California State University, Long Beach

General Education Action Request

Instructions: Complete and submit all pages

RESET FORM

I. Course Identification

Dept. Prefix and Course Number: BIOL 370 Official Course Title: General Genetics

Course Cross Listed: ☐ Yes ☑ No College: CNSM Dept. Prefix & Course Number: _____

II. Course Coordinator

Faculty member(s) responsible for this course and this report: Judy Brusslan

Phone: X58133 Email: judy.brusslan@csulb.edu

III. Course History

Frequency of offering during past three years:

☑ Every semester ☐ Once a year Other (describe) _____

Number of sections per offering 1 Number of instructors teaching the course 2

IV. Catalog Description (including prerequisites) If existing course, provide photocopy from catalog. If changes have occurred since catalog publication, attach signed Course Change Form.

Prerequisites: Completion of entire Foundation with one or more Exploration courses and Upper division standing; BIOL 211, BIOL 212 and either BIOL 260 or CHEM 251, all with a grade of "C" or better.
Detailed study of classical transmission genetics and introduction to modern molecular genetics. Includes current observations and concepts of nature, organization, function, and regulation of genetic expression.
Letter grade only (A-F). (Lecture 3 hrs., laboratory 3 hrs.) Course fee may be required.

V. Requested GE Categories

Check "Add" if new to category; "Delete" if removing from category; "Continue" if PREVIOUSLY APPROVED BY GEGC, and there are no substantial changes.

Add	Delete	Continue	First Year Experience GE:
☐	☐	☐	Written Communication (A.1)
☐	☐	☐	Oral Communication (A.2)
☐	☐	☐	Critical Thinking (A.3)
☐	☐	☐	Mathematics/Quant. Reasoning (B.2)
			Explorations:
☑	☐	☐	Life Sciences (B.1.a)
☐	☐	☐	Life Sciences No Lab (B.1.a.NL)
☐	☐	☐	Physical Sciences (B.1.b)
☐	☐	☐	Physical Sciences No Lab (B.1.b.NL)
☐	☐	☐	The Arts (C.1)
☐	☐	☐	Humanities: Literature (C.2.a)
☐	☐	☐	Humanities: Philosophy (C.2.b)
☐	☐	☐	Humanities: Foreign Lang. (C.2.c)
☐	☐	☐	U.S. History (D.1.a)
☐	☐	☐	Const. & American Ideals (D.1.b)
☐	☐	☐	Social Sciences & Citizenship (D.2)
☐	☐	☐	Lifelong Learning & Self-Dev. (E)

Upper Division Requirements:

Add	Delete	Cont.	
☑	☐	☐	Category B
☐	☐	☐	Category C
☐	☐	☐	Category D

Capstones (F):

Add	Delete	Cont.	
☐	☐	☐	Interdisciplinary
☐	☐	☐	Advanced Skills
☐	☐	☐	Service Learning
☐	☐	☐	Writing Intensive
☐	☐	☑	Integrative Learning*

*For majors only

Additional Requirements:

Add	Delete	Cont.	
☐	☐	☐	Human Diversity: Consider for HD Status
☐	☐	☐	Global Issues: Consider for Global Status

➢ Course may be Human Diversity or Global Issues, not both

VI. Essential GE Skills

Regardless of GE Category, each course must address GE Essential Skills. These are the GE Skills used for assessment in departmental progress reports. For more clarification on each skill, please see the description of the Essential GE Skills and their associated learning outcomes.

Level of emphasis in this course:

Using the list below, check the box indicating the extent to which each skill is addressed in this course. For the primary level of emphasis, your proposal must include a **minimum of two (2) skills, but no more than three (3) identified**. **These primary skills should be reflected in your Student Learning Outcomes (SLO).** Depending on the GE approval requested, some GE Essential Skills will be pre-determined for the primary level of emphasis, please consult the Essential GE Skills table for assistance. Please list any essential skills that are a secondary level of emphasis (these skills are addressed in the course, but are not the primary emphasis). Secondary skills do not have to be reflected in your SLOs. **Please leave blank any skills that are not a primary or secondary emphasis.** Please keep in mind that the ratings below determine the assessment in your departmental annual report on assessment and program self-study.

Primary	Secondary	
☑	☐	Written Communication
☐	☐	Oral Communication
☑	☐	Critical Thinking
☐	☑	Quantitative Reasoning
☐	☐	Information Literacy
☐	☐	Teamwork
☑	☐	Inquiry and Analysis
☐	☐	Intercultural Knowledge
☐	☐	Ethical Reasoning
☐	☐	Creativity and Discovery
☐	☐	Foundation & Skills for Lifelong Learning
☐	☐	Interdisciplinary Learning
☐	☐	Social Responsibility and Civic Engagement
☐	☐	Problem Solving
☐	☐	Global Learning

VII. All General Education Action Request (GEAR) forms must include the Standard Course Outline.

VIII. Department and College Review of GE Courses

The GEGC recommends that Department and College Curriculum Committees review proposed GE courses in the context of the Department's and College's GE Course Inventory. New GE courses should fill a demonstrated curricular need, be viable and sustainable, as well as meet the GE Essential Skills and Student Learning Outcomes. Courses not meeting these expectations should be reconsidered.

IX. Required Signatures

By signing below, the department chair, college curriculum committee chair, and the college dean/associate dean verify that they have reviewed this action request and its supplemental materials for completeness, and attest to the appropriateness of the requested action.

Chair, Department of Biological Sciences Date: 1/22/19

PRINT NAME: Dessie Underwood SIGN NAME:

Chair, Curriculum Committee: College of Natural Sciences & Mathematics Date: 1/22/19

PRINT NAME: Nate Onderdonk SIGN NAME:

(Assoc.) Dean, College of Natural Sciences and Mathematics Date: 1/22/19

PRINT NAME: Kris Slowinski SIGN NAME:

Submit Electronically ☐

Revised 12/12/2017

Biol 370 GE Integrative Capstone and Upper Division B Application
Standard Course Outline

I. General Information:

A. Course number: Biol 370
B. Title: General Genetics
C. Units: 4
D. Prerequisites: BIOL 211, BIOL 212 and either BIOL 260 or CHEM 251 all with a grade of "C" or better.
E. Responsible faculty: Judy Brusslan
F. SCO Prepared by: Judy Brusslan
G. Date prepared/revised: 1/22/19

II. Catalog Description:

Prerequisites: Completion of entire Foundation with one or more Exploration courses and Upper division standing; BIOL 211, BIOL 212 and either BIOL 260 or CHEM 251, all with a grade of "C" or better.
Detailed study of classical transmission genetics and introduction to modern molecular genetics. Includes current observations and concepts of nature, organization, function, and regulation of genetic expression.
Letter grade only (A-F). (Lecture 3 hrs., laboratory 3 hrs.) Course fee may be required.

III. Curriculum Justification(s)

Biol 370, General Genetics, is a required course for all students majoring in Biology and Marine Biology. Since it is taken by biology and marine biology majors in the Dept. of Biological Sciences, we propose to make it an Integrative Capstone course for students fulfilling the GE requirements outlined in GE policy 12-00, and to designate it an Upper Division B course for majors in the Biological Sciences following EO-1100. As outlined in the GE policy, this course has its primary GE skills written communication, critical thinking, and inquiry and analysis (see below for detailed explanations of each category). It fulfills the Natural Sciences criteria because an understanding of genetics and genetic principles is central to understanding how living organisms grow, develop, reproduce, and evolve, as well as how living things are related. In both the lecture and the laboratory, methods and results of genetic analysis are discussed. In the laboratory students collect and analyze data. Several lectures incorporate broader impacts of genetics and genetic manipulation, such as genetically modified organisms, forensic DNA analysis, and personalized medicine.

IV. Measurable Student Learning Outcomes, Evaluation Instruments, and Instructional Strategies for Skill Development

- SLO #1 Students will demonstrate advanced scientific writing in the form of a written lab report in standard scientific format in field of genetics. This report is at least 2500 words. (Written Communication)
    - Evaluation instruments:
      The lab report will be assessed using a rubric that includes the structure of a scientific lab report (1 - genre and disciplinary conventions), the appropriate content for each section (2 - content development), clarity of writing and grammar (3 - control of syntax and mechanics).
    - Instructional strategies:
      There will be a standard rubric for the course and lab instructors will introduce and explain each point of the rubric (1, 2, 3). Students will be able to consult both the lab instructors and professors of the course while writing their papers.

- SLO #2 Students will solve genetics-based problems in classical molecular and high through-put genetics. Students will (1) explain the problem, (2) generate a possible solution

(hypothesis), test their solution using available evidence (3), and reach a conclusion (4 - do the data support the predictions of their hypothesis?). (Critical thinking)

- Evaluation instruments:
  Critical thinking will be primarily evaluated through problem-based exams in lecture, Beachboard weekly quizzes, the written lab report in lab, lab exams, and short problem-solving assignments in lab (1, 2, 3, 4).
- Instructional strategies:
  Because this is a large lecture class, we use 'think-pair-share'. Videos explaining how to solve problems are posted on Beachboard (1, 2, 3, 4). Questions with multiple possible answers are posed to the class as a whole (1, 2), students vote (3, 4), and then answers are explained in class (3, 4). Hands-on lab will be used to reinforce critical thinking learned in lecture.

- SLO #3 Students will demonstrate knowledge of genetic principles (1 – existing knowledge). They will be able (2) to analyze data from publications, web-accessible databases, and their own experiments, (3) to draw conclusions, and (4) to explain the limitations of the studies and their implications for basic science and the broader impacts. (Inquiry and Analysis)
  - Evaluation instruments Inquiry and Analysis skills will be evaluated on lecture and lab exams, BeachBoard quizzes, homework problem sets, and the written lab report (1, 2, 3, 4).
  - Instructional strategies Lectures by instructors will introduce genetic concepts and methods (1), and demonstrate how they can be applied to solving problems (2, 3). Students have opportunities to solve problems in both lecture and lab, where the instructors provide scaffolding and assistance (1, 2, 3). Instructors also introduce and encourage students to consider and discuss broader societal implications of knowledge of genetics and of genetic techniques (4).

- SLO #4 Students will use statistical analyses to evaluate data. (Quantitative Reasoning) They will be able (1) to represent their data numerically, (2) to carry out statistical calculations, (3) to draw conclusions from the analysis, (4) to state the assumptions of their chosen statistical test, and (5) to communicate their findings in figures and text.
  - Evaluation Instruments Quantitative reasoning will be evaluated on lecture and lab exam problems (1, 2, 3, 5), BeachBoard quizzes (1, 2, 3, 5), homework problem sets (1, 2, 3, 5), and in the written lab report (1, 2, 3, 4, 5).
  - Instructional strategies Lecture and laboratory instructors will introduce, explain, and model the use of statistical tests of data (1, 2, 3, 5), explaining the appropriate use of the tests (4), their assumptions, and their limitations (4). Students have the opportunity to practice carrying out statistical analysis of datasets (1, 2, 3, 5) in the lab and on homework problem sets (1, 2, 3, 5). They can consult with lecture and laboratory instructors as they develop their written laboratory report.

V. Outline of Subject Matter

This is a broad outline of the topics to be covered:

Lecture:

- Modern Topics in Genetics, Genetic basis of personality (SLO #3)
- Mitosis, Meiosis, Mendel's 1st Law (SLO #3)
- Sex Linkage, Pedigrees, Mendel's 2nd Law (SLO #3)
- Complementation, Genetic interactions (SLO #3)
- Genetic interactions, Allelic relationships (SLO #3)
- Linkage, Interference, Three point testcross (SLO #3)
- DNA Mutation (SLO #3)
- Chromosome Mutation: Euploidy, Aneuploidy, Inversions, and Transposable Elements (SLO #3)
- Bacterial Genetics (SLO #3)
- Transcription, Processing & Translation (Wobble) (SLO #3)
- Recombinant DNA Techniques (SLO #3)
- DNA Sequencing Technology (SLO #3)
- Genomes and Genomics (SLO #3)
- NCBI Accessions (SLO #3)
- Functional Genomics Research Paper! Nature 500: 207 (August 8 2013); The haplotype-resolved genome and epigenome of the aneuploid HeLa cancer cell line (SLO #2, SLO#3)
- Prokaryotic Gene Expression (SLO #3)
- Eukaryotic Gene Expression (SLO #3)
- Forensics, Probability of Matches (SLO #3, SLO #4)
- Population and Quantitative Genetics (SLO #3, SLO #4)

Laboratory:

- Safety, Set up *Drosophila melanogaster* F_1 cross ; Identify phénotypes (SLO #2, SLO #3)
- Mitosis and meiosis (SLO #3, SLO #4)
- Maize genetics and chi-square analysis (SLO #3, SLO #4)
- Score *D. melanogaster* F_2 *Drosophila* linkage data analysis (SLO #3, SLO #4)
- DNA Extraction (SLO #3, SLO #4)
- Q&A for Written Lab Report ; introduce and explain grading rubric (SLO #1, SLO #2, SLO #4)
- Basic lab skills, Agarose electrophoresis, DNA restriction digests (SLO #3, SLO #4)
- Restriction Enzyme Digest Analysis; Restriction mapping problems (SLO #2, SLO #3, SLO #4)
- Mapping the *vir2* gene in *Arabidopsis thaliana;* PCR reactions; 5' 3' DNA Problems (3 pt); Register for DNA Subway (SLO #2, SLO #3, SLO #4)
- DNA Subway: Gene Annotation on the Red Line (SLO #1, SLO #2, SLO #3)
- Digests, Electrophoresis by TA*; vir2* mapping data analysis; RNA-seq on the Green Line (SLO #2, SLO #3, SLO #4)
- Population Genetics Simulations (SLO #2, SLO #3, SLO #4)

VI. Methods of Instruction

This is a large lecture course and the lecture itself is largely standard lecture format. However, in the required lab sections, students solve problems in groups, and research a topic related to human genetics. In addition, there are group discussions of data collected in lab and other lab-based activities. The essential skills SLOs must be included in all syllabi.

VII. Information about Textbooks/Readings

Textbook: An Introduction to Genetic Analysis, 11th Edition ISBN 1-4641-0948-8 hardcover, ISBN 1-4641-8804-1 (Loose Leaf) or ISBN 1-4292-7278-3 for the ebook.
Anthony J. F. Griffiths, Susan R. Wessler, Sean B. Carroll, John Doebley
W. H. Freeman and Company, New York, 20105

VIII. Bibliography

This bibliography is not comprehensive and is used only as a guide for instructors.

Griffiths, AJF, Wessler, SR, Carrol, SB, Doebley, J (2015) Introduction to Genetic Analysis, 11 ed. WH Freeman & Company, New York, NY

Adey, A, Burton, JN, Kitzman, JO, Hiatt, JB, Lewis, AP, Martin, BK, Qiu, R, Lee, C, Shendure, J (2013) The haplotype-resolved genome and epigenome of the aneuoploid HeLa cancer cell line. Nature 500:207

Gokham, D et al. (2014) Reconstructing the DNA methylation maps of the Neandertal and the Denisovan. Science 344: 523

Knisely, K. (2017) A Student Handbook for Writing in Biology, 5 ed. WH Freeman & Company, New York, NY

Lamichhaney, S et al. (2015) Evolution of Darwin's finches and their beaks revealed by genome sequencing. Nature doi:10.1038/nature14181

Reddy, P et al. (2015) Selective elimination of mitochondrial mutations in the germline by genome editing. Cell 161:459

Tachibana, M Amato, P et al. (2013) Towards germline gene therapy of inherited mitochondrial diseases. Nature 493:627

IX. Instructional Policies Requirements Policy on missing examinations and late papers.

X. Course Assessment

Grading scale: A (90-100%), **B** (80-89%), **C** (70-79%), **D** (60-69%), **F** (59 % or below).
Exam 1: **160** points (SLO #2, SLO #3, SLO #4)
Exam 2: **160** points (SLO #2, SLO #3, SLO #4)
Exam 3: **160** points (SLO #2, SLO #3, SLO #4)
Exam 4 (cumulative): **190** points (SLO #2, SLO #3, SLO #4)
Beachboard Quizzes: **80** pts (SLO #2, SLO #3, SLO #4)
Lab points for homework, lab exams, and writing assignment: **250** pts (SLO #1, SLO #2, SLO #3, SLO #4)
Total: **1000** points.