

LSC Use Only

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Number: 92-22
Action: App
Date: 2/9/93
Senate App 3/2/93

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. Title/Author of Change

Course/Program Title: BI 466/566 Principles of Virology
Suggested 20 Character Course Title: Principles of Virology
Department: Biology
Contact Person: Dr. Carl S. Luciano

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. Henderson
Department Curriculum Committee

Allan T. Andrews
Department Chairperson

[Signature]
College Curriculum Committee

[Signature]
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

Date Submitted to LSC: _____
to UWUCC: _____

Semester/Year to be Implemented: _____

Date to be published in Catalog: _____

PART II. DESCRIPTION OF CURRICULUM CHANGE

1. Catalog Description

A camera-ready copy of the catalog description of Principles of Virology is included on a separate page as Appendix A.

2. Course Syllabus

I. Catalog Description

BI 466/566 PRINCIPLES OF VIROLOGY

3c-3sh

Prerequisite: BI 263 or equivalent course in Genetics or
CH 351 or equivalent course in Biochemistry or permission of the instructor

Topics include structure, classification, assay and transmission of viruses; methods used in the study of viruses; viral replication, gene expression and gene regulation; host-viral interactions and subviral pathogens.

II. Course Objectives

Students will achieve the following objectives as the result of taking this course.

1. Students will know the basic concepts of viral architecture, classification, gene expression and transmission. An understanding of some of the mechanisms involved in viral pathogenesis will also be gained.
2. Students will know the evolutionary relationships among viruses, between individual viruses and their hosts and those between viruses and subviral pathogens.
3. Students will demonstrate their knowledge of these topics by their performance on written examinations.
4. Students will gain familiarity with pertinent scientific literature in Virology.
5. Students will demonstrate familiarity with literature through two brief oral reports on journal articles and one term paper written on a separate topic.
6. Students will gain experience in the presentation of scientific data to a group of peers.

III. Detailed Course Outline

Topics are listed in the intended order of presentation. The number of lecture hours per topic is indicated in parentheses. In constructing the outline, a 13.5-week semester with two 1.5 hr

class meetings per week was assumed. One class meeting was allotted to a midterm exam and 8 class hours reserved for student presentations.

- 1) Introduction to Virology (1)
- 2) Definition of Viral Types and Classification of Viruses (1)
 - a. traditional methods
 - b. the Baltimore scheme
- 3) Structure of Viruses (2)
 - a. structural components
 - b. the quasi-equivalence theory
 - c. types of viral particles
- 4) Assay of Viruses (2)
 - a. one-step growth curves
 - b. plaques, local lesions, foci
- 5) Methods Used in the Study of Viruses (3)
 - a. ultracentrifugation
 - b. electrophoresis
 - c. immunological methods
 - d. recombinant DNA methods and sequencing
 - e. electron microscopy
 - f. tissue culture methods
- 6) Viral Gene Expression and Regulation (6)
 - a. bacteriophage lambda and lysogeny
 - b. adenoviruses and splicing
 - c. RNA bacteriophages
 - d. tobacco mosaic virus: cotranslational disassembly and subgenomic messenger RNAs
 - e. protein processing in picornavirus-infected cells
 - f. expression by double-stranded and (-) strand RNA viruses
- 7) Viral Replication (6)
 - a. double-stranded DNA bacteriophages
 - b. single-stranded DNA bacteriophages and rolling circle replication
 - c. eukaryotic DNA viruses
 - d. retro- and caulimoviruses
 - e. protein-primed replication by poliovirus
- 8) Host-virus Interactions (4)
 - a. the entry of viruses into cells
 - b. the thymidine kinase gene of herpes viruses
 - c. inhibition of host protein synthesis by poliovirus
 - d. animal cell transformation
 - e. release of viruses from infected cells
 - f. interferon
- 9) Assembly of Viruses (1)
 - a. tobacco mosaic virus
 - b. bacteriophage lambda

- 10) Transmission of Viruses (2)
 - a. vectors
 - b. the aphid transmission factor of potyviruses
- 11) Sub-viral Pathogens (2)
 - a. viroids
 - b. prions
- 12) Evolution of Viruses (1)

IV. Evaluation Methods

The numbers in parentheses indicate the percent of the final grade to be derived from each evaluation method.

- A. Examinations (Total = 70%)
 - i. One mid-semester exam (35%)
 - ii. One comprehensive final exam (35%)

Examinations will consist of three sections. One section will contain "fill-in-the-blank" type questions to which students are required to supply a one- or two-word answer to specific questions. The second section will consist of short problems to which students are required to supply a one- or two-sentence answer or mathematical solution. The third section will consist of essay questions to which students are required to respond with well-organized 200-500 word answers. The third section will contain about 30% of the total points on each exam.

- B. One term paper (20%)

Students will be required to write a (10-15 standard double-spaced typed pages) term paper on one aspect of Virology. Students will be allowed a high degree of freedom in selecting the topic in order to maximize their interest but they will be expected to adhere to a fairly rigid schedule and set of format requirements.

Students will select an area of special interest in Virology. The instructor will meet with individual students and together they will focus and define a term paper topic within the area of special interest. A decision on the term paper topic will be due about four weeks after the semester begins. The early deadline requires students to survey the text and other materials soon after the semester begins.

Students will identify general and/or key references pertaining to the term paper topic. They will begin to collect copies of these references from the IUP library or other sources as needed. A preliminary bibliography will be due about five weeks after the semester begins.

Students will continue to collect reference material and to develop a sense of the organization of their term paper. A preliminary outline of the paper and a revised bibliography will be due about 7 weeks after the semester begins.

Students will write a rough draft of the term paper and submit it to the instructor about 9 weeks after the semester begins. The instructor will hold an individual conference with each student in order to discuss the rough draft and make suggestions for revision.

Students will revise the rough draft and turn in the final copy about 11 weeks after the semester begins. In its final form, the term paper is to resemble a formal scientific review article (from "The Annual Review of Microbiology," for example) and is to be substantially correct in grammar, usage, punctuation and spelling as well as scientific terminology. The term paper is expected to demonstrate the author's ability to synthesize material from various sources and to think critically about scientific data.

C. Oral Presentations (Total = 10%)

Students will make two oral presentations of separate research papers in Virology chosen by the student from recent scientific journals. Students are expected to focus on the results of these studies, to comment on their significance and to raise questions and counterarguments to the conclusions of the studies.

V. Required Textbooks, Supplemental Books & Readings

The text book required for the course is: Virology, 2nd ed., by H. Fraenkel-Conrat, P.C. Kimball and J.A. Levy, Prentice-Hall, Inc., Englewood Cliffs, 1988. No other text is to be required.

VI. Special Resource Requirements

The student is expected to supply the instructor with one photocopy of each journal article presented to the class. No lab fee is associated with the course.

VII. Bibliography

(A) Textbooks, Standard Reference Works

Collins, Mary K.L. (ed.) Practical Molecular Virology. Humana Press, Clifton, 1991.

Diener, T.O. Viroids and Viroid Diseases. John Wiley and Sons. New York: 1979.

Dimmock, N.J., and S.B. Primrose. Introduction to Modern Virology 3rd ed. Blackwell Scientific Publications. Oxford: 1987.

Fraenkel-Conrat, Heinz; Paul C. Kimball, and Jay A. Levy. Virology 2nd ed. Prentice-Hall, Inc. New Jersey: 1988.

Gibbs, Adrian, and Bryan Harrison. Plant Virology; The Principles. John Wiley and Sons. New York: 1976.

Goodheart, Clyde R. An Introduction to Virology. W.B. Saunders Company. Philadelphia: 1969.

Joklik, W.K. Virology (3rd ed.) Appleton & Lang. East Norwalk. 1988.

Kornberg, A. and T. Baker. DNA Replication (2nd ed.). W.H. Freeman and Co. New York, 1992.

Knight, C.A. Chemistry of Viruses 2nd ed. Springer-Verlag. New York: 1975.

Luria, S.E., James E. Darnell, Jr., David Baltimore, and Allan Campbell. General Virology 3rd ed. John Wiley and Sons. New York: 1978.

Robertson, Hugh D. (ed.), Stephen H. Howell (ed.), Milton Zaitlin (ed.), Russell L. Malmberg (ed.). Plant Infectious Agents; Viruses, Viroids, Virusoids, and Satellites. Cold Spring Harbor Laboratory; 1983.

Smith-Keary, Peter. Molecular Genetics of *Escherichia coli*. The Guilford Press, New York; 1989.

Watson, J.D., Witkowski, J., Gilman, M. and M. Zoller. Recombinant DNA (2nd ed.). Scientific American Books, New York, 1992.

A more extensive list of primary and secondary material is provided in Appendix D.

III. Course Analysis Questionnaire

A: Details of the Course

A1.

- (1) This course fills an academic need for an advanced undergraduate course in the general area of molecular biology. The Biology Department offers few such courses, but, judging from conversations with students and the high enrollment when Principles of Virology was taught as a Special Topics offering, demand for such a course exists.
- (2) The content of this course complements existing Department offerings in Microbiology, Immunology and Cell Physiology. The course presents a survey of virological principles rather than an in-depth examination of a select group of viruses and their effects on their hosts (human pathogens, for example).
- (3) The course is designed for a clientele which includes any qualified undergraduate with an interest in molecular biology. The following groups would be likely to be among these students: (a) upper-division undergraduates majoring some aspect of Biology, including Pre-Med; (b) upper division undergraduate majoring in Chemistry or Biochemistry and having an interest in molecular biology; and (c) an occasional upper-division undergraduate from Allied Health or Continuing Education.
- (4) The course is not designed as a Liberal Studies elective nor is it proposed for inclusion in the Liberal Studies course list.

A2. This course does not require changes in the content of existing courses.

A3. This course follows the traditional type of offering by the Biology Department. It is not considered novel.

A4. The course has been offered once at IUP on a dual-listed Special Topics basis during the Spring, 1991 semester. Thirty-five students enrolled in the course.

A5. This course is to be a dual-level course. Review at the graduate level is taking place concurrently with review at the undergraduate level.

A6. The course is not to be taken for variable credit.

A7. A list of higher education institutions which offer a similar course, along with transcripts of corresponding catalog descriptions, is provided as Appendix B.

A8. No accrediting agency recommends or requires the skills or the content of the proposed course.

B: Interdisciplinary Implications

- B1. The course will be taught by a single instructor.
- B2. No additional or corollary courses are needed now or later.
- B3. The course complements but does not overlap offerings of the Chemistry Department and of the Biochemistry Program at IUP.
- B4. Seats in the course will be made available to students in the School of Continuing Education.

C: Implementation

- C1. The following resources will be needed to teach this course.
 - *Faculty: Three complement hours per offering, current resources are adequate.
 - *Space: One average-size classroom per offering, to be used twice a week, current recourses are adequate.
 - *Equipment: Standard audio-visual equipment such as an overhead projector and screen, current resources are adequate.
 - *Laboratory Supplies: None needed.
 - *Library Materials: Current holdings are adequate for oral presentations but inadequate for term papers. Students will be expected to use inter-library loan, reprint requests, faculty journal collections and libraries other than IUP's to make up the deficiency.
 - *Travel Funds: Students are expected to fund their own travel to out-of-town libraries.
- C2. None of the resources are funded by a grant.
- C3. It is expected that the course will be offered in alternate years, during the Spring semester.
- C4. It is anticipated that a single section of the course will be offered during any given semester.
- C5. The course can accommodate a total of 24 undergraduate and graduate students per section. Class size is limited by the number of journal article presentations which can be conveniently made in a semester.

- C6. No professional society recommends enrollment limits or parameters for a course of this nature.
- C7. The course is not a curriculum requirement. It will serve primarily as a free elective for undergraduates in Biochemistry, Biology, and Chemistry. The graduate component of this dual-listed course will serve as controlled elective for Biology graduate students and as a free elective for Chemistry graduate students with a Biochemistry specialization. The course will be open to interested students from other departments.

D: Miscellaneous

No miscellaneous items are included in this proposal.

APPENDIX A

Catalog Description of Principles of Virology

BI 466/566 PRINCIPLES OF VIROLOGY

3c-3sh

Prerequisite: BI 263 or equivalent course in Genetics, or CH 351 or equivalent course in Biochemistry, or permission of the instructor.

Topics include structure, classification, assay and transmission of animal, bacterial and plant viruses; methods used in the study of viruses; viral replication, gene expression and gene regulation; host-viral interactions and sub-viral pathogens.

APPENDIX B

Catalog Descriptions of Similar Courses at Other Institutions

Biology 456 VIROLOGY

West Chester University of Pennsylvania
1989-1990 Catalog

BIO 465 VIROLOGY (3)*

Molecular biology of bacterial, plant and animal viruses; virus classification, ultrastructure, mechanisms of replication and effects of virus on host cell.

Prerequisites: one year of organic chemistry and BIO 330**

* 3-credit course meeting 3 hrs/wk with no lab

** BIO 330 is an undergraduate Course in Genetics

BIOL 443 VIROLOGY

Clarion University of Pennsylvania
1990-1991 Catalog

BIOL 443 VIROLOGY

3 s.h.

A study of plant, animal and bacterial viruses with emphasis on biochemistry, structure, life-cycles and disease-causing mechanisms. 3 class hours per week.

Pre-requisites: CHEM 453* and BIOL 341** or consent of instructor. Fall, annually.

* CHEM 453 is an undergraduate Biochemistry course

** BIOL 341 is an undergraduate Microbiology course

BIO 444 BASIC VIROLOGY

James Madison University
1990 Catalog

BIO 444 BASIC VIROLOGY

3 cr.

A study of the fundamental aspects of both basic and medical virology.

Pre-requisite: Microbiology or consent of the instructor. Credit may not be earned in both BIO 444 and BIO 644.

BMED 534 VIROLOGY
 Western Michigan University
 1987-1989 Catalog

BMED 534 VIROLOGY

3 hrs. winter

A study of the classification, structure and chemistry of viruses. Emphasis will be placed on the cell-virus interactions leading to the disease process of cellular alterations in mammalian systems.

Prerequisite-BMED 312 (Microbiology)
 Recommended-Biochemistry

BIOL 407 VIROLOGY
 Western Kentucky University
 1991 Catalog

BIOL 407 VIROLOGY 3 hrs

Prerequisite-BIOL 220* and one Microbiology course

A study of Bacterial, Animal and Plant viruses with special emphasis on the chemistry and replication of bacterial viruses. 3 lecture hours per week (Spring, odd-numbered years).

*BIOL 220 is entitled "Introduction to Molecular Biology"

MICR 441-3 VIROLOGY LECTURE
 Southern Illinois University
 1990-1991 Catalog

MICR 441-3 VIROLOGY LECTURE

General properties, classification, multiplication of bacterial and animal viruses. Lysogeny, immunological and serological reactions, relation of viruses to cancer, consideration of selected viral diseases of animals.

Prerequisites: BIO 301 and 302*

*BIO 301 and 302 are undergraduate courses in Molecular Biology and Microbiology, respectively.

BIOL 281 INTRODUCTION TO VIROLOGY

Drake University
1990-1992 Catalog

BIOL 281 INTRODUCTION TO VIROLOGY

2 hrs.

Virus structure and function, growth characteristics, with emphasis on viruses of humans.

Prerequisite: BIOL 103*

Spring

*BIOL 103 is an undergraduate course in Microbiology

APPENDIX C

Information Required for Review at the Graduate Level

At the graduate level, this dual-listed course is designed primarily as a controlled elective for Biology students. It may also be elected by students in Chemistry with a Biochemistry emphasis, students from other IUP departments, or high school teachers maintaining currency in a subject area (this actually occurred when the course was offered on a Special Topics basis). The experience of a graduate student will differ from that of an undergraduate in both quantitative and qualitative ways.

First, a graduate student will be expected to do more writing than an undergraduate. The hour examinations will contain a special "For Graduate Students Only" section with additional essay questions and problems above and beyond those answered by undergraduates. For graduate students, 50-60% of the grade on each exam will be derived from essay questions. Graduate students will be expected to conduct a more thorough literature survey than undergraduates in preparing the term paper. Graduate students will be expected to process and synthesize more material than undergraduates during the term paper process.

Second, graduate students will be held to a higher standard of performance than undergraduates. Graduate students will be expected to produce better organized and more detailed writing than undergraduates. Graduate students will be expected to show greater ability to synthesize concepts gained from previous studies with those gained in this course. Graduate students will be expected to demonstrate superior skills in the analysis of scientific data than undergraduates.

The instructor will maintain separate grading scales for graduates and undergraduates.

A list of other institutions offering similar graduate courses in Virology, as well as catalog descriptions of those courses, is provided as Appendix E.

Appendix D
Additional Primary and Secondary References

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APPENDIX E

Graduate-level Courses in Virology Offered at Other Institutions

1. Bowling Green State University (1990-1992 graduate catalog)

BIOL 562

BIOL 562. Virology (4) I. Alternate years. Properties, functions, and replication of viruses; interactions with cells and hosts; fundamental principles of methods commonly used for handling and studying animal viruses. Two 1-hour lectures and two 3-hour laboratories, plus arranged time. Prerequisite: consent of instructor.

2. Penn State University (1990-1992 Graduate Degree Programs Bulletin)

CMBIO 553

553. (MICRO 553) SCIENCE OF VIROLOGY (3) Emphasizes replication of viruses and effect on host, including transfer of genetic information, immunology, and oncogenic properties of viruses.

3. University of North Dakota (1991-1993 Catalog)

Microbiology and Immunology 501

501. VIRUSES

Three credits

Prerequisites: Microbiology and biochemistry and/or consent of instructor. Chemistry and biochemistry of bacterial and animal viruses.

4. San Diego State University (1986-1987 Catalog)


BIO 552

552. General Virology (2) I, II

Prerequisite: Biology 350. Recommended: Biology 585 and 589. Viruses, their structure, function, culture, and methods of study. (Formerly numbered Microbiology 535.)

Date: January 12, 1993

To: Dr. Hilda Richards
Provost

From: Aleksandra B. Kaniasty 
Assistant to the Dean, NS&M

Subject: Curriculum Proposals

Attached please find four curriculum proposals from the College of Natural Sciences and Mathematics to be reviewed by the UWUCC. The course BI 466/566 Principles in Virology has been offered as a Special Topics course therefore will not require additional resources to implement. The other proposals are program revisions, B.S. in Natural Science and B.S. in Physics Education, and a revision of the number of credits that can be taken as a Geoscience internship. None of these revisions require any additional resources.