MAR 11 1994

LSC Use Only
Number: _____
Action: _____
Date: _____

UWUCC Use Only
Number: ~~93-80c~~ 94-28
Action: ~~App~~ 3/28/95
Date: _____
Senate App 5/2/95

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. Title/Author of Change

Course/Program Title: BI 210 Botany
Suggested 20 Character Course Title: Botany
Department: Biology
Contact Person: Dr. William E. Dietrich

II. If a course, is it being Proposed for:

__X__ Course Revision/Approval Only
_____ Course Revision/Approval and Liberal Studies Approval
_____ Liberal Studies Approval Only (course previously has been approved by the University Senate)

III. Approvals

Robert P. Gendron
Department Curriculum Committee

Department Chairperson

College Curriculum Committee

W J Cole
College Dean*

Director of Liberal Studies (where applicable)

Provost (where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. Timetable

re-submitted

Date Submitted to LSC: _____
to UWUCC: _____

Semester to be implemented: Fall, ~~1996~~ 1997

Date to be published in Catalog: ~~1995~~ 1996

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LIBERAL STUDIES

V. DESCRIPTION OF CURRICULUM CHANGE

1. Catalog Description

BI 210 Botany — 3 credits
5 lecture/lab hours
(2c-3l-3sh)

Prerequisite: BI 111 and 112 or permission of instructor.

A survey of the major plant groups, their physiology, structure, life cycles, evolution and ecology, and economic roles of plants. Combined lecture-laboratory.

Course Syllabus

I. CATALOG DESCRIPTION

BI 210 Botany

3 credits
5 lecture/lab hours
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Prerequisite: BI 111 and 112 or permission of instructor.

A survey of the major plant groups, their physiology, structure, life cycles, evolution and ecology, and economic roles of plants. Combined lecture-laboratory.

II. COURSE OBJECTIVES

Students will:

1. develop an appreciation of plants as organisms which integrate structure with function.

2. develop an appreciation of plants as organisms which evolved to fill certain essential roles within the biosphere.

3. appreciate the importance of the ecological roles filled by plants in various ecological habitats.

4. gain an appreciation of the ecological and economic importance of plants to humans and human society.

5. be able to recognize representatives of the important major plant groups.

6. understand how plants have evolved solutions to the problems of multicellular life in their own unique ways.

7. appreciate the importance of the welfare of the local and world-wide plant community as being essential for local and global environmental well-being.

8. create an awareness of important areas of plant science that are open to scientific investigation.

9. demonstrate the importance of plant science as a human endeavor and to plate it in proper perspective *vis a vis* the other sciences and other human activities.

III. COURSE OUTLINE

Course Introduction and Propagation and Care of Plants (2 1/2 hours)

- Propagation
  - by seed
    - requirements for germination
    - planting
  - by spore
    - requirements for germination
    - planting
  - by vegetative means
    - cuttings
      - herbaceous
      - hardwood
    - bulbs, corms, tubers and roots
- Growing Plants
  - requirements
    - light
    - temperature
    - water
    - nutrients
      - soil
      - hydroponics
  - support
  - care
    - trimming
    - repotting
    - pest control

Structure of Plant Cells (5 hours)

- review of eukaryotic cell structure
- special features of plant cells
  - cell walls
    - composition
      - cellulose & chitin structure
    - cell wall structure
  - plastids
    - plastid developmental cycle
    - chloroplast structure
    - chromoplasts
    - storage plastids
      - amyloplasts
      - proteoplasts
      - elaioplasts
  - vacuole

- tonoplast
- content of vacuoles
- vacuole function

cellular specialization within plants (cell types and tissues)

- parenchyma cells
  - storage
  - epidermal
  - secretory
- support cells
  - collenchyma
  - schlerenchyma
- vascular cells
  - xylem
  - phloem

simple and complex tissues

Plant Organs (5 hours)

primary structure - internal and external anatomy

- root
- stem
- leaf
- primary meristems

secondary - internal and external anatomy

- secondary meristems
- secondary root
- secondary stem

Plant Physiology (14 hours)

water & nutrient uptake and transport

- water potential & osmosis
- long distance water transport
- transpiration and its control
- soil and mineral nutrition
- mineral uptake and transport
- organic material transport

metabolism

- photosynthesis
  - review of light reactions & carbon dioxide fixation
  - adaptations of the photosynthetic apparatus
    - C_3 and C_4 plants
    - CAM and SAM plants
    - light intensity adaptations
- respiration
- photorespiration

plant growth and development

development throughout the life of a plant (physiological life cycle)
germination
vegetative growth & plasticity
reproductive growth
flowering, pollination, seed formation, fruit formation
cell division, cell enlargement & differentiation
localization of growth
internal and external control of plant growth and development
control by growth substances
auxins
gibberellins
cytokinins
abscissins
ethylene
photomorphogenesis
phytochrome
red/far red controlled phenomena
leaf blade growth
plumular hook opening
seed germination
chloroplast orientation
flowering
tropisms
photo
gravi-
etc.

Introduction to the Evolution of Plants (2 1/2 hours)
review of Darwinian evolution
sources of variation
recombination
drift
mutation
hybridization
natural selection
adaptation
special evolutionary mechanisms of plants
hybridization - introgression
polyploidy
examples: marsh grass, *Asplenium* complex (fern)
evolution of cultivated plants
evolution of the plant life cycle
selective pressures in Angiosperms
adaptation to land
floral/reproductive strategies

- coevolution - pollinator/flower relationships
- wind pollination

the plant kingdom throughout time

systematics
- definition
- nomenclature - binomial system
- classification system

<u>Kingdom Mycetae (Fungi including Lichens) (5 hours)</u>

defining characteristics and features
- absorptive nutrition
- chitinous cell walls
- dimorphic forms: yeasts/hyphal
- reproductive variation
- dimorphism

ecological and economic roles of fungi
- saprophytism: decay
- parasitism: disease
- mutualism: mycorrhiza and lichens

Zygomycota
- coenocytic
- sporangium
- zygospore
- example genera: *Rhizopus, Phycomyces*

Ascomycota
- septate hyphae
- conidium
- limited dikaryon stage
- ascocarp with ascospores in asci
- unicellular forms
- multicellular/filamentous forms: *Peziza,* morels, *Claviceps,* truffles
- Lichens:
  - morphological forms: crustose, foliose, fructicose
  - linchen involvements

Basidiomycota
- septate mycelium with extensive dikaryon stage
- baidiocarp with basidia and basidiospores
- septate basidial forms: rusts, smuts, jelly fungi
- non-septate basidial forms: gill, pore and tooth fungi

<u>Kingdom Protoctista: Plant-like Protists (5 hours)</u>

geological background to the evolution photosynthetic protists
- algae defined
- distribution of algae

environmental parameters affecting algal growth and reproduction

- brown algae (Phaeophyta)
  - characteristics: cell wall, pigments, storage materials
  - major morphological variants
    - microscopic filamentous - *Ectocarpus*
    - ribbon-like - *Laminaria*
    - highly-branched - *Fucus, Sargassum*
- red algae (Rhodophyta)
  - characteristics: cell wall, pigments, storage materials
  - morphological considerations
  - ecological considerations
  - example genera including *Polysiphonia*
- green algae (Chlorophyta)
  - characteristics: cell wall, pigments, storage materials, motility and variations in nuclear division
  - major morphological variants
    - unicellular motile - *Chlamydomonas*
    - colonial motile - *Volvox*
    - unicellular non-motile - *Chlorella*
    - multicellular, filamentous/sheet-like - *Ulva*
    - coenocytic - *Valonia*
    - stoneworts - *Chara, Nitella*
- economic and ecological importance of algae
  - primary production
  - economic
    - cell wall products
    - food
    - fertilizers and soil conditioners
  - role in eutrophication
  - significance in reef building
  - as scientific organisms

<u>Kingdom Plantae (17 1/2 hours)</u>

- non-vascular plants
  - Bryophytes (2 1/2 hours)
    - land plant format
    - pigmentation
    - multicellular sex organs
    - "vascular-like" tissue
    - habitat diversity
    - true alternation of generations
    - liverworts (Hepaticopsida)
      - thallous - *Marchantia*
      - "leafy" - *Riccia*
    - hornworts (Anthocerotopsida)
    - mosses (mucopsida)

- Bryidae - true mosses
- Sphagnidae - peat mosses

vascular plants
- sporophyte generation
  - predominant stage
  - leaf types
    - microphylls
    - megaphylls
  - spore production
    - sporophyll
    - sporangium
- gametophyte generation

lower vascular plants (2 1/2 hours)
- wisk ferns (Psilophyta)
  - characteristics
  - living genera: *Psilotum, Tmesipteris*
- club mosses (Lycophyta)
  - living genera: *Lycopodium, Selaginella, Isoetes*
  - fossil genera: *Lepidodendron, Sigillaria*
- horsetails (Sphenophyta)
  - living genus: *Equisetum*
  - fossil general: *Sphenophyllum, Calamites*

ferns (Pterophyta) (2 1/2 hours)
- Ophioglossales
- Filicales
  - homosporous ferns
    - sporophyte features
    - gametophyte features
  - heterosporous ferns

higher vascular plants -- seed-producing plants
- gymnosperms (2 1/2 hours)
  - origin of seed plants
  - Coniferophyta
    - features
    - life cycle
  - other gymnosperms
    - Cycadophyta
    - Ginkgophyta
    - Gnetophyta

flowering, seed-producing plants
- angiosperms (7 1/2 hours)
  - reproduction
    - flower structure
    - microgametophyte development
    - megagametophyte development

fruit and seed structure
origin and evolution of angiosperms
major groups of flowering plants
monocots
dicots

Plant Ecology (10 hours)
development of biomes of North America
deciduous forests of North America
characteristic species
environmental traits
ecology of Western Pennsylvania
mixed mesophytic forest
characteristic species
environmental traits
climate, soils & watersheds of Indiana County
physiographic provinces
the changing native flora
chestnut blight disease
Dutch elm disease
dogwood anthracnose
acid rain
introduced species
endangered plants

Humanistic Botany (2 1/2 hours)
agriculture
food
fibers
chemicals
impact of plant disease
plant biotechnology
medicinal plants
spice plants
poisonous plants
dye plants
hallucinogenic plants
wild edible plants

Tentative Class Schedule:

Week	Topic (Each period represents 2 1/2 hours of class time)
1	Period #1 - Introduction & Plant Propagation Lecture/discussion of plant propagation. Plant seeds, cuttings, spores, hydroponics, etc. for use later in course

Period #2 - Plant Cell Structure

Review of eukaryotic cell structure.
Lecture on cell wall composition and structure, plastids, and vacuoles.
Microscope work on plant cells: *Elodea* leaf and *Allium* epidermis; free hand sectioning and staining for starch, lignin, cellulose, pectin, vacuole.

2 Period #1 - Plant Cell Types

Lecture on the three cell types, functional specialization of each cell type. Free hand sectioning and observation of: parenchyma, schlerenchyma, collenchyma. Observation of prepared sections of same.
Lecture on simple and complex tissues.

Period #2 - Plant Anatomy I

Lecture on internal and external anatomy of primary stem, leaf, and root and apical meristems. Observation of prepared slides of primary stem, root (cross & longisection) & leaves; Observation/dissection of fresh and preserved specimens of above.

3 Period #1 - Plant Anatomy II

Lecture on secondary tissues & adaptations.
Observation of prepared slides of secondary stem & root (woody & herbaceous). Observation of prepared slides of secondary stem and root.
Demonstrations of leaf, stem & root adaptations for storage, water economy and reproduction. Observation of external anatomy and dissection of fresh and preserved specimens of above.

Period #2 - Plant Physiology I

Lecture on water potential, water uptake and transport of water and mineral nutrients in the xylem. Measurement of tissue water potential and cell osmotic potential; begin hydroponic mineral nutrition experiment.

4 Period #1 - Plant Physiology II

Lecture on mineral nutrition, uptake of mineral nutrients from soil; transport of photosynthate and storage materials in the phloem. Start transpiration measurement, effect of ABA on transpiration & unequal uptake of anions and cations.

Period #2 - Plant Physiology III

Lecture review of photosynthetic metabolism. Finish transpiration measurement, calculate area-specific transpiration rates; finish uneven uptake of anions and cations experiment. Computer simulation of transpiration and use of computer for data analysis and presentation.
Exam #1 (1 hour)
Special project description due.

5 Period #1 - Plant Physiology IV

Lecture on photosynthetic adaptations - C3/C4 & CAM/SAM plants, photorespiration and respiration. Photosynthesis experiment; start plant starvation. Computer simulation of photosynthesis; use of computer for data presentation and analysis.

Period #2 - Plant Physiology V

Lecture on physiological plant life cycle. Finish plant starvation and starch determination; start reversal of dwarfism by GA, gravitropism i whole plants, presentation time of gravitropic stimulus in watermelon radicles, phototropism in fast plants.

6 Period #1 - Plant Physiology VI

Lecture on plant growth substances, their effects and photomorphogenesis. Finish tropisms.

Period #2 - Plant Evolution & Systematics

Discussion/review of Darwinian evolution including sources of variation, natural selection and adaptation. Lecture on special evolutionary mechanisms of plants including examples, evolution of cultivated plants, evolution of the plant life cycle, adaptation to land and floral/reproductive strategies. Discussion of systematics.

7 Period #1 - Kingdom Hycetae (Fungi & Lichens)

Lecture on the polyphyletic nature of fungi and their role in environment; factors that affect growth and mating; living forms and the diversity of the non-fungal slime molds. Techniques for handling fungi; begin a series of fungal cultures; microscopic observation of basic and unique fungal structures.

Period #2 - Kingdom Myceteae (Fungi & Lichens) (cont'd)

Lecture on distinguishing major fungal groups by sexual reproduction: Zygomycetes, Ascomycetes, Basidiomycetes, and Deuteromycetes. Observation of prepared slides of major fungal groups; complete study of fungal cultures begun in period #1. Fungal associations: lichens, mycorrhizae, plant diseases and mycoses. Observation of histological slides of selected associations and infections. Observation and dissection of fresh and preserved materials of associations and infections.

8 Period #1 - Kingdom Protoctista (plant-like protists)

Introduction to algae: definition, evolution, distinguishing characteristics of the major groups. Green algae: structure, life cycles, occurrence and role in the environment. Microscopic study of Chlamydomonas, *Volvox, Chlorella, Ulva, Valonia, Spirogyra* and the stoneworts, *Chara* and *Nitella.*

Period #2 - Kingdom Protoctista (plant-like protists)

Red and brown algae: characteristics and life cycles. Study of *Fucus, Ectocarpus, Laminaria, Polysiphonia,* and *Porphyridium* through

microscopic sections and fresh and preserved specimens. Lecture and discussion of economic and ecological importance of algae.

9 Period #1 - Plant Kingdom: Bryophytes

Lecture on classification, morphology, and reproduction in the Hepaticopsida, Anthocerotocopsida and Mucopsida. Observation of prepared slides of representative taxa of greenhouse specimens and of living cultures of gametophyte development.

Period #2 - Plant Kingdom: Lower Vascular Plants except ferns

Lecture on development of megaphylla; fossil and extant genera of Psilophyta, Lycophyta, and Sphenophyta; variety of fossil ferns. Observation of aspects of morphology and reproduction from preserved and greenhouse specimens, prepared slides. Observation of fossils. Micro- and mega-gametophyte development in living *Isoetes*.
Exam #2 (1 hour)

10 Period #1 - Plant Kingdom: Ferns

Lecture/film presentation of variety and complexity of ferns, their growth and reproduction; fossil and extant forms. Propagation of ferns, induction and observation of fertilization in gametophytes. Fern anatomy and reproduction as observed with greenhouse specimens, preserved materials and prepared slides. Use of computers for fern taxonomy.

Period #2 - Plant Kingdom: Gymnosperms

Lecture on vascular plant modification for seed development, fossil and extant groups of gymnosperms: Coniferophyta, Ginkgophyta, Gnetophyta, and Cycadophyta. Study of the life cycle of the pine using fresh materials and prepared slides. Use of fresh and preserved materials to compare anatomy, morphology and major developmental stages of the four gymnosperm divisions.

11 Period #1 - Plant Kingdom: Angiosperms

Lecture on flower structure and megasporogenesis, floral adaptations for pollination. Dissection of various flowers, microscopic study of prepared sections showing megagametophyte development. Comparison of monocots and dicots. Lecture/demonstration of the major angiosperm families.

Period #2 - Plant Kingdom: Angiosperms (cont'd)

Lecture on microgametophyte development and pollution. Microscopic examination of prepared slides showing pollen development and development of embryonic plant; dissection of fruits and seeds. Continuation of lecture/demonstration of major angiosperm families.

12 Period #1 - Plant Ecology *:

Lecture on evolutionary development of the deciduous forest in the Eastern U.S. - topography, glaciation, climate and major plants; the deciduous forests of Western Pennsylvania.

Period #2 - Plant Ecology*

Interpretation of soils and topographic maps. Film on endangered plants of Pennsylvania. Group activity: use of SimEarth software for understanding competition/extinction/resource limits.

13 Period #1 - Plant Ecology*

Identification of important trees on IUP campus.

Period #2 - Plant Ecology*

Field trip to White's Woods; collection of soil samples.

14 Period #1 - Plant Ecology*

Discussion of forest structure and identification of the major plants of the canopy, sub-canopy, shrub and herb layers. Comparison of soil profiles from deciduous and coniferous forests

Period #2 - Humanistic Botany

Lecture/discussion of place of plants in human culture and evolution; different uses of plants and plant products; plant biotechnology and the future.

Final Exam

*Note: This subject matter and associated laboratory experiences will entail field trips. Thus, it will be taught early in the Fall Semester but late in the Spring Semester in order to be assured of weather conditions appropriate for learning.

IV. EVALUATION METHODS

The final grade for the course will be determined as follows:

75% Exams. 3 one-hour exams plus a comprehensive final (1 hour). The final exam will be formatted so as to include the third hourly exam plus the comprehensive final. All exams will be composed of a combination of objective, essay and lab practicum.

12.5% Special Project. Students will choose a group of no more than four students in the same section to cooperate in a project. Each project is intended to extend the students' knowledge of plant biology in an area of special interest. some examples of projects are: use of a computer simulation, construction of a demonstration, growth of a special group of plants, e.g. crop grains, *Equisetum,* planning and executing an experiment in plant anatomy or physiology.

During the first four weeks of the semester, students will be asked to choose their group-mates, decide on a project and present a one-paragraph description of the project. At the end of the semester a 5-page report (typewritten, double spaced, 1 inch margins) of the project will be presented to the instructor for evaluation. In addition,

each member of each group anonymously will give a % grade of each of the other group members on the basis of how much they helped on the project and the value of their help to the successful completion of the project. The grade for each project will be determined as follows: 50% instructor evaluation and 50% averaged peer evaluation.

12.5% Quizzes. Five unannounced, 10 point quizzes will be given during the semester. They will be composed of short answer questions. The purpose of these quizzes will be to impress upon the students the necessity of keeping up with the exposition of the course material, to determine student progress and to indicate trouble spots.

V. REQUIRED TEXTBOOKS, SUPPLEMENTAL BOOKS AND READINGS

Textbook: Mauseth, J.D. Botany: An Introduction to Plant Biology. 1991, Saunders College Publishing, Philadelphia.

Course Manual: This manual will be written by the instructors and will include the course syllabus, lecture outlines, supplemental reading materials, directions and data sheets for the laboratory experiences and questions intended to direct study.

VI. SPECIAL RESOURCE REQUIREMENTS

Each student will be expected to supply the following items: a centimeter ruler, appropriately ruled graph paper, and a marker for writing on glass.

In order to teach Botany in the manner proposed, that is with an integrated lecture/discussion/laboratory, it will be necessary to revamp the current plant biology laboratory rooms (Weyandt Hall 214 and 215). It is realized that teaching in this manner puts all of the functions of lecture, discussion and laboratory in a single room; requiring some alteration. A lecture room will be freed up for three hours per week over the present Plant Biology (BI110). Further, since the emphasis of the course is changing from the present course to a more "hands on" and inquiry-style education it is necessary that the capability to grow some plant paterials be included in the two botany rooms.

The following renovations are required:
a. Room 215 must be modified to accommodate a plant growing area in which the students will grow plants for their own experiments and will conduct the experiments. The creation of such an area will entail the building of a rack of fluorescent lights, installation of an exhaust fan and an air conditioner, and the purchase of bins for storage of potting material. The estimated cost of this is appended (See Appendix #1) as part of a memo to the acting Dean.

b. Room 214 must be modified to accommodate 6 Macintosh computers for student use. Computers will be used by students for three separate purposes: review of class material using tutorial software, e.g. Omegaware Courseware; simulation as a learning aid, e.g. SimEarth and Plant Biology Data Sim; and analysis and presentation of data, e.g. Cricket Graph and Wormstat. Some further modification is required because some of the storage functions of room 215 will be given over to plant growth lights and because the formal lectures will be carried out in this room as well. The modifications are:

1. Modifications to the present lab tables so that microscopes may be stored in them. This has already been surveyed by a university carpenter and has twice been the subject of a work order.
2. The removal of microscope cabinets, relocation of a storage cabinet and a sink, installation of wall shelves for use with computers and the installation of hanging storage cabinets.
3. Addition of lecture functions in this room will require the purchase of an LCD panel, overhead projector and screen, as well as the replacement of the presently warped table top on the fron table.

Cost estimates for these alterations and purchases are included in the memo to the acting Dean (see Appendix #1).

V. BIBLIOGRAPHY

1. General Botany Books

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Galston, A.W., P.J. Davies and R.L. Satter. 1980. The Life of the Green Plant. 3rd ed. Prentice-Hall, Inc., NJ.

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Kaufman, P.B., T.C. Carlson, P. Dayandan, M.L. Evans, J.B. Fisher, C. Parks and J.R. Wells. 1989. Plants: Their Biology and Importance. Harper & Row, Inc., NY.

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Ray, P.M., T.A. Steeves and S.A. Fultz. 1983. Botany. Saunders College Pub., Philadelphia.

Rayle, D.L. and H.L. Wedberg. 1980. Botany. A Human Concern. 2nd ed. Saunders College Pub., Philadelphia.
Saigo, R.H. and B.W. Saigo. 1983. Botany: Principles and Applications. Prentice-Hall Inc., NJ
Schumann, D.N. 1980. Living with Plants: a Gardeners Guide to Practical Botany. Mad River Press, Inc. CA.
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Tippo, O. and W.L. Stern. 1979. Humanistic Botany. W.W. Norton & Co., NY.

2. Specialized Texts

a. Algae

Bold, H.C. and M.J. Wynne. 1985. Introduction to the Algae, 2nd ed. Prentice-Hall, NJ.
Smith, G.R. 1950. The Fresh-Water Algae of the United States, 2nd ed. McGraw-Hill, NY.

b. Anatomy

Cutter, E.G. 1978. Plant Anatomy: Cell and Tissues, Part 1, 2nd ed. Addison-Wesley Pub. Co., MA.
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Cutter, D.F. 1978. Applied Plant Anatomy. Longman Group Ltd., London.
Esau, K. 1977. Anatomy of Seed Plants, 2nd ed. Wiley & Sons, Inc., NY.

c. Ecology/Systematics/Evolution

Barbour, M.G., J.H. Burk and W.D. Pitts. 1987. Terrestrial Plant Ecology. Benjamin/Cummings Pub., NY.
Brown, L. 1976. Weeds in Winter. Norten Pub., MA.
Buckles, M.P. 1985. The Flowers Around Us. U. Missouri Press, St. Louis.
Capon, B. 1990. Botany for Gardeners. Timber Press, OR.
Daubenmire, R. 1978. Plant Geography. Academic Press, Inc., NY.
Ehrlich, P., A. Church and J. haldren. 1977. Ecoscience: Population, Resources, Environment. W.H. Freeman, CA.
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c. Fungi

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Kendrick, B. 1985. The Fifth Kingdom. Mycologue Pub, Ontario.
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d. Physiology

Briggs, W.R. (ed.) 1989. Photosynthesis. A.R. Liss, Inc., NY.
Devlin, R.M. and F.H. Witham. 1983. Plant Physiology, 4th ed. W. Grant Press, MA.
Fitter, A.H. and R.K.M. Hay. 1987. Environmental Physiology of Plants, 2nd ed. Academic Press, Inc., NY.
Harborne, J.B. 1988. Introduction to Ecological Biochemistry, 3rd ed. Academic Press, Inc., NY.
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Robinson, T. 1975. The Organic Constituents of Higher Plants, 3rd ed. Cordus Press, MA.
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Taiz, L. and E. Zeiger. 1991. Plant Physiology. Benjamin/Cummings, CA.
Wilkins, M.B. (ed.). 1984. Advanced Plant Physiology. Pitman, Bath.

3. Plant Science Journals

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BioScience
Brittonia
Bryology
Botanical Gazette
Ecological Monographs
Ecology
Journal of Ecology
Mycologia
Nature
PhytopathologyPhytochemistry
Plant Physiology
Planta
Science
Systematic Botany
Taxon
The Plant Cell

Torrey Botanical Club Bulletin

4. Reviews
Annual Reviews of Ecology and Systematics
Annual Reviews of Plant Physiology and Plant Molecular Biology
Annual Review of Plant Pathology
Botanical Review

Course Analysis Questionnaire

A. DETAILS OF THE COURSE

A1. This course will be one of the three diversity courses proposed for Biology majors. It will be taken by students who have completed Principles of Biology I and II. Thus, most students will take it in their sophomore year, although it is likely that all pre-professional students will delay taking this until their senior year by virtue of their need to take certain other courses in preparation for the MCAT and DAT exams. This course is designed for Biology majors and is not proposed for inclusion in the Liberal Studies course list.

A2. This course is proposed as part of a major revision of the Biology department B.S. and B.A. programs. These changes are described in the proposal for program revision. This course will replace BI 110, Plant Biology.

A3. The course does not follow the traditional type of offering in the department. It will combine lecture and lab, which historically have been separated, into a single unit in order to unite student thought, derived from lecture with actual experience derived from laboratory exercises and experiments. Lecture and lab, therefore, will be taught in single experiences twice a week.

We propose to teach this course by integration of lecture and laboratory into 2 1/2 hour classes held twice per week; this is time-equivalent to the more normal 2 hours of lecture and 3 hours of lab. This mode of teaching emphasizes that the laboratory material is not to be less valued than lecture material. In fact, we want to emphasize that the lecture material was discovered in the lab. The integration of what was separate lecture and lab material into a unity is made possible by the curriculum proposed.

Recent literature (see bibliography) emphasizes the need to alter, for a number of reasons which cannot be discussed here, science curricula from current practice. Teaching of science is seen as a process that should emulate the scientific process as much as possible. Thus, discovery and confirmation using a variety of tools are the prime foci. Additionally, the development of communities of learners that include the "teacher" and the personalization of knowledge are emphasized.

Such a curriculum, as here proposed, makes the above considerations possible. Immediate confirmation or discovery can only be carried out by merging the lecture and lab. Each class becomes a community of learners in which student-student as well as student-teacher interactions become a prime learning method. Further, close and frequent contact with the instructor, that such a format makes possible, allows the personalization of learning since not everyone can immediately see the logic in certain concepts or the conclusions from certain data sets.

One of the botany faculty at IUP, Dr. Jerry Pickering, has had the opportunity to use this method of instruction in BI 110, Plant Biology, in each of the last three summers. He is convinced of the value of this format. Students verify that this is a valuable pedagogic method. Not every student will do well, but it seems that a greater number of students can be brought to a higher level of interest using this instructional format.

Bibliography:

American Association of the Advancement of Science. 1990. The Liberal Art of Science: Agenda or Action. AAAS, Washington.

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Myers, C. 1986. Teaching Students to Think Critically. Jossey-Bass Pub., CA.

Penick, J.e. and J.A. Dunkhase (eds.) 1988. Innovations in College Science Teaching. Society for College Science Teachers, Washington.

Project Kalaidoscope Committees. 1991. What Works: Building Natural Science Communities, vo. 1. Project Kalaidoscope, Washington.

Rutherford, F.J. and A. Ahlgren. 1990. Science for All Americans. Oxford U. Press, NY.

Tobias, S. 1990. They're Not Dumb, They're Different. National Research Council, Tucson.

A4. This specific course has never been offered at IUP on a trial basis. BI 110, the course this one will replace, is the currently offered Botany course within the Biology department.

A5. This is not a dual-level offering.

A6. This course will not be offered for variable credit.

A7. Most colleges and universities offer Botany as part of their undergraduate programs in Biology.

A8. The content of this course is not mandated by any professional society, accrediting authority, law or external agency.

B. INTERDISCIPLINARY IMPLICATIONS

B1. This course will be taught by one instructor per section.

B2. No additional or corollary courses are needed with this course. Upper level courses in Plant Physiology, Field Botany and Mycology are often taken by those students gaining an initial interest in Botany.

B3. There is no overlap between this course and courses taught in other departments. This course will complement some course material on the Geoscience Department as regards the history of life on earth.

B4. Seats in this course can be made available to students in the School of Continuing Education.

C. IMPLEMENTATION

C1. Resources (See section VI of the Syllabus, Special Resource Requirements)

a. Current Biology Department faculty can teach this course.

b. Since lecture and laboratory will be combined they will be taught in a single laboratory room, and its adjacent preparation room, currently available in Weyandt Hall.

c. This course will be taught with the equipment currently available in the Biology Department.

d. The current Biology Department budget will serve for purchase of supplies.

e. The IUP library is weak in this area. Library materials can be supplemented by faculty personal libraries and the botany library in the A.G. Shields Herbarium.

f. Travel funds other than those normally needed to aid faculty in keeping current in their fields will be unnecessary.

C2. None of these resources will be from grants.

C3. This course will be offered each semester and in the summer.

C4. Two sections of this course will be offered each semester. Past experience indicates that occasionally a third section will be necessary in the spring semester. Further, it is anticipated that one section will be taught most summers.

C5. A combined lecture/laboratory section will accommodate a maximum of 24 students. This number is limited by laboratory design, facilities and by the manner in which we propose to teach this course.

C6. No professional society mandates any component of this course.

C7. This course will be part of a revision of the B.S. and B.A. programs in Biology. Botany, General Zoology and Principles of Microbiology will comprise the three required diversity courses taken by all Biology majors. It will be a prerequisite for upper-level Botany courses.

MAIL> extract tt:
From: GROVE::RGENDRON "Rob Gendron" 24-MAR-1995 12:29:36.62
To: DRCHRDSN
CC: RGENDRON
Subj: Bio Curriculum

To UWUCC:
Re: Biology Proposals 4/25/26
Responses to our Questions

Darlene,

I have made the corrections in the BI111 and Program proposals and sent the pages to you via campus mail. (yes, received + placed in proposals)

I have asked Bob Prezant and Bill Dietrich to comment on the question the committee had regarding BI105, BI210 and BI220. What follows are their slightly edited e-mail messages to me. As you can see, the library holdings are not so weak as to preclude the teaching of BI210 and BI220, which are both introductory courses. In their proposals Drs. Prezant and Dietrich have simply reiterated the plea for more support for the library. In this they probably reflect the feelings of the Biology Department, and probably many other faculty.

As Dr. Prezant's reply indicates, we forsee no problem in meeting the need for Cell Biology, even with the reduced class size.

Rob Gendron

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From Bob Prezant:

"Weak library holdings" signifies the current state of the University library for all Biology materials. Having said that: There is sufficient material in our zoology holdings in the IUP library to run the BI220 course as an introductory level majors course. The "weakness" stems from a lack of depth in those holdings. Students wishing to pursue deeper aspects of zoology, as introduced in BI220, will be challenged by our holdings.

BI105: The total number of seats for BI105 has not been reduced. With enrollment management taking effect for Nursing and with our Biology majors and Medical Technology students no longer taking BI105 (but instead taking Principles), the 2-3 sections of 48 students each should suffice. Teaching this course outside of Weyandt Hall is not a requirement; merely a suggestion to keep those students taking the course on their "home base". The course will be scheduled where appropriate rooms are available.

From Bill Dietrich:

Regarding BI210, Botany:
The library holding are weak but not enough so that we are unable to teach the course as described in the proposal. We pressntly supplement the holdings with our personal books and jopurnals.

The reply of the UWCC implies that the Biology department can do something about the woeful state of funding of the IUP library. As near as I know, we can only complain. The real question is: What will the university do to alleviate the problem. The library has been a low priority for funding for quite a while and the Biology department did not make or enforce that decision.