

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

13-36m

|                           |  |  |
|---------------------------|--|--|
| LSC Use Only Proposal No: | UWUCC Use Only Proposal No: <u>12-137m</u> |  |
| LSC Action-Date:          | UWUCC Action-Date: <u>AP-8/27/13</u>       | Senate Action Date: <u>APP-10/8/13</u> |

**Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee**

|   |  |
|---|--|
| Contact Person(s)<br><b>Robert Hinrichsen</b> | Email Address<br><b>bhinrich@iup.edu</b> |
| Proposing Department/Unit<br><b>Biology</b>   | Phone<br><b>72706</b>                    |

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 203 Principles of Genetics & Development**

**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

**3. Other Designations, as appropriate**

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

**Received**  
**APR 29 2013**

**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: \_\_\_\_\_

**Liberal Studies**

| 5. Approvals                                     | Signature            | Date       |
|--|----------------------|------------|
| Department Curriculum Committee Chair(s)         | <i>Samuel Dewell</i> | 1 Feb 2013 |
| Department Chairperson(s)                        | <i>[Signature]</i>   | 1 FEB 2013 |
| College Curriculum Committee Chair               | <i>Andre Rando</i>   | 4/24/13    |
| College Dean                                     | <i>[Signature]</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>Gail Schust</i>   | 9/25/13    |

## **Part II. Description of Curriculum Change**

### **1. Syllabus of Record**

#### **I. Catalog Description**

**BIOL 203 Principles of Genetics & Development**  
**Prerequisites: BIOL 202 or permission of instructor**

**3c-3l-4cr**

Introduction to the science of genetics, with an emphasis on the basic principles of Mendelian genetics, the genetics of populations, molecular genetics and the genetics of development. For Science majors.

#### **II. Course Outcomes**

Students will be able to:

- 1. Explain how the major concepts in genetics are relevant to the other disciplines in Biology.**
- 2. Explain how individual traits are inherited between generations, as well as elucidate the mechanisms by which genetic traits flow in a large population.**
- 3. Discuss the role of genetics in the development of organisms.**
- 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. Mendelian Genetics**

- |   |             |
|---|-------------|
| <b>1. Introduction to the field of genetics</b> | <b>1 hr</b> |
| <b>2. The formation of gametes- meiosis</b>     | <b>1 hr</b> |
| <b>3. The two Mendelian laws</b>                | <b>2 hr</b> |
| <b>a. The organism used</b>                     |             |
| <b>b. Segregation of alleles</b>                |             |
| <b>c. Independent assortment of genes</b>       |             |
| <b>4. Extensions of Mendelian Genetics</b>      | <b>3 hr</b> |
| <b>a. Variations in dominance</b>               |             |
| <b>b. Lethal alleles</b>                        |             |

|   |      |
|---|------|
| c. Multiple alleles   |      |
| d. Epistasis  |      |
| e. Environmental influences                                 |      |
| 5. Chromosomal theory of inheritance                        | 1 hr |
| Exam 1  | 1 hr |
| 6. Extranuclear Genetics                                    | 2 hr |
| a. Mitochondrial genetics                                   |      |
| b. Maternal inheritance                                     |      |
| c. Infectious particles                                     |      |
| 7. Linkage, Crossing Over and Mapping                       | 3 hr |
| a. Linkage  |      |
| b. 3 factor mapping   |      |
| c. Modern mapping techniques                                |      |
| 8. Quantitative Genetics                                    | 2 hr |
| a. Polygenic inheritance                                    |      |
| b. Variation  |      |
| 9. Population and evolutionary genetics                     | 2 hr |
| a. Hardy-Weinberg Equilibrium                               |      |
| b. Genetic Drift  |      |
| c. Gene Flow  |      |
| Exam 2  | 1 hr |
| <b>B. Mutations</b>   |      |
| 1. Chromosomal Variation and Sex Determination              | 1 hr |
| a. Polyploidy   |      |
| b. Polysomy   |      |
| c. Genes involved in sex determination                      |      |
| 2. Gene Mutations and Repair                                | 3 hr |
| a. Base substitutions                                       |      |
| b. Induced vs. spontaneous mutations                        |      |
| c. DNA repair mechanisms                                    |      |
| 3. Transposable Elements                                    | 2 hr |
| a. Bacterial insertion elements and transposons             |      |
| b. Eukaryotic transposons and retrotransposons              |      |
| <b>C. Control of gene expression</b>                        |      |
| 1. Review of DNA structure and transcription                | 2 hr |
| 2. Genetic Regulation in Prokaryotes and Eukaryotes         | 4 hr |
| a. The lac operon in <i>E. coli</i>                         |      |
| b. Eukaryotic gene regulation- transcriptional control      |      |
| c. Eukaryotic gene regulation- post-transcriptional control |      |
| 3. RNA Interference- the new regulation                     | 2 hr |
| a. The mechanism  |      |
| b. miRNA control of gene expression                         |      |
| 4. Epigenetics  | 2 hr |
| a. DNA modifications  |      |
| b. Epigenetic inheritance                                   |      |
| Exam 3  | 1 hr |

#### D. Developmental genetics

- |  |      |
|--|------|
| 1. Brief review of development in multicellular organism     | 1 hr |
| 2. Coordinate gene patterning of the anterior-posterior axis | 1 hr |
| 3. Regulation of pair rule genes                             | 1 hr |
| 4. <i>Hox</i> genes  | 1 hr |
| 5. The genetics of development in <i>C. elegans</i>          | 2 hr |

Exam 4 (Final Exam) 2 hr

#### Lab Schedule

- |          |  |
|----------|--|
| Week 1   | Introduction to genetics in the laboratory                                     |
| Week 2   | The cell cycle and life cycle of yeast   |
| Week 3   | Dihybrid crosses of yeast mutants: The concept of epistasis                    |
| Week 4   | Mutagenesis in yeast: the determination of mutagen dosage                      |
| Week 5   | Isolation of novel mutants in yeast  |
| Week 6-7 | Analysis of mutants  |
| Week 7   | Transformation in yeast: plasmid structure                                     |
| Week 8   | Characterization of plasmids from transformed yeast                            |
| Week 9   | Bioinformatics and the yeast genome  |
| Week 10  | Gene expression in bacteria: The use of GFP-tagged genes                       |
| Week 11  | Characterization of transformed bacterial colonies                             |
| Week 12  | DNA fingerprinting: the use of human DNA as a means of personal identification |
| Week 13  | Analysis of DNA products   |
| 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 problem sets that test the students understanding of the material.

#### 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

Brooker, R.J. 2009. *Genetics: Analysis and Principles*, 3<sup>rd</sup> edition. McGraw-Hill, Boston, Massachusetts.

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

Fox-Keller, E. 2000. *The Century of the Gene*. Harvard Press, Cambridge, Mass.

Gillham, N.W. 2011. *Genes, Chromosomes and Disease: From Simple Traits to Complex Traits, to Personalized Medicine*. FT Press, New Jersey.

#### VIII. Special Resource Requirements

None.

#### IX. Bibliography

Brown, T.A. 2007. *Genomes 3*. Garland Science, New York.

Cummings, M.R. 2006. *Human Heredity: Principles and Applications* 7<sup>th</sup> edition. Thomson Brooks/Cole Belmont CA.

Eldridge, N. 2000. *The Pattern of Evolution*. Freeman and Co., New York.

Gilbert, S.F. 2000. *Developmental Biology*, 7<sup>th</sup> edition. Sinauer Associates, Inc. Sunderland, Massachusetts.

Hartl, D.L. and Ruvolo, M. 2012. *Genetics: Analysis of Genes and Genomes*, 8<sup>th</sup> edition. Jones and Bartlett Learning, Burlington, Massachusetts.

Hartl, D.L. and Clark, A.G. 1989. *Principles of Population Genetics*, 2<sup>nd</sup> edition. Sinauer Associates, Inc. Sunderland, Massachusetts.

Lewin, B., Cassimeris, L., Lingappa, V. and Plopper, G., editors. 2007. *Cells*. W.H. Freeman and Company, New York.

Lewin, B. 2004. *Genes VIII*. Pearson/Prentice Hall, Upper Saddle River, New Jersey.

- Snustad, D.P. and Simmons, M.J. 2006. *Principles of Genetics*, 4<sup>th</sup> edition. Wiley Press.
- Watson, J. 2003. *DNA: The Secret of Life*. Arrow Books, London.
- Wilson, D.S. 2007. *Evolution for Everyone: How Darwin's Theory Can Change the Way We Think About Our Lives*. Delta Trade Paperbacks.

## **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.**

This course is designed to be the third biology course of the core curriculum for biology majors. It will replace BIOL 263 Genetics. BIOL 263 included classical genetics and molecular genetics. The new course is able to reduce that amount of time devoted to molecular genetics since the student will cover this material in BIOL 202. The BIOL 203 course will now include an entire section on population genetics, quantitative genetics and evolutionary genetics. Finally, the BIOL 203 course will present an introduction to developmental genetics. This involves shifting the topic of development from BIOL 112 to BIOL 203. As proposed, this BIOL 203 course will give the students the proper background for a variety of upper level courses that the student will take in the third and fourth years. Our intention is to offer this course as writing-intensive, since it is replacing BIOL 263, currently a writing-intensive 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 263 Genetics, a course that has been taught regularly for many years. Currently BIOL 263 Genetics is the final course in the core curriculum of Biology, and it is offered in both the fall and spring semesters.

**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).**

**The introduction to the science of genetics is offered by the majority of Biology departments in the United States. It is considered a fundamental subject for biology students.**

**Examples include:**

**Duquesne University: BIOL 111 Biology I: Cells, Genetics and Development and Lab 4cr**

**University of Pittsburgh: BIOSCI 0350 Genetics and lab 4cr**

**University of Pennsylvania: BIOL 221 Molecular Biology and Genetics and lab 4cr**

**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 is only one lecture professor, who adheres to the syllabus of record. Additional faculty members are usually involved in the labs. 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 263 Genetics. The revision of the core curriculum involves a reduction in the number of credits in the major for most of the tracks within the department so that faculty load will be adequate for the increase in credits from BIOL 263 at 3 credits to 4 credits in BIOL 203.**

**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 263, will be used for the new course. 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 semester. 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?**

**BIOL 203 will be offered with one lecture section and two or three lab sections. We expect all biology majors to enroll in BIOL 203, but the course will also be required by students in the Biochemistry program and the Natural Sciences program and one lecture section and two to three lab sections has been adequate in previous years for BIOL 263.**



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.

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 blue ink 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