# Course Change Proposal

## Form A

**Academic Group (College):** Natural Sciences and Mathematics  
**Academic Organization (Department):** Biological Sciences  
**Date:** October 30, 2009

**Type of Course Proposal:** New _X_  
**Department Chair:** Rose Leigh Vines  
**Submitted by:** Kelly McDonald

**Does this course fulfill a requirement for single-subject or multiple subject credential students?** Yes _X_  
**For Catalog Copy:** Yes _X_  
**CCE:** Yes _X_  
**No__**  
**Semester Effective:** Summer 2011

This course replaces experimental course **Subject Area (prefix) and Catalog Number (course number):**

This Catalog Number (course number) is being replaced:

| Change from: |  |  |  |
|--------------|------------------|------------------|
| **Subject Area (prefix) & Catalog No. (course no.):** | **Title:** | **Units:** |

| Change to: |  |  |  |
|------------|------------------|------------------|
| **Subject Area (prefix) & Catalog No. (course no.):** | **Title:** Exploration of Biological Methodology | **Units:** 3 |

## Justification:

BIO 221A Cell & Molecular Methods and Techniques and BIO 221B Methods in Ecology, Evolution and Conservation are current courses in the graduate curriculum that expose students to current research methods/techniques and develop analytical thinking skills in the areas of cell and molecular biology and ecology and evolution, respectively. BIO221C is being proposed as a third course in the series with the primary target audience being secondary teachers pursuing an MA in Biological Sciences. While this course would not be restricted to in-service or pre-service teachers, this intensive laboratory/lecture course would be taught in the summer, accommodating the schedules of teachers. In addition, BIO221C has been designed as an “integrated course” that combines laboratory experiences with lectures, discussions and field trips to examine a single biological problem in a multifaceted manner, with a flow that addresses the molecular, cellular, environmental, evolutionary and ecological issues. As many secondary instructors teach general biology classes that cover all of these fields in the course of one semester or one school year, BIO221C could serve as a model for an integrated approach to “problem-based” science.

## New Course Description:

(Not to exceed 80 words, and language should conform to catalog copy. See http://www.csus.edu/acaf/univmanual/crspls.htm - Guidelines for Catalog Course Description)

Intended for students in the MA grant proposal track, this course explores a selected topic from multiple scientific perspectives. A discovery-based laboratory project using cell and molecular techniques complemented with lectures, discussions and field trips that investigate the ecological, environmental, and evolutionary aspects of the same topic. The laboratory project will focus on a current biological topic (such as genetically modified organisms) in accordance with the instructor’s interests and expertise. One hour lecture, six hours lab per week. Units: 3.

**Note:** Not open to students in the Master of Science: Cell and Molecular Biology Concentration or the Master of Art: Stem Cell Internship track.

**Prerequisite:** none

**Corequisite:** none

**CAN (California Articulation Number):**

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<thead>
<tr>
<th>Graded:</th>
<th>Instructor Approval Required?</th>
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<tbody>
<tr>
<td><strong>Letter <em>X</em> Credit/No Credit</strong></td>
<td>Yes <em>X</em> No__</td>
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<table>
<thead>
<tr>
<th>Course Classification (e.g., lecture, lab, seminar, discussion):</th>
<th>Title for SIS+/CMS (not more than 30 characters)</th>
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<tbody>
<tr>
<td><strong>Lecture and Laboratory C2, C16</strong></td>
<td>Exploration of Biological Methods</td>
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<tr>
<th>Cross Listed?</th>
<th>If yes, do they meet together and fulfill the same requirement, and what is the other course.</th>
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<tr>
<td>Yes <em>X</em> No__</td>
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**How Many Times Can This Course be Taken for Credit?** 1

**Can the course be taken for Credit more than once during the same term?** Yes _X_ No__
FOR NEW COURSE PROPOSALS OR SUBSTANTIVE CHANGES ONLY:

Description of the Expected Learning Outcomes: Describe outcomes using the following format: “Students will be able to: 1), 2), etc.” See the example at http://www.csus.edu/acad/example.htm

Students will be able to:
- Demonstrate proficiency in a broad range of molecular and cellular laboratory tools through a discovery-based project (e.g., detection and quantification of genetic modifications in plants)
- Apply bioinformatic approaches to assist in experimental design and data analysis
- Explore the environmental, ecological, and evolutionary issues related to the selected topic through readings, discussions, and field trips/guest lectures
- Analyze and evaluate the scientific literature, as well as communicate findings in written and oral form.

**Attach a list of the required/recommended course readings and activities [Note: it is understood that these are updated and modified as needed by the instructor(s).] This attachment should be forwarded only to your Dean’s office, not Academic Affairs.

Assessment Strategies: A description of the assessment strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers) which will be used by the instructor to determine the extent to which students have achieved the learning outcomes noted above:

Grading will be based on the result of two written exams, one laboratory report on individually-collected data, one group poster (each student will contribute to the design and development), 2 written assignments based on literature reviews, and a laboratory notebook.

For whom is this course being developed?
Major in the Dept. X  Majors of other Depts.  Minors in the Dept.  General Education  Other 
Is this course required in a degree program (major, minor, graduate degree, certificate)? Yes  No X
If yes, identify program(s):

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer facilities, faculty, etc.)? Yes X  No
If yes, attach a description of resources needed and verify that resources are available.

Indicate which department or programs will be affected by the proposed course (if any).

The Department Chair’s signature below indicates that affected programs have been sent a copy of this proposal form.

Approvals: If proposed change, new course or deletion is approved, sign and date below. If not approved, forward without signing to the next reviewing authority, and attach an explanatory memorandum to the original copy.

<table>
<thead>
<tr>
<th>Signatures:</th>
<th>Date</th>
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<tbody>
<tr>
<td>Department Chair:</td>
<td>11/16/09</td>
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<tr>
<td>College Dean or Associate Dean:</td>
<td>1/20/10</td>
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<tr>
<td>CPS (for school personnel courses ONLY)</td>
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<tr>
<td>Associate Vice President and Dean for Academic Programs</td>
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Distribution: Academic Affairs (original), Department Chair and College Dean. Dean’s office to send original after approval to Academic Affairs, at mail zip 6016. An electronic copy must also be sent.
Exploration of Biological Methodology
BIO 221C

Corequisites:

Instructor: TBA
Contact Info: TBA
Office Hours: TBA

Course Format: This course will meet for three 6-hour blocks per week over a 6-week summer session (or four 4.5hr meetings). Students will receive 15 hr of lab and 3 hr of lecture per week for a total of 3 Units.

Course Materials: Most of the course readings will come from the scientific literature. Articles will be posted on SacCT. A text may be recommended as a reference. A hardcover, bound lab notebook will be required.

Course Content and Objectives: BIO 221C is a graduate level introduction to research methods course that explores a selected topic from multiple scientific perspectives. A discovery-based laboratory project using cell and molecular techniques is complemented with lectures, discussions and field trips that investigate the ecological, environmental, and evolutionary aspects of the same topic. The laboratory project will focus on a current biological topic (such as genetically modified organisms) in accordance with the instructor's interests and expertise.

Learning Objectives:
- Gain familiarity with a broad range of molecular and cellular laboratory tools through a discovery-based project (e.g., detection and quantification of genetic modifications in plants)
- Learn bioinformatics skills to assist in experimental design and data analysis
- Explore the environmental, ecological, and evolutionary issues related to the selected topic through readings, discussions, and field trips/guest lectures
- Gain proficiency in reading and searching the scientific literature, as well as communicating findings in written and oral form.

Course Requirements

a. Class Participation: Attendance and participation in each of the lecture and laboratory sessions is expected. Maintaining a personal laboratory notebook is required and is essential for keeping yourself organized in the lab. Failure to attend the lab sessions, to participate, or to keep a satisfactory lab notebook will result in the loss of points at the instructor’s discretion.

b. Grading will be based on the result of two written exams, one laboratory report on individually-collected data, one group poster (each student will contribute to the design and development), 2 written assignments based on literature reviews, and a laboratory notebook.

<table>
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<tr>
<th>Evaluation</th>
<th>Points</th>
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<tbody>
<tr>
<td>2 Written Exams (100 points each)</td>
<td>200</td>
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<tr>
<td>Lab Report on Individual Data</td>
<td>75</td>
</tr>
<tr>
<td>Group Poster</td>
<td>50</td>
</tr>
<tr>
<td>2 Literature Reviews/Written Assignments</td>
<td>50</td>
</tr>
<tr>
<td>Laboratory Notebook</td>
<td>25</td>
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Total Points 400
Course Policies:

a. Make-Up Exam/Quiz Policy: If, due to personal illness or emergency, you are unable to take the scheduled exam or submit an assignment on time, you must contact the instructor or the departmental office prior to the exam or assignment due date. No make-up exams or quizzes will be scheduled without prior notification. You must schedule make-up exams and assignments at the first class meeting after you return to school or earlier.

b. Adding/Dropping the Course: It is important that you evaluate whether you have the necessary time to devote to this course. The 6-week summer schedule is compressed and therefore intensive. In addition to the 18 hours of class time per week, you will need sufficient time to complete out-of-class research, reading and studying.

c. Classroom Conduct: To learn we must strive to keep our attention on the task. Be mindful of potential distractions that you can prevent. Electronic devices should be off, or, if necessary, set to vibrate. If you arrive late or need to leave early please take a seat near a door.

d. Cheating and Plagiarism: Evidence of cheating or plagiarism, will be reported to the Department Chair and the Dean of Students, and the student may be dismissed from the course with a grade of “F”. Lesser action, such as reducing the student’s final grade by one letter, may instead be imposed at my discretion. No communication is permitted between students during exams. Exams are closed book, note, and calculator. Students may not leave the room during an examination without permission of the instructor. University policy on plagiarism defines plagiarism as “the use of distinctive ideas or works belonging to another person without providing adequate acknowledgement of that person’s contribution.” The university further states, “Regardless of the means of appropriation, incorporating another's work into one's own requires adequate identification and acknowledgement…. Acknowledgement is not necessary when the material used is common knowledge.” The university’s policy on plagiarism is provided on the web at http://www.csus.edu/admbus/umanual/ump14150.htm. The CSUS library web site also has a number of documents addressing integrity and plagiarism: http://library.csus.edu/content2.asp?pageID=360.

e. Disabilities: If you have a disability, please let me know as soon as possible if there are, accommodations I can make to facilitate your full participation. I will make every attempt to maintain confidentiality.
Tentative Schedule (subject to change):

**Week 1:** Introduction to Research Methods

**Lecture:** Overview of Current Molecular, Cellular and Field Methods as they apply to a broad range of applications

**Lab:** Review of fundamental laboratory instruments and techniques
   Assigned readings and student literature searches exploring the potential benefits and risks, as well as the current level of political and public acceptance, of genetically modified crops.

**Week 2:** Recombinant DNA (rDNA) Technology/Applications in Plants, Animals and Microorganisms

**Lecture:** Discussion of articles selected from literature searches of plant GMOs
   Writing assignment #1 on student-selected article due

**Lab:** rDNA experiment (ligation, transformation, plasmid prep and gel analysis)
   Tour of Arcadia Biosciences, Inc. in Davis, CA
   Assigned readings and student literature searches exploring GM technologies/products designed for increased crop yield, improved nutrition, and environmental protection and sustainability

**Week 3:** DNA-based GMO detection methods I

**Lecture:** PCR theory and applications (GMOs, forensics, etc.)
   Writing assignment #2 on student-selected article due
   Midterm written exam

**Lab:** Conventional PCR of control samples as well as food products collected by students
   Introduction to Bioinformatics – BLAST, Primer design, databases searching, data analysis tools

**Week 4:** DNA-based GMO detection methods II

**Lecture:** quantitative PCR (qPCR) theory and applications

**Lab:** qPCR to quantitate GMO concentrations in food products that tested positive by endpoint GMO analysis
   Generation of standard curves and different analysis methods

**Week 5:** Protein-based GMO detection methods Part I

**Lecture:** Introduction to Western Blot Analysis and ELISA

**Lab:** Western blot or ELISA (TBA)
   Continue data analysis from qPCR of food products
   Lab Report of Individual Data from Endpoint and qPCR project due

**Week 6:** Protein-based GMO detection methods Part II

**Lecture:** Introduction to Immunofluorescence and Microscopy
   Final Written Exam

**Lab:** Performance or demonstration of Immunofluorescence and Microscopy (TBA)
   Finalization and Presentation of Group Poster
RESOURCE STATEMENT FOR BIO 221C:

BIO 221C is being developed as part of an M.A. track in Biological Sciences that is focused on educating K-12 Biology teachers. To attract Biology teachers into K-12 education, faculty in Teacher Education and Biological Sciences are submitting a grant to the National Science Foundation that will allow students to complete a Masters degree and credential training simultaneously. This course will be completed by these students in lieu of the more focused techniques courses that currently exist in the curriculum (Bio 221A and Bio 221B). If this grant is funded, there is potential for an increase in the number of students in the Biological Sciences graduate program, and a greater interest from teachers hoping to earn a masters degree. Because the primary aim of this course will be teacher education, it will be offered primarily during the summer session when teachers can dedicate large blocks of time to the course (although this may be offered during the academic year at some point). The first proposed offering of this course will be in summer 2011, however the course must be in place before the grant application is submitted in Spring 2010. This course does represent an increase in WTUs for the Biological Sciences graduate program. However, offering of this course will be contingent on grant funding and increased student enrollment in the M.A. program. The Department of Biological Sciences will also adjust course offerings in other graduate courses by decreasing elective course offerings in order to offer this course if necessary.