

ROCHESTER COMMUNITY & TECHNICAL COLLEGE

COMMON COURSE OUTLINE: Course discipline/number Biology 1102

A. CATALOG DESCRIPTION (include prerequisites)

Course Title: Plant Biology

Credits: 3

Hours/Week: 2 hours lecture and 2 hours lab per week

Semester Offered: Fall + ?

Prerequisites: High school biology or BIOL 1101 or equivalent

This course teaches the fundamentals of plant biology, focusing on the various types of plants and the basic anatomy and physiology of plants. The course is also designed to promote an awareness of the significance of plants in the natural processes of our biosphere and specifically for humans. Students will be challenged to think about the importance of plants in decision making, from individual, ethical choices to social, economic, and political policy making. CT, NS, PE

B. DATE LAST REVISED (use current date): May 2005

C. RECOMMENDED ENTRY SKILLS/KNOWLEDGE:

College-level reading and writing skills and working knowledge of elementary algebra

D. OUTLINE OF MAJOR CONTENT AREAS:

1. Plant classification

A. Binomial System

B. Major Classifications

i. Eubacteria

ii. Cyanobacteria

iii. Protista

iv. Fungi and Lichens

v. Plantae

1. Bryophytes

2. Vascular Plants

a. Ferns and their relatives (vascular plants)

b. Gymnosperms

c. Angiosperms

i. Monocots

ii. Dicots

2. Vascular Plant Anatomy

A. Whole plant

B. Cells

i. organelles

ii. nucleus

iii. cytoplasm

iv. plasma membrane

v. protein synthesis (overview)

C. Tissues

D. Roots

- E. Stems
 - F. Leaves
 - G. Flowers
 - H. Fruits
 - I. Seeds
3. Vascular Plant Physiology
- A. Membrane Transport
 - B. Enzymes and Energy Transfer
 - C. Movement
 - D. Photosynthesis
 - i. process
 - ii. specializations of $C_3/C_4/CAM$ plant photosynthesis
 - E. Respiration
4. Vascular Plant Growth
- A. Water/Transport
 - B. Light
 - C. Soil/Minerals/Nutrients
 - D. Hormones
 - E. Temperature
 - F. Dormancy and Quiescence
 - G. Response to Environmental Conditions
5. Reproduction and Genetics
- A. Cell division and Reproduction
 - i. Mitotic Cell Division
 - ii. Meiotic Cell Division
 - iii. Alternation of Generations
 - B. Reproduction
 - i. Asexual Reproduction
 - ii. Sexual Reproduction
 - iii. Inheritance
 - a. Mendelian Genetics
 - b. Use of Conventional Plant Breeding Strategies
 - c. Use of Biotechnology for Plant Improvement
6. Evolution and Ecology
- A. Evolution and Natural Selection
 - B. Ecology
 - i. Natural Cycles
 - ii. Succession
 - iii. Importance of Plants to Humans
 - iv. Influence of Human Systems on Plants
 - a. Political, Economic, Social, Ethical Issues
 - b. Local/Regional issues

c. Global issues

- 1) Climate Change
- 2) Loss of biodiversity
- 3) Deforestation
- 4) Food and Poverty
- 5) Water Quality

Laboratory activities are designed to give “hands-on experience” in observation of the diversity of plants, plant anatomy, and plant cell structure and physiology. Periodic quizzes, assignments including drawings and basic data collection and analysis, and lab practical exams may be used in measuring the students’ comprehension of material presented in the laboratories.

The following topics may include but may not be limited to:

- Microscope use and cellular study
- Measurement
- Identification of plants using dichotomous keys
- Protista, Fungi, Lichens, Bryophytes, Ferns, Gymnosperms, Angiosperms
- Gymnosperm reproduction
- Angiosperm reproduction
- Anatomy and physiology flowers, fruits, seeds, roots, stems, leaves
- Histology and physiology of cells and tissues
- Monitoring plant growth over a period of weeks to understand how conditions can affect growth

E. **LEARNING OUTCOMES (GENERAL):**

1. Learn and correctly use basic plant vocabulary
2. Be able to describe the phylogenetic relationships of plants starting with Eubacteria and proceeding through flowering plants.
3. Learn basic plant structures (seeds – whole plants)
4. Be able to describe the movement and use of water in plants
5. Understand basic life requirements of plants and how these are met in nature and in human systems
6. Understand the cellular biology of plants and of plant growth
7. Understand the processes of photosynthesis and cellular respiration
8. Understand classical genetics and biotechnology as applied to plant development and improvement
9. Understand the dependence of the Earth’s ecosystems on plants
10. Understand human’s dependence on plants – political, social, economic, ethical issues
11. Understand the impact of human development on natural systems

F. **LEARNING OUTCOMES (MNTC)***Goal 2 Critical Thinking*

To develop thinkers who are able to unify factual, creative, rational, and value-sensitive modes of thought. Critical thinking will be taught and used throughout the general education curriculum in order to develop students’ awareness of their own thinking and problem-solving procedures. To integrate new skills into their customary ways of thinking, students must be actively engaged in practicing thinking skills and applying them to open-ended problems.

Student competencies: Students will be able to

- Gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, conscious of possible bias in the information selected.
- Imagine and seek out a variety of possible goals, assumptions, interpretations, or perspectives which can give alternative meanings for solutions to given situations or problems.
- Analyze the logical connections among the facts, goals, and implicit assumptions relevant to a problem or claim: generate and evaluate implications that follow from them.
- Recognize and articulate the value assumptions which underlie and affect decisions, interpretations, analyses, and evaluations made by ourselves and others.

Goal 3 Natural Sciences

To improve students' understanding of natural science principles and of the methods of scientific inquiry, i.e., the ways in which scientists investigate natural science phenomena. As a basis for lifelong learning, students need to know the vocabulary of science and to realize that while a set of principles has been developed through the work of previous scientists, ongoing scientific inquiry and new knowledge will bring changes in some of the ways scientists view the world. By studying the problems that engage today's scientists, students learn to appreciate the importance of science in their lives and to understand the value of a scientific perspective. Students should be encouraged to study both the biological and physical sciences.

Student competencies: Students will be able to

- Demonstrate understanding of scientific theories.
- Communicate their experimental findings, analyses, and interpretations both orally and in writing.
- Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

Goal 10 People and the Environment

To improve students' understanding of today's complex environmental challenges. Students will examine the inter-relatedness of human society and the natural environment. Knowledge of both bio-physical principles and socio-cultural systems is the foundation for integrative and critical thinking about environmental issues.

Student competencies: Students will be able to:

- Explain the basic structure and function of various natural ecosystems and of human adaptive strategies within those systems.
- Evaluate critically environmental and natural resource issues in light of understandings about interrelationships, ecosystems, and institutions.
- Propose and assess alternative solutions to environmental problems.
- Articulate and defend the actions they would take on various environmental issues.

H. METHODS FOR EVALUATION OF STUDENT LEARNING:
May include the following:

1. Lecture theory exams
2. Lecture and/or laboratory quizzes
3. Oral lab quizzes
4. Lecture and/or lab assignments
5. Laboratory practical exams
6. Graded plant collection
7. Graded slide collection of x-sections and macerations of plants
8. Student presentations

I. SPECIAL INFORMATION (fees, directives on hazardous materials, etc.):

The initial lab session explains and familiarizes the student with general safety hazards and safety equipment in the lab. During the pre-lab discussion, the hazardous characteristics of any materials used during the lab are discussed. In addition, if the lab involves any potentially infectious material, the students will be instructed on the proper use and disposal. The instructor will direct all students to wear necessary protective equipment while working with any hazardous chemicals. A copy of Material Safety Data Sheets for chemicals used is available in the lab.