

BIO 180: MOLECULAR BIOLOGY RESEARCH EXPERIENCE

In Workflow

1. BIO Committee Chair (altman@csus.edu)
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Approval Path

1. Mon, 08 May 2023 21:01:25 GMT
Jamie Kneitel (kneitel): Approved for BIO Committee Chair
2. Mon, 08 May 2023 21:02:31 GMT
Jamie Kneitel (kneitel): Approved for BIO Chair
3. Thu, 07 Sep 2023 20:03:12 GMT
Mikkel Jensen (mikkel.jensen): Rollback to Initiator
4. Wed, 27 Sep 2023 05:43:40 GMT
Susanne Lindgren (lindgren): Rollback to Initiator
5. Fri, 17 Nov 2023 21:14:59 GMT
Robin Altman (altman): Rollback to Initiator
6. Thu, 30 Nov 2023 01:09:10 GMT
Robin Altman (altman): Approved for BIO Committee Chair
7. Mon, 11 Dec 2023 17:39:06 GMT
Susanne Lindgren (lindgren): Approved for BIO Chair
8. Wed, 21 Feb 2024 23:27:56 GMT
Mikkel Jensen (mikkel.jensen): Approved for NSM College Committee Chair
9. Thu, 22 Feb 2024 00:08:35 GMT
Shannon Datwyler (datwyler): Approved for NSM Dean

Date Submitted: Mon, 20 Nov 2023 02:37:29 GMT

Viewing: BIO 180 : Molecular Biology Research Experience

Last edit: Mon, 20 Nov 2023 02:37:28 GMT

Changes proposed by: Andrew Reams (214603026)

Contact(s):

| Name (First Last) | Email | Phone 999-999-9999 |
|-------------------|-----------------------|--------------------|
| Drew Reams | andrew.reams@csus.edu | 916-278-7678 |

Catalog Title:

Molecular Biology Research Experience

Class Schedule Title:

Molec Bio Research Experience

Academic Group: (College)

NSM - Natural Sciences & Mathematics

Academic Organization: (Department)

Biological Sciences

Will this course be offered through the College of Continuing Education (CCE)?

No

Catalog Year Effective:

Fall 2024 (2024/2025 Catalog)

Subject Area: (prefix)

BIO - Biological Sciences

Catalog Number: (course number)

180

Course ID: (For administrative use only.)

106236

Units:

4

Is the only purpose of this change to update the term typically offered or the enforcement of existing prerequisites at registration?

No

In what term(s) will this course typically be offered?

Fall, Spring

Does this course require a room for its final exam?

Yes, final exam requires a room

This course complies with the credit hour policy:

Yes

Justification for course proposal:

This is not a new course proposal, rather it is a request for four changes to an existing BIO 180 course. Also, this upper division undergraduate BIO 180 course is paired with a graduate course, called BIO 280. To keep these two paired courses consistent these same changes being proposed here to BIO 180 are also being proposed to BIO 280 via a parallel Form A. These four changes to BIO 180 are:

1) Remove BIO 121 prerequisite (keep BIO 184 prereq.)

2) Update course name:

Current Course Name: Advanced Molecular Biology

New Course Name: Molecular Biology Research Experience

3) Update course description to describe current materials covered:

Current course description: Examination of the structure of genes and genomes, the mechanisms by which they change, and the use of evolutionary relationships to understand function. Mechanisms of the regulation of gene expression from gene to phenotype and the tools used to study these processes. Applications of molecular tools in medicine and biotechnology and the ethics around these approaches. Lecture two hours, laboratory six hours.

New course description: Novel course-based research experience investigating unknown biomolecular pathways, genes, genomes, and the mechanisms by which they change. Hands-on experience designing and constructing new mutants using genetic engineering, and analysis of mutants and their phenotypes to study molecular processes. Applications of these approaches to medicine, biotechnology, and debating their surrounding ethics. Paired with Bio 280 and the material covered will be the same. Fee course. Lecture two hours, laboratory six hours. 4 units. This course requires safety training and personal protective equipment (PPE).

4) Update Student Learning Outcomes

The previous LOs were outdated and at a lower taxonomical level than the current course. Updates were made to reflect the current BIO 180 course's higher taxonomical learning outcomes.

General rationale for 4 changes:

These 4 changes aim to 1) more accurately name and describe the BIO 180/280 course to reflect its central intended purpose (i.e., research experience) and 2) reduce barriers for students interested in gaining research experience by making this course more accessible to our students. BIO 180/280 (lecture and lab) offers students with a unique research experience (CURE) in a class format with 6 hours of lab per week (two 3-hour labs) and an aligned lecture (two 1-hour lectures per week). Students perform novel independent research while performing genetic engineering projects unique to each student. This course is valuable not only to students in the Microbiology and Molecular Biology concentrations (who are required to take the course), but also it is a great opportunity for diverse students who 1) want a trial research experience in a class format and gain research experience before

joining a lab, 2) want research experience but are unable to find a lab to join, or 3) only have a semester remaining before graduation. In general, this course is valuable to all Biology and Biochemistry students who want research experience. Also, the research in BIO 180/280 is very medically relevant since it aims to elucidate molecular pathways contributing to cancer and human diseases. Currently, BIO 180/280 students are identifying gene products involved in pathways of forming gene amplification mutations that drive cancer, various human diseases, and antibiotic resistant pathogens. These gene products may serve as potential actionable therapeutic targets for preventing these mutations in cancer and pathogens. So, this course is particularly important for BioMed students interested in gaining medically relevant research experience (but are rarely given an opportunity).

Rationale for removing BIO 121 prerequisite:

- Students do not need BIO 121 (Molecular Cell Biology) as a prerequisite to understand the material covered in BIO 180. BIO 180 uses a bacterial experimental system to study genetics and molecular biology. In contrast, BIO 121 (lecture only) focuses on eukaryotic-specific molecular pathways.
- Eliminating the BIO 121 prerequisite would remove a barrier: Students would benefit by taking BIO 180 earlier rather than at the end of their college career. As mentioned, BIO 180 is a great opportunity for students who want a trial research experience in a class format and gain research experience before joining a lab or applying for an REU. Importantly, this trial research experience exposes students to alternative graduate school programs and career pathways in research.
- Currently, Biochemistry students have the option of taking BIO 121 or BIO 180 as an elective. However, if they already take BIO 121, this fulfills the elective requirement and nullifies the need to take BIO180.
- Eliminating the BIO 121 prerequisite would remove a barrier: it would allow more students from diverse concentrations and majors to take the BIO 180 course. Also, removing this prerequisite would allow students to take BIO 180 earlier. By taking BIO 180 earlier, it also serves as a research experience at an earlier stage in their education and allows students to look for more opportunities before graduating. I have referred many students to join colleagues' labs because they become newly interested in research while taking BIO 180, and it is not too late to join a lab if they take BIO 180 in their junior year (as compared to taking a capstone course).

Rationale for change in course name and description:

- The "Advanced" in "Advanced Molecular Biology" makes it appear that BIO 121 (Molecular Cell Biology) should be taken as a prerequisite.
- A course name and description change would emphasize the Research Experience part, thereby making this BIO 180 course's central objective clearer to students seeking research experience.
- Students seeking a Biomedical Sciences concentration (the most popular Biology concentration) are the only concentration that does not have a required CURE (or capstone-like course). Yet, they are encouraged to participate in research to bolster their applications to medical programs. Previous Biomed students who have taken BIO 180 in the past frequently comment they believe more BioMed students should take this course due to its relevance to detecting and treating cancer and applying emerging molecular technologies for treating human diseases. I would like to encourage more BioMed students, who would benefit from gaining medically-relevant research experience, to take BIO 180 by emphasizing the Research Experience part.

Notes:

- A Form A to request these same changes to BIO 280 (paired with BIO 180) was submitted in parallel

Course Description: (Not to exceed 80 words and language should conform to catalog copy.)

Novel course-based research experience investigating unknown biomolecular pathways, genes, genomes, and the mechanisms by which they change. Hands-on experience designing and constructing new mutants using genetic engineering, and analysis of mutants and their phenotypes to study molecular processes. Applications of these approaches to medicine, biotechnology, and debating their surrounding ethics. Paired with Bio 280 and the material covered will be the same. Fee course. Lecture two hours, laboratory six hours. 4 units.

Are one or more field trips required with this course?

No

Fee Course?

Yes

Is this course designated as Service Learning?

No

Is this course designated as Curricular Community Engaged Learning?

No

Does this course require safety training?

Yes

Does this course require personal protective equipment (PPE)?

Yes

Course Note: (Note must be a single sentence; do not include field trip or fee course notations.)

This course requires safety training and personal protective equipment (PPE).

Does this course have prerequisites?

Yes

Prerequisite:

BIO 184

Prerequisites Enforced at Registration?

Yes

Does this course have corequisites?

No

Graded:

Letter

Approval required for enrollment?

No Approval Required

Course Component(s) and Classification(s):

Laboratory
Lecture

Laboratory Classification

CS#16 - Science Laboratory (K-factor=2 WTU per unit)

Laboratory Units

2

Lecture Classification

CS#02 - Lecture/Discussion (K-factor=1WTU per unit)

Lecture Units

2

Is this a paired course?

Yes

Please confirm that it complies with the Paired Courses Policy and enter the course with which it is paired:

BIO 280

Is this course crosslisted?

No

Can this course be repeated for credit?

No

Can the course be taken for credit more than once during the same term?

No

Description of the Expected Learning Outcomes and Assessment Strategies:

List the Expected Learning Outcomes and their accompanying Assessment Strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers). Click the plus sign to add a new row.

| | Expected Learning Outcome | Assessment Strategies |
|---|--|--|
| 1 | Students will apply bioinformatic tools to identify and compare key genomic features in model organisms to reveal evolutionary patterns that provide insight into biological function. | Exams and Quizzes Lab Research Production, Quality, and Troubleshooting Progress Written Research Report |

| | | |
|---|---|---|
| 2 | Students will use genetic engineering tools to design, construct, and verify site-specific mutant strains for addressing unanswered research questions. | Exams and Quizzes Lab Research Production, Quality, and Troubleshooting Progress Written Research Report |
| 3 | Students will produce and analyze novel experimental data to test and identify the unknown functions of gene products and investigate their molecular pathways. | Exams and Quizzes Lab Research Production, Quality, and Troubleshooting Progress Written Research Report |
| 4 | Students will apply and analyze the effects of regulating gene expression by its translation into phenotypes under different environmental conditions. | Exams and Quizzes Lab Research Production, Quality, and Troubleshooting Progress Oral Presentation Written Research Report |
| 5 | Students will use oral and written communication to present molecular biology literature and novel experimental data generated by the class. | Exams and Quizzes Lab Research Production, Quality, and Troubleshooting Progress Oral Presentation Written Research Report |
| 6 | Students will analyze how molecular biology tools are being applied in medicine and biotechnology, examine their limitations, and debate some of their surrounding ethical questions. | Exams and Quizzes |

Attach a list of the required/recommended course readings and activities:

BIO 180-280 Syllabus & Schedule.pdf

Is this course required in a degree program (major, minor, graduate degree, certificate?)

No

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer)?

No

Will there be any departments affected by this proposed course?

No

I/we as the author(s) of this course proposal agree to provide a new or updated accessibility checklist to the Dean's office prior to the semester when this course is taught utilizing the changes proposed here.

I/we agree

University Learning Goals

Undergraduate Learning Goals:

- Competence in the disciplines
- Knowledge of human cultures and the physical and natural world
- Intellectual and practical skills
- Personal and social responsibility
- Integrative learning

Is this course required as part of a teaching credential program, a single subject, or multiple subject waiver program (e.g., Liberal Studies, Biology) or other school personnel preparation program (e.g., School of Nursing)?

No

GE Course and GE Goal(s)

Is this a General Education (GE) course or is it being considered for GE?

No

Reviewer Comments:

Mikkel Jensen (mikkel.jensen) (Thu, 07 Sep 2023 20:03:12 GMT): Rollback: We request changes to the BIO 180 Form A, and recommend submitting a Form a for BIO 280 with the following changes: •The course descriptions of the proposed 180 and the current 280 are not aligned. The course descriptions don't have to be exactly identical (although they can certainly be), but they must be closely aligned to reflect that they are paired and that the material covered is the same. •The LOs of the proposed 180 and the current 280 are identical – they can have some shared LOs, but the graduate-level 280 course needs to have additional LOs at a higher taxonomic level than the undergraduate course. This can either be remedied by changing the 180 LOs or filing a 280 Form A and

resubmitting the two in parallel. •Requires PPE and safety training requirements: 180 Form A says no to both? Please double-check this; this should probably be yes, if 280 requires it? •Please attach a draft syllabus to the Form A for the new, modified 180 course.

Susanne Lindgren (lindgren) (Wed, 27 Sep 2023 05:43:40 GMT): Rollback: For recommended edits

Robin Altman (altman) (Fri, 17 Nov 2023 21:14:21 GMT): Rollback for revisions (communicated by email to author.)

Robin Altman (altman) (Fri, 17 Nov 2023 21:14:59 GMT): Rollback: Revisions communicated to author by email.

Key: 465