final exam date for the course
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 laboratory.

Four 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.

<table>
<thead>
<tr>
<th>Date</th>
<th>Subject Material</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 Jan.</td>
<td>Start <em>Brassica rapa</em> seedlings &amp; fern gametophyte cultures</td>
<td></td>
</tr>
<tr>
<td>28 Jan.</td>
<td>The light microscope</td>
<td>Topic 1-1</td>
</tr>
<tr>
<td></td>
<td>Plant cells</td>
<td>Topic 3-1</td>
</tr>
<tr>
<td>4 Feb.</td>
<td><strong>FIRST LAB QUIZ</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seeds, germination, and seedling development</td>
<td>Handout</td>
</tr>
<tr>
<td></td>
<td>The structure of flowers</td>
<td>Topic 2-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Topic 18-7 to 18-9</td>
</tr>
<tr>
<td>11 Feb.</td>
<td>Plant water relations: determination of water potential of potato tuber tissue.</td>
<td>Handout</td>
</tr>
<tr>
<td></td>
<td>Relevance of water potential to stomate regulation, sugar transport, and water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>movement in plants</td>
<td></td>
</tr>
<tr>
<td>18 Feb.</td>
<td>Cloning plants with tissue culture</td>
<td>Handout</td>
</tr>
<tr>
<td>25 Feb.</td>
<td>Enzyme lab: extraction and assay of catalase from spinach leaves</td>
<td>Handout</td>
</tr>
<tr>
<td>4 Mar.</td>
<td><strong>SECOND LAB QUIZ</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examine tissue culture experiments (2 weeks)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Is catalase found throughout the plant?</td>
<td>Handout</td>
</tr>
</tbody>
</table>
Is the activity of the enzyme affected by light?

Sat 6 Mar. - Sun. 14 Mar.  **SPRING RECESS**

18 Mar.  Examine tissue culture experiments (4 weeks)
         Mitosis: root meristems  Topic 4-1
         Meiosis  Topic 8-1

25 Mar.  Examine tissue culture experiments (5 weeks)
         Three major tissue systems of plants and the cells
         which comprise them  Topic 2-3, 2-4
         Stems of dicots and monocots  Topic 23-1

1 Apr.   Field trip (We’ll leave mid morning and return to campus about 5:00 pm.)

Fri. 2 Apr. - Mon. 5 Apr.  **EASTER RECESS**

8 Apr.   **THIRD LAB QUIZ**
         Examine tissue culture experiments (7 weeks)
         Leaves: dicots, monocots, C_3 and C_4, abscission  Topic 24-1
         Roots: root systems, primary growth, origin of
         secondary roots, dicot & monocot roots  Topic 22-1

15 Apr.  The fern life cycle: an example of alternation
         of generations with dominant sporophytes  Topic 16-1
         Mosses have dominant gametophyte generations  Topic 14-5 to 14-7

22 Apr.  *Marchantia*, a liverwort  Topic 14-1 to 14-4
         Pine life cycle: an example of the gymnosperms  Topic 17-1 to 17-6

29 Apr.  **PRACTICAL EXAM**
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 4 and 6 February, so you should plan to read the book according to the following time line. In any event, be certain to complete the book prior to 13 February as it will be included on the first exam.

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>Friday</td>
</tr>
<tr>
<td>Chapters 1 &amp; 2</td>
<td>22 January</td>
</tr>
<tr>
<td>Chapters 3 &amp; 4</td>
<td>Monday</td>
</tr>
<tr>
<td></td>
<td>25 January</td>
</tr>
<tr>
<td>Chapters 5, 6 &amp; 7</td>
<td>Friday</td>
</tr>
<tr>
<td></td>
<td>29 January</td>
</tr>
<tr>
<td>Chapters 8 &amp; 9</td>
<td>Friday</td>
</tr>
<tr>
<td></td>
<td>5 February</td>
</tr>
</tbody>
</table>

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.


Chapter 4: *Swords or Pistols* (read pp. 60-65 on fig wasps)


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

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Assignments¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>REC, Ch. 1, pp. 1-13</td>
</tr>
<tr>
<td>Seeds, germination, and the development of the plant body</td>
<td>REC, Ch 22, pp. 502-509</td>
</tr>
</tbody>
</table>
| Flowers, floral anatomy, and reproduction in flowering plants                 | REC, Ch. 19, pp. 434-451  
                          | REC, Ch. 20, pp. 465-474  
                          | REC, Ch. 22, pp. 497-502 |
| Pollination biology                                                          | REC, Ch. 20, pp. 452-464  
                          | Judson, O. Ch. 4. *Swords or Pistols* pp. 60-65 |
| Why are plants important to us? (useful plants and plant products)            | Handouts |
| Molecular components of plant cells*                                          | REC, Ch. 21, pp. 475-495  
                          | REC, Ch. 2, pp 15-28 |
| Enzymes and factors which affect their action*                                | REC, Ch. 5, pp. 89-101 |
| Structure of plant cells*                                                     | REC, Ch. 3, pp. 35-58  
                          | REC, Ch. 4, pp. 71-87 |

---

¹ REC = Raven, Evert, and Curtis.
Mitosis*  
REC, Ch. 3, pp. 58-70

Totipotency and its importance in plant biotechnology  
REC, Ch. 10, pp. 188-194

Meiosis*  
REC, Ch. 8, pp. 141-162  
(especially pp. 141-150)

Cells, differentiation, and plant tissues  
REC, Ch. 23, pp. 510-527

Stems and leaves*  
REC, Ch 25, pp. 547-579
Secondary growth in stems  
REC, Ch. 26, pp. 580-600

Roots*  
REC, Ch. 24, pp. 528-546

Plant growth and development  
Hormones*  
REC, Ch. 27.  pp. 603-621
How plants respond to their environment  
(REC, Ch. 28.  pp. 622-644  
 especially phototropism, photoperiodism, and phytochrome)

Plant ecology2  
Biomes and global ecology  
REC, Ch. 31, Ecology (on the Web)  
REC, Ch. 32, Global ecology (Web)

Systematics and the major groups of living things  
REC, Ch.12, pp.219-237

Alternation of generations*  
REC, Ch. 17, pp. 376-377  
(Fig. 17-8)

Lower vascular plants (ferns and fern allies)*  
Focus on the fern life cycle as a prototype  
(especially pp. 389-398 most important, fern life cycle, pp. 396-397)

Bryophytes*  
In this chapter concentrate on the life cycle  
of mosses (pp. 362-363) and the liverwort  
Marchantia (pp. 354-355)

Gymnosperms*  
Here the most important part of the chapter  
is pp. 414-427. Pines will be our one example  
on the gymnosperms (see pp. 418-419).

---

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/raven. 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.
Photosynthesis*

REC, Ch. 7, pp. 115-153. This is an especially important chapter, and it integral to the mission of the course.

Biodiversity and conservation

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*
Harris, M. Ch. 3: *Origin of Agriculture*
Grube, N. pp. 70-79 on *Maya Agriculture* and pp. 80-83 on *Tortillas and Tamales*
Diamond, J. Chapters 4-8. Study questions for this assignment will be distributed in class.