

Curriculum Proposal Cover Sheet – form is available on-line as an interactive PDF

13-361.

LSC Use Only Proposal No: LSC Action-Date:	UWUCC Use Only Proposal No: <u>12-1374</u> UWUCC Action-Date: <u>App-8/27/13</u>	Senate Action Date: <u>App - 10/8/13</u>
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Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) Robert Major	Email Address rmajor@iup.edu
Proposing Department/Unit Biology	Phone 7-7958

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

New Course Course Prefix Change Course Deletion

Course Revision Course Number and/or Title Change Catalog Description Change

Current course prefix, number and full title: _____

Proposed course prefix, number and full title, if changing: **BIOL 202 Principles of Cell & Molecular Biology**

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

Learning Skills Knowledge Area Global and Multicultural Awareness Writing Intensive (include W cover sheet)

Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)

Global Citizenship Information Literacy Oral Communication

Quantitative Reasoning Scientific Literacy Technological Literacy

Received

3. Other Designations, as appropriate

Honors College Course Other. (e.g. Women's Studies, Pan African)

APR 29 2013

Liberal Studies

4. Program Proposals

Catalog Description Change Program Revision Program Title Change New Track

New Degree Program New Minor Program Liberal Studies Requirement Changes Other

Current program name: _____

Proposed program name, if changing: _____

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)	<i>Sarah Stewart</i>	30 Nov. 2012
Department Chairperson(s)	<i>Wino</i>	30 NOV 2012
College Curriculum Committee Chair	<i>Ann Koda</i>	4/24/13
College Dean	<i>Dane Surf</i>	4/29/13
Director of Liberal Studies (as needed)		
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	<i>Crail Sedquist</i>	9/25/13

Part II. Description of Curriculum Change

1. Syllabus of Record

I. Catalog Description

BIOL 202 Principles of Cell & Molecular Biology
Prerequisite: CHEM 111 or CHEM 113

3c-3l-4cr

Introduction to the structure and function of prokaryotic and eukaryotic cells and their cellular biochemistry, with emphasis on the genetic flow of information from DNA to RNA to protein and the regulatory events, including cell-cell communication, that instruct these pathways. Develops skills in the use of the scientific method. For Science majors.

II. Course Outcomes

Students will be able to:

- 1. Explain important concepts in cellular and molecular biology and their relevance to other disciplines in Biology.**
- 2. Explain the regulatory events that allow for a transfer of genetic information from the nucleus to other areas of the cell.**
- 3. Discuss the role of proteins as enzymes for metabolism, mediators of intercellular and intracellular signaling events, structure, and transport.**
- 4. Formulate hypotheses based on observations of natural phenomena, design experiments to test hypotheses, collect and analyze data, and interpret experimental results.**
- 5. Communicate effectively in writing (prose, graphs and tables) their experimental methodology, results, and conclusions.**

III. Detailed Course Outline

Lecture Schedule

A. Introduction to Cellular Biology

- | | |
|--|-------------|
| 1. Microscopy, Scale, and Introduction to Cellular Organelles | 1 hr |
| 2. Basic Biological Chemistry | |
| a. Chemical bonds, Water, and Macromolecular Building Blocks | 1 hr |

3. Energy Flow Within Cells	2 hr
a. Thermodynamics, ATP, and Free Energy	
b. Enzymes, Anabolism and Catabolism	
4. Protein Structure and Function	4 hr
a. The Levels of Protein Structural Organization	
b. Cellular Regulation of Protein Function	
c. Technologies for Studying Protein Structure and Function	
5. Structure and Replication of DNA	2 hr
a. Historical Models of DNA Replication	
b. DNA Synthesis at the Replication Fork	
Exam 1	1 hr
B. The Flow of Genetic Information	
1. DNA Repair	3 hr
a. The Results of Genetic Mutations	
b. Generating Genetic Variation and Evolution of Genes and Genomes	
c. Mechanisms of Mutation Repair	
2. DNA Recombination	1 hr
a. Exchange of Genetic Information During Meiosis	
b. Mobile Genetic Elements and Viruses	
3. Transcription	3 hr
a. Initiation and Control of Eukaryotic Gene Transcription	
b. RNA Splicing	
c. Initiation and Control of Prokaryotic Gene Transcription	
4. Translation	2 hr
a. The Genetic Code	
b. The Ribosome	
c. Post-Translational Modification	1 hr
5. Tools to analyze Genetic Material	2 hr
a. Recombinant DNA Technology and Gene Cloning	
b. The Polymerase Chain Reaction and Modern Applications	
c. DNA Sequencing	
d. Microarray and Whole Transcriptome Analyses	
Exam 2	1 hr
C. Membranes and Cell-Cell Communication	
1. Membrane Structure	1 hr
a. Lipid Bilayer and Membrane Proteins	
2. Membrane Transport	1 hr
a. Concentration Gradients, Channels, and Passive Transport	
b. Ion Pumps and Active Transport	
c. Membrane Potential and Nerve Cell Signaling	
3. Protein Sorting and Vesicular Transport	2 hr
a. The Signal Sequence	
b. The Endoplasmic Reticulum and Golgi Complexes	
c. Lysosomes and Endocytosis	

4. The Principles of Cell Signaling	3 hr
a. Types of Cell-Cell Communication	
b. G-Protein-Coupled and Enzyme-Coupled Receptors	
c. 2 nd Messengers as Mediators of Signal Transduction	
5. The Cytoskeleton and the Extra-Cellular Matrix	2 hr
Exam 3	1 hr
D. Cell Division and Cellular Metabolism	
1. The Eukaryotic Cell Cycle	1 hr
a. The Phases of the Cell Cycle	
b. Checkpoints, Cyclins, and Cell cycle Control	
2. Cancer	1 hr
3. Energy Metabolism	6 hr
a. Breakdown of Sugars and Fats	
b. The Krebs Cycle	
c. Feedback Regulation	
d. Electron Transport and Oxidative Phosphorylation	
e. Chloroplasts and Photosynthesis	
Exam 4 (Final Exam)	2 hr

Lab Schedule

Week 1	Applications of the Scientific Method in Cell Biology
Week 2	Introduction to Microscopy
Week 3	Osmosis and Diffusion
Week 4	Differential Centrifugation/Sub-cellular Fractionation
Week 5	Enzyme Assay on Sub-cellular Fractionation Samples
Week 6	Mitosis and Meiosis Lab
Week 7	DNA Extraction
Week 8	PCR Amplification of Extracted DNA
Week 9	Agarose Gel Electrophoresis of PCR Products
Week 10	Histological Staining of Subcellular Proteins
Week 11	Fluorescence Confocal Microscopy
Week 12	Stem Cell Fate in Planarian Regenerates Part 1

Week 13 Stem Cell Fate in Planarian Regenerates Part 2

Week 14 Group Presentations

IV. Evaluation Methods

- 25% Lab (100 points) Lab grades will be based upon a mix of quizzes, lab reports, and lab exercise summaries. Lab instructors will determine the proportions of various assignments.
- 60% Exams (Exam 1 = 60 points; Exam 2 = 60 points; Exam 3 = 60 points; Exam 4 = 60. Exams may include a variety of question types, depending on the lecture professor's choices.
- 15% In class assignments or Homework (60 points) These may be variable among lecture professors. An example would be points associated with reading and answering questions on articles from the Science Times section of the New York Times. This segment also lends itself to case studies for small-group work.

V. Example Grading Scale

≥ 90% A; 80 – 89% B; 70 – 79 % C; 60 – 69% D ; < 60% F

VI. Undergraduate Course Attendance Policy

The attendance policy will be in accordance with University guidelines as outlined in the undergraduate catalog.

VII. Required Textbook(s), Supplemental Books and Readings

Alberts, B., Bray, D., Hopkin, K., Johnson, A., Lewis, J., Raff, M., Roberts., Walter, P. 2010. Essential Cell Biology, 3rd edition. Garland Science, New York, NY.

Individual instructors may require a non-textbook reading. Examples are:

Bray, D. 2011. Wetware: A Computer in Every Living Cell. Yale University Press

Carroll S.B. 2006. Endless Forms Most Beautiful: The New Science of Evo Devo. W. W. Norton & Company.

Goodsell, D.S. 2009. The Machinery of Life. Springer Science+Business Media, New York, NY.

VIII. Special Resource Requirements

None.

IX. Bibliography

Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P. 2007. Molecular

- Biology of the Cell. 5th Edition. Garland Science, New York, NY.
- Berg, J. M., Tymoczko, J.L., and Stryer, L. 2010. Biochemistry 7th Edition. W. H. Freeman and Company, New York, NY.
- Cooper, G.M., and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th Edition. Sinauer Associates, Inc.
- Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., and Doebley, J., 2012. Introduction to Genetic Analysis. 10th Edition. W. H. Freeman and Company, New York, NY.
- Lewin, B., Cassimeris, L., Lingappa, V., and Plopper, G., editors. 2007. Cells. W. H. Freeman and company. New York, NY.
- Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A., and Scott, M.P. 2012. Molecular Cell Biology. 7th Edition. W. H. Freeman and Company, New York, NY.
- Nelson, D.L., and Cox, M.M. 2008. Lehninger Principles of Biochemistry. 5th Edition. W. H. Freeman and company, New York, NY.
- Watson, J.D., Baker, T.A., Bell., S.P., Gann, A., Levine, M., and Losick, R. 2007. Molecular Biology of the Gene. 6th Edition. Cold Spring Harbor Laboratory Press.

2. Course Analysis Questionnaire

Section A: Details of the Course

A1. How does this course fit into the programs of the department? For which students is the course designed? Explain why this content cannot be incorporated into an existing course.

We are revising our core curriculum to create three pillars of biology: BIOL 201 Principles of Ecology & Evolution, BIOL 202 Principles of Cell & Molecular Biology, and BIOL 203 Principles of Genetics & Development. The change in the core curriculum constitutes a shift in philosophy, moving away from a lengthy list of topics to a more integrated and focused cluster of courses. Also, we are shifting away from the old-fashioned botany-zoology dichotomy to a modern levels-of-organization approach. BIOL 202 Principles of Cell & Molecular Biology is designed to be the second biology course for freshman biology majors and other science majors. It will replace BIOL 111 Principles of Biology I. BIOL 111 included basic cellular biochemistry, cellular and molecular biology, genetics, and physiology. The new course is designed to provide biology majors with a dedicated cellular and molecular biology course and will allow for a greater emphasis on molecular genetics. This will decrease the level of molecular genetics in BIOL 203 Principles of Genetics & Development, allowing for a strengthening of population, quantitative, and evolutionary genetic components for that course.

A2. Does this course require changes in the content of existing courses or requirements for a program? If catalog descriptions of other courses or department programs must be changed as a result of the adoption of this course, please submit as separate proposals all other changes in courses and/or program requirements.

This course is part of the program revisions being submitted by the Biology Department. Relevant revisions to biology courses and programs accompany this course proposal.

Other departments affected by this change are listed in the Letters section of this proposal, and those departments are aware of the necessary changes in their programs.

A3. Has this course ever been offered at IUP on a trial basis (e.g., as a special topic)?

This course is replacing BIOL 111 Principles of Biology I, a course that has been taught routinely for many years. Currently BIOL 111 Principles of Biology I is the first course in the freshman sequence, and it is offered only in the Fall semester.

A4. Is this course to be a dual-level course?

This course is not dual-level.

A5. If this course may be taken for variable credit ...

This course is not offered for variable credit.

A6. Do other higher education institutions currently offer this course? If so, please list examples (institution, course title).

One reason we are changing the title of our introductory course is because it is difficult to identify content when the title is generic, e.g., principles of biology. Most schools still have the generic title for freshman courses, but cellular and molecular topics are fundamental in any introductory courses. Examples include:

Duquesne University: BIOL 212 Cell and Molecular Biology and Lab 4 cr

University of Pittsburgh: BIOSC 1500 Cell Biology and lab 4cr

University of Pennsylvania: BIOL 202 Cellular Biology and Biochemistry and lab 4 cr

A7. Is the content, or are the skills, of the proposed course recommended or required by a professional society, accrediting authority, law or other external agency?

No external agency monitors the content or skills of this of this course.

Section B: Interdisciplinary Implications

B1. Will this course be taught by instructors from more than one department or team taught within the department? Is so, explain the teaching plan, its rationale, and how the team will adhere to the syllabus of record.

This course will be taught by biology professors only. Generally, there are three lecture professors, each teaching a separate lecture section, who both adhere to the syllabus of record. Both sections use the same textbook. Additional faculty members are usually involved in the labs. The philosophy is to maintain open lines of communication among all the instructors involved in the course. The lecture and lab professors meet regularly to coordinate activities. A laboratory manual containing one set of laboratory activities is

used by all instructors, although we allow for some individual interpretations of the activities. The laboratory activities are routinely discussed and all faculty members participate in the preparation and clean-up of labs.

B2. What is the relationship between the content of this course and the content of courses offered by other departments? Summarize your discussions (with other departments) concerning the proposed changes and indicate how any conflicts have been resolved. Please attach relevant memoranda from these departments that clarify their attitudes toward the proposed change(s).

The content of this course is not offered by other departments. Letters of support or acknowledgment have been requested.

B3. Will this course be cross-listed with other departments?

This course will not be cross-listed with other departments.

B4. Will seats in this course be made available to students in the School of Continuing Education?

This course is designed specifically for biology majors, but a student in the School of Continuing Education may register for the course.

Section C: Implementation

C1. Are faculty resources adequate? What will be taught less frequently or in fewer sections to make this possible?

This course replaces BIOL 111 Principles of Biology I. We expect the faculty load to be similar to the existing faculty load for the current course. There may be a slight decrease in student enrollment by offering this course in the second semester of the freshman year rather than the first semester of the freshman year. This is based on past observations of attrition in spring.

C2. What other resources will be needed to teach this course and how adequate are the current resources? If not adequate, what plans exist for achieving adequacy? Reply in terms of the following: space, equipment, laboratory supplies and other consumable goods, library materials, and travel funds.

Other resources are adequate. Space and equipment from the existing course, BIOL 111, will be used for the new course. We plan to move this course to the new science building when it is constructed. Laboratory supplies are budgeted each year within the biology department. Library materials are adequate. No travel funds are needed.

C3. Are any of the resources for this course funded by a grant?

No resources for this course are funded by a grant.

C4. How frequently do you expect this course to be offered? Is this course particularly designed for or restricted to certain seasonal semesters?

We expect to offer the course every year in the spring semester as part of a freshman year experience for biology majors. It would be feasible to teach the course in summer, but we do not expect sufficient enrollment to be able to offer the course in summer.

C5. How many sections of this course do you anticipate offering in any single semester?

In fall semester of 2012, BIOL 111 was offered with three lecture sections and 14 lab sections. We expect enrollment in BIOL 202 to be comparable to BIOL 111. In the future, we anticipate that departments and programs other than Biology, including the Biochemistry and Natural Sciences Programs, will likely want their students to take BIOL 202.

C6. How many students do you plan to accommodate in a section of this course? What is the justification for this planned number of students?

Each lab section will contain no more than 24 students since this is the maximum capacity of the lab room. Each lecture section will be in multiples of 24, with four or five lab sections associated with one lecture section.

C7. Does any professional society recommend enrollment limits or parameters for a course of this nature?

No professional society recommends enrollment limits or parameters for this course.

C8. If this course is a distance education course, ...

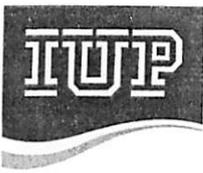
This course is not a distance education course.

Section D: Miscellaneous

None

Part III. Letters of Support or Acknowledgment

Allied Health Professions: Clinical Laboratory Science
Biochemistry
Chemistry
Geoscience
Natural Science
Psychology



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September 7, 2013

This is to confirm that I have read the new curriculum proposals being put forth by the Biology Department in regards to changes in the core curriculum, and agree that they will not have any consequences to the Biochemistry program. Previously the Biochemistry students took BIOL 111, but the new course BIOL 202 will be an adequate substitution as an introductory biology course. I look forward to seeing the new courses being put into place.

A handwritten signature in black ink, appearing to read 'Robert Hinrichsen', with a long horizontal stroke extending to the right.

Robert Hinrichsen
Associate Professor
Coordinator- Biochemistry Program
Indiana University of Pennsylvania



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September 9, 2013

TO WHOM IT MAY CONCERN:

As indicated in the current IUP Undergraduate Catalog, students in the Natural Science B. S. program (all tracks) must take a total of 6 courses that are offered through the Biology Department, including BIOL 111, BIOL 112, BIOL 150, BIOL 151, BIOL 241, and BIOL 263. The multi-part proposal for revising the Biology Department's core curriculum that is now under consideration by the University Wide Undergraduate Curriculum Committee contains at least one provision that impacts the Natural Science program. That provision involves the elimination of the course BIOL 263 (Genetics). BIOL 263 is not only one of the courses required for students in the Natural Science program; it serves a second purpose in that it constitutes the writing intensive course in the major. Fortunately, the Biology Department has built into their proposal, a remedy to the problem created by the elimination of this critically important course. As part of their proposal, the Biology Department plans to create a new course, BIOL 203 (Principles of Biology: Genetics and Development), which will, like the old BIOL 263, be writing intensive. The course coverage for the proposed BIOL 203, as described in Dr. Hinrichsen's Curriculum Proposal, is consistent with the needs of the Natural Science students, as most in the major aspire to careers in the health care field. The Biology Department has indicated that BIOL 203 would be available to the Natural Science B.S. majors. If the Biology Department proposal is accepted and ultimately implemented, a curriculum revision would then need to be submitted, substituting BIOL 203 for BIOL 263 in the requirements for the Natural Science program. The change will result in an increase in the number of credits required for the Natural Science major from 40 to 41 as the proposed BIOL 203 course is 4 credits while BIOL 263 is a 3-credit offering.

In summary, I fully support the new course proposal for BIOL 203 as a replacement for BIOL 263.

Sincerely,

A handwritten signature in cursive script that reads "Lawrence Kupchella".

Lawrence Kupchella, Ph.D
Coordinator, Natural Science Baccalaureate Program
Department of Chemistry

Subject: Fw: psychology letter

From: "Sandra Newell" <sjnewell@iup.edu>

Date: 9/5/2013 9:29 AM

To: "Megan Knoch" <mknoch@iup.edu>, "Sechrist, Gail S" <Gail.Sechrist@iup.edu>

CC: "Carl Luciano" <luciano@iup.edu>

From: [Dr. Susan Zimny](#)

Sent: Wednesday, September 04, 2013 3:29 PM

To: [Sandra Newell](#)

4 September 2013

To Whom It May Concern:

The Undergraduate Committee of the Psychology Department reviewed the Biology Department's curriculum revisions and formally voted to support those revisions.

Susan T. Zimny, Ph.D. & Chair Undergraduate Committee
Psychology Department
Indiana University of Pennsylvania
Phone: 724.357.5554