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LIBERAL STUDIES

Part II. Description of Curricular Change

I. Catalog Description

BIOL 123 Perspectives in Cell and Molecular Biology

1 class hour 0 Lab hours
1 semester hour (1c-0l-1sh)

Prerequisite: BIOL 111

Designed for those who are interested in entering the Cell and Molecular Biology Track. The course will introduce the latest advances in the fields of molecular biology and biotechnology, as well as the career possibilities and professional responsibilities in these fields. It is designed to aid students in clarifying career goals and introduce them to the literature of molecular biology, including electronic resources. It will include field trips that might take place on weekends.

II. Course Objectives

As a result of participation in this course, students will:

- a. become aware of the history of the DNA revolution, the basic principles of DNA technology, genomics and proteomics, and their impact on society today
- b. understand the most recent advances in genomic analysis and how this can be utilized in modern society
- c. appreciate the impacts of molecular biology and biotechnology on allied disciplines such as forensics, medicine, ecology, evolution and behavior
- d. discuss the ethical issues and concerns that have been raised in the field of molecular biology and biotechnology
- e. become aware of the literature in molecular biology
- f. interact in the group learning process

III. Detailed Course Outline

The topics for discussion are listed in the order that they will be presented during the semester. This sequence is based on a single one-hour meeting a week in an academic semester of 14 weeks. The discussions are meant to be a broad survey of topical areas of interest in molecular and cellular biology. The objective of the course is to have the students actively participate in the discussions, with the instructor providing structure and guidance. Readings from the textbooks, Internet and literature for each topic will be listed in the syllabus, and form the basis of the discussion.

Topical Outline: BIOL 123 Perspectives in Cell and Molecular Biology

Session 1 **Introduction to modern molecular biology and biotechnology and use of computers and the Internet as a means of accessing biological information**

- What is biotechnology? How does it relate to cellular and molecular biology? How is it used in modern society? How can modern biological information be accessed?

Session 2 **The history of molecular biology**

- The introduction of molecular biology into the field of biotechnology

Session 3 **A tour of the Cellular and Molecular Biology facilities at Indiana University of Pennsylvania**

- Tour of the facilities in the Biochemistry laboratory and laboratories of several IUP faculty

Session 4 **Guest speaker**

- A molecular biologist from an outside institution will be invited to speak to students about careers in molecular biology and biotechnology, and to provide the students with information on research in the field

Session 5 **Recent advances in transgenic technology as applied to animals and plants**

- Discussion of recent work such as gene transfer, transgenic animals and plant genetic engineering

Session 6 **Medical biotechnology- the future revolution in health care**

- Discussion of biotechnology and medicine

Session 7

Molecular investigations utilized in the courtroom

- Discussion of methods of DNA profiling and what is in store for future forensics studies

Session 8

Genome projects- discovery of the genetic blueprints from yeast to humans

- How genome sequences are obtained and the future use of genomic data

Session 9

Bioinformatics- how do you analyze genome data once they are generated?

- An introduction to the field of bioinformatics, its importance in modern molecular biology and the future of bioinformatics in biotechnology

Sessions 10-11

Fieldtrip to another institution

- This one day trip will account for 2 sessions. The students will visit an outside institution or biotechnology company in the area as a means of exposure to cutting edge molecular biology and biotechnology

Sessions 12

Ethical considerations and regulation

- The ethics and regulation of biotechnology and biomedical research will be discussed

Sessions 13-14

Student Presentations

- Students will make group oral presentations that focuses on a particular career opportunity in the fields of molecular biology and biotechnology

Session 15

Final exam week

- Students will meet for a debriefing session. They will discuss the material that was covered in the course and how it might be improved in the future.

IV. Evaluation Methods

Students will be evaluated on their performance in three written essays, on their student presentation to the class, and their participation in classroom discussions.

A. Types of Evaluation Used

1. A series of short essays

Each student will be required to write three short essays that deal with various topics in molecular biology and biotechnology. These will be assigned throughout the semester and will allow the student to critically evaluate information from the literature. The first assignment will be to identify an article in a newspaper or newsmagazine that deals with a current topic in molecular biology or biotechnology. The student will be asked to write a short essay on this topic, using the Internet as a source of further information. The importance of using Internet sources that are peer reviewed will be stressed in this assignment. The students will also be assigned review articles from scientific journals such as Scientific American and Science which provide overviews of the major topics in molecular biology and biotechnology.

2. Student Presentation

Groups of three or four students will present an oral presentation of a designated topic on career opportunities in molecular biology and biotechnology that has been approved by the instructor. These presentations will last 15-20 minutes. Students in the class will be expected to discuss the presentation and ask questions concerning the topic. Students will be encouraged to use current presentation technology.

3. Classroom participation

It will be expected that each student become an active participant in the classroom. The students will be required to have read in advance all materials that will be covered on a given day. In this manner, they will be able to participate in the discussion of each topic. The instructor will keep a record of the participation of each student during the course of the semester. This record will be broken into three categories and each category will be assigned a grade (++ = exceptional; + = acceptable; - = not acceptable). The three categories of evaluation will be A) the student had read and understood the assigned reading material; B) the student actively participated in the discussion of the assigned material; and C) the student displayed an ability to discuss the subject beyond the scope of the written material.

B. Grade Breakdown

1. Short essays (3 essays worth 10% each)	30%
2. Oral presentation	20%

3. Classroom participation

50%

C. Grading Scale

A = 90-100%, B = 80-89%, C = 70-79%, D = 60-69%, F = 0-59%

D. Attendance

The attendance policy will conform to the university wide attendance criteria.

V. Required Textbooks, Supplemental Books and Readings

A. Textbook:

BIOTECHNOLOGY: An Introduction by Susan R. Barnum, 1998, Wadsworth Publishing Company, Belmont, CA.
ISBN# 0-534-23436-4

UNDERSTANDING DNA AND GENE CLONING: A Guide for the Curious by Karl Drlica 1997, John Wiley & Sons, Inc. New York, New York
ISBN# 0-471-13774-X

B. Supplemental Readings (Optional):

A Passion for DNA: Genes, Genomes and Society by James D. Watson, 2000, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY
ISBN # 0-87969-581-1.

The Path to the Double Helix; The Discovery of DNA by R. Olby, 1994, Dover Pubns.
ISBN # 0486681173

Due Consideration: Controversy in the Age of Medical Miracles by Arthur Caplan, 1998, John Wiley, New York, USA
ISBN # 0-471-18344-X

C. Useful Web Sites

www.nih.gov National institutes of Health
www.nsf.gov National Science Foundation
www.ncbi.nlm.nih.gov National Center for Biotechnology Information
www.ndbserver.rutgers.edu Nucleic Acid Database Project
www.asmtusa.org American Society of Microbiology
www.biomedcentral.com BioMed Central

www.upenn.edu/bioethics Bioethics Internet Center
www.gene-watch.org Council for Responsible Genetics
http://fullcoverage.yahoo.com/fc/Science/Biotechnology_and_Genetics Biotechnology and Genetics- Yahoo
www.nhgri.nih.gov/index.html National Human genome Research Institute
www.ornl.gov/TechResources/Human_Genome/home.html Human Genome Project Page
www.cid.harvard.edu/cidbiotech/homepage.htm Biotechnology and Development
<http://srd.yahoo.com/drst/16887125/> Biotech Chronicles
www.bio.org/career/career1.html Biotechnology: The Choice for the Future

VI. Special Resource Requirements

The resources required for this course include the textbook and non-textbook readings. The students are not expected to supply any other resources and there is no lab fee associated with this course.

VII. Bibliography

- Anderson, W. French. 1995. Gene Therapy. *Sci. Am.* 273:124-128.
- Baker, K.H. *Bioremediation*, McGraw-Hill, New York, NY, 1994.
- Genetics and Society*. 1995. Barker, P (editor) The H.W. Wilson Company, New York.
- Becker, E.W. 1994. *Microalgae: Biotechnology and Microbiology*. Cambridge University Press, Cambridge, England.
- DNA on Trail: Genetic Identification and Criminal Justice*. 1992. Billings, P.R. (editor) Cold Springs Harbor laboratory Press, Cold Spring Harbor, New York.
- Bolin, Frederick. 1999. Leveling Land Mines with Biotechnology. *Nature Biotechnology*, 17:732.
- Bolsover, Stephan, Jeremy Hyams, Steve Jones, Elizabeth Shephard and Hugh White. 1997. *From Genes to Cells*. Wiley-Liss Press, New York, USA,
- Bonnicksen, Andrea L. 1998. The Politics of Germline Therapy. *Nature Genetics*, 19:10-11.
- Cohen, Phillip and Rachel Nowak. 1998. We Ask They Answer. *New Scientist*.
- Dale, Phillip. 2000. Public Concerns over Transgenic Crops. *Genome Research*. 10:1.
- Drilica, K.A. 1994. *Double-Edged Sword: The Promise and Risks of the Genetic Revolution*. Addison-Wesley Publishing Company, Reading, Massachusetts.

Fincham, J.R.S. and J.R. Ravetz. 1991. *Genetically Engineered Organisms: Benefits and Risks*. University of Toronto Press, Toronto, Canada.

Hartwell Leland, Leroy Hood, Michael Goldberg, Ann Reynolds, Lee Silver and Ruth Veres. 2000. *Genetics: From Genes to Genomes*, McGraw-Hill, Boston, USA.

Hoffert, Stephan P. 1998. Concerns Mount over Privacy as Genetic Research Advances. *The Scientist*.

The Code of Codes: Scientific and Social Issues in the Human Genome Project. 1992. Kevles, D.J. and L. Hood (editors). Harvard University Press, Cambridge, Massachusetts.

Lander, Eric S. 1996. The New Genomics: Global Views of Biology. *Science* 274:536-539.

Lewin, Benjamin. 2000. *Genes VII*. Oxford University Press, Oxford, England.

The Polymerase Chain Reaction. 1994. Mullis, Kerry, F. Ferre and R. Gibbs (editors). Birkhauser Verlag, Basel, Switzerland.

Transgenesis. 1992. Murray, J.A.H. (editor) John Wiley and Sons, Inc., New York, NY.

Peters, P. 1993. *Biotechnology: A Guide to Genetic Engineering*. Wm. C. Brown, Dubuque, Iowa.

Poirer, Yves. 1999. Green Chemistry Yields a Better Plastic. *Nature Biotechnology*. 17:960.

Sagar, Ambuj, et.al. 2000. The Tragedy of the Commoners: Biotechnology and Its Publics. *Nature Biotechnology*, 18:2.

Genetically Modified Organisms: A Guide to Biosafety. 1995. Tzotzoa, G.T. (editor). CAB International, United Kingdom.

Gene Targeting, 1995. Vega, M.A. (editor) CRC Press, Inc. Boca Raton, Florida.

Velander, W.H., H. Lubon, and W.N. Drohan 1998. Transgenic Livestock as Drug Factories. *Sci. Amer.* 276:70-75.

Wallace, Robert W. 1998. The Human Genome Diversity Project: Medical Benefits Versus Ethical Concerns. *Molecular Medicine Today*, 4:59-62.

Human Identification: The Use of DNA Markers. 1995. Weir, B.S. (editor). Kluwer Academic Publishers, Boston.

White, T.J. 1996. The Future of PCR Technology: Diversification of Technologies and Applications. *Trends in Biotechnol.* 14:478-483.

Zilinskas, R.A., R.R. Colwell, D.W. Lipton and R.T. Hill. 1995. *The Global Challenge of Marine Biotechnology: A Status Report of the United States, Japan, Australia and Norway*. Maryland Sea Grant Publications. College Park, Maryland.

2. Course Analysis Questionnaire

Section A: Details of the Course

A1. The course is designed to be a 1-credit non-laboratory science course that students must fulfill as part of their requirements for the Cell and Molecular Biology track in the Department of Biology. Students majoring in Biology can count this course as a controlled elective.

A2. This course does not require a change in any existing course or program.

A3. This course has never been offered at IUP.

A4. This course is not a dual-listed course.

A5. This course will not be offered for variable credit.

A6. While there appears to be no comparable course, several institutions offer related courses.

(1) BI 100 Orientation to Biology, Mansfield University of Pennsylvania- a freshman seminar course that talks about current trends and opportunities in the entire field of biology.

(2) BI 201 Introduction to Biotechnology, Shippensburg University of Pennsylvania- a sophomore level course that introduces the field of biotechnology and the recent advances in molecular biology.

(3) BSC 4401 Biotechnology; Applications in Industry, Agriculture and Medicine, Florida International University

(4) BIOL 2430 Biotechnology, Georgia State University- a course that emphasizes genetic engineering and applications to medicine and agriculture.

(5) BIOTC 001 Introduction to Biotechnology, Penn State University- a course through their Biotechnology program that introduces the scope of biotechnology, with applications to agriculture and the health sciences.

A7. No accrediting agency recommends or requires the skills or content of the proposed course.

Section B: Interdisciplinary Implications

B1. This course will be offered by a single instructor.

B2. There is no relationship between the content of this course and any existing course offered by other departments.

B3. Seats in this course will be made available for students in the School of Continuing Education.

Section C: Implementation

C1. One complement hour per offering will be required. Faculty resources are currently adequate.

- C2.
- a. Space: One average size classroom per offering, to be used one time a week. Current resources are adequate.
 - b. Equipment: Standard audio-visual equipment such as an overhead projector, screen, TV and VCR. The Biology Computer room will also be utilized. Current resources are adequate.
 - c. Laboratory supplies: Not required.
 - d. Library materials: Current holdings are adequate for an introductory course. However, students will be required to use inter-library loan, faculty collections and Internet resources to supplement the library holdings.
 - e. Travel Funds: No travel funds are required. University vans will be used to transport students to an outside institution.

C3. Not applicable. The course is not funded by a grant.

C4. It is expected that this course will be offered on a yearly basis, depending on demand.

C5. It is expected that the course will be offered during the Spring semester.

C6. The course can accommodate up to 24 students. This class size is predicated on the limited number of Biology vans used for field trips and the size of the computer facilities located in the Biology Department.

C7. No professional society recommends enrollment limits for a course of this nature.