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| For Academic Affairs and Research Use Only |
| CIP Code:  |  |
| Degree Code: |  |

**New Course Proposal Form**

**[ X] Undergraduate Curriculum Council**

**[ ] Graduate Council**

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| --- |
| **[ ] New Course or [ ]Experimental Course (1-time offering) (Check one box)** |

Signed paper copies of proposals submitted for consideration are no longer required. Please type approver name and enter date of approval.

Email completed proposals to curriculum@astate.edu for inclusion in curriculum committee agenda.

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| David F Gilmore 10/25/2018**Department Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**COPE Chair (if applicable)** |
| Travis D. Marsico 10/26/2018**Department Chair:**  | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Head of Unit (If applicable)**   |
| David F Gilmore 10/25/2018**College Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Undergraduate Curriculum Council Chair** |
| A Lambertus for Anne Grippo 10/26/2018**College Dean** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Graduate Curriculum Committee Chair** |
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| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Enter date |

**General Education Committee Chair (If applicable)**   | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Vice Chancellor for Academic Affairs** |

1. Contact Person (Name, Email Address, Phone Number)

Asela Wijeratne, awijeratne@astate.edu, 870-972-3311

Maureen Dolan, mdolan@astate.edu, 870-680-4359

2. Proposed Starting Term and Bulletin Year

Spring, 2019; 18/19

3. Proposed Course Prefix and Number (Confirm that number chosen has not been used before. For variable credit courses, indicate variable range. *Proposed number for experimental course is 9*. )

BIO 4173

4. Course Title – if title is more than 30 characters (including spaces), provide short title to be used on transcripts. Title cannot have any symbols (e.g. slash, colon, semi-colon, apostrophe, dash, and parenthesis). Please indicate if this course will have variable titles (e.g. independent study, thesis, special topics).

Molecular Biology

5. Brief course description (40 words or fewer) as it should appear in the bulletin.

***Fundamental principles of molecular biology and their application. Emphasis on integrating technologies, past and present, to explore gene structure, regulation and function in driving biological processes.***

6. Prerequisites and major restrictions. (Indicate all prerequisites. If this course is restricted to a specific major, which major. If a student does not have the prerequisites or does not have the appropriate major, the student will not be allowed to register).

1. Yes Are there any prerequisites?
	1. If yes, which ones?

BIO 3013 or permission of instructor.

* 1. Why or why not?

 Genetics provides foundational content needed for this course to build upon.

1. No Is this course restricted to a specific major?
	1. If yes, which major? Enter text...

7. Course frequency(e.g. Fall, Spring, Summer). *Not applicable to Graduate courses.*

Spring

8. Will this course be lecture only, lab only, lecture and lab, activity, dissertation, experiential learning, independent study, internship, performance, practicum, recitation, seminar, special problems, special topics, studio, student exchange, occupational learning credit, or course for fee purpose only (e.g. an exam)? Please choose one.

Lecture only

9. What is the grade type (i.e. standard letter, credit/no credit, pass/fail, no grade, developmental, or other [please elaborate])

standard letter

10. Yes Is this course dual listed (undergraduate/graduate)?

11. No Is this course cross listed?

*(If it is, all course entries must be identical including course descriptions. Submit appropriate documentation for requested changes. It is important to check the course description of an existing course when adding a new cross listed course.)*

**11.1** – If yes, please list the prefix and course number of cross listed course.

 Enter text...

**11.2** – **Yes / No** Are these courses offered for equivalent credit?

Please explain. Enter text...

12. No Is this course in support of a new program?

a. If yes, what program?

 Enter text...

13. No Does this course replace a course being deleted?

a. If yes, what course?

Enter text...

14. No Will this course be equivalent to a deleted course?

a. If yes, which course?

Enter text...

15. Yes Has it been confirmed that this course number is available for use?

 *If no: Contact Registrar’s Office for assistance.*

16. No Does this course affect another program?

If yes, provide confirmation of acceptance/approval of changes from the Dean, Department Head, and/or Program Director whose area this affects.

Enter text...

**Course Details**

17. Outline (The course outline should be topical by weeks and should be sufficient in detail to allow for judgment of the content of the course.)

|  |  |  |  |
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| **Week** | **Lecture Topics** | **Activity** | **Instructor**  |
| **1** | Course Overview, History of Molecular Biology | Assessment test | MD |
| **2** | Protein fundamental concepts: folding/structure/modification | Activity: Translation  | MD |
| **3** | Western/SDS PAGE | 1 presentation alternate type of protein gel electrophoresis technique | MD |
| **4** | Chromatography/ELISA | 2 presentation on a chromatography chemistry or a version of ELISA | MD |
| **5** | MS/**Case study** (TBD) | Protein case studies  | AJW |
| **6** | DNA basics; Chromatin packaging, organization, ploidy  | **Exam 1** (50 min) | AJW |
| **7** | PCR/Sequencing; Genomics (Structure of the genome) | 1 presentation on isothermal | AJW |
| **8** | HTS different applications | 1 digital PCR; 1 presentation on a new HTS technology | AJW |
| **9** | Array; **Case study** (Breast cancer panel) |   | AJW |
| **10** | RNA basics; Structure and function Transcription basics  | **Exam 2** (50 min) | MD |
| **10****11** | RNA basics; Structure and function Transcription basics RNA types; Gene regulation (transcription and post transcription)  | Activity: Transcription | MDMD |
|   |
| **12** | Measuring expression levels: qRT-PCR, RNA Seq, small RNA sequencing  | 1 presentation: Small RNA technology | AJW |
| **13** | Regulatory transcriptomics: ChIP-Seq, DNAase assay; Pathway analysis  | 1 presentation: RNA-seq application | AJW |
| **14** | Cloning; CRISPR-Cas technology; **Case study** (CRISPR-cas application) | 1 presentations: TBD | AJW |
|  |  | **Final exam** |  |
|  |  |  |  |

18. Special features (e.g. labs, exhibits, site visitations, etc.)

Enter text...

19. Department staffing and classroom/lab resources

This course has been taught as a Special Topics course; staffing and class space exists.

1. Will this require additional faculty, supplies, etc.?

 No

20. No Does this course require course fees?

 *If yes: please attach the New Program Tuition and Fees form, which is available from the UCC website.*

**Course Justification**

21. Justification for course being included in program. Must include:

 a. Academic rationale and goals for the course (skills or level of knowledge students can be expected to attain)

 **Academic rationale:** Molecular Biology is a field that is evolving rapidly, with tools and applications developed to enhance human health and agriculture. This course will allow students to learn novel developments in the field and prepare them for their future careers. **Course Goals:** Reinforce key concepts that are foundational to the study of molecular biology. Emphasize applications of modern molecular biology to various fields. Emphasize concepts and theories of molecular biology applications to various problem settings. Interpret and effectively communicate scientific concepts.

b. How does the course fit with the mission established by the department for the curriculum? If course is mandated by an accrediting or certifying agency, include the directive.

 This course fits well with the goals of Department of Biological Sciences as the department embraces a wide range of topics. This is a required course for the BS Biotechnology program, which prepares students to compete successfully for existing and future careers in biotechnology

c. Student population served.

Undergraduate students in the Biotechnology and Biological Sciences programs

d. Rationale for the level of the course (lower, upper, or graduate).

The diverse tools and technology involved in molecular biology require a mature approach to the understanding of the subject. Hence upper level undergraduate students will benefit maximally from this course.

**Assessment**

**Relationship with Current Program-Level Assessment Process**

22. What is/are the intended program-level learning outcome/s for students enrolled in this course? Where will this course fit into an already existing program assessment process?

As a required course in the Biotechnology program, this course will substantially contribute to the 3 PLOs for this program: Demonstrate an understanding of basic techniques used in the field of biotechnology. • Understand and describe concepts of scientific rigor, reproducibility and quality control. • Communicate concepts of biotechnological applications to solve real-world problems.

23. Considering the indicated program-level learning outcome/s (from question #23), please fill out the following table to show how and where this course fits into the program’s continuous improvement assessment process.

*For further assistance, please see the ‘Expanded Instructions’ document available on the UCC - Forms website for guidance, or contact the Office of Assessment at 870-972-2989.*

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| **Program-Level Outcome 1 (from question #23)** | Communicate concepts of innovation, entrepreneurship, and biotechnological applications to solve real-world problems. |
| Assessment Measure | Direct assessment will be performed during the BIO 4053 Applications in Biotechnology course. Students will take ten questions at the end of each semester. Indirect assessments will be performed as class activities, including in-class presentations, exams, and case studies.  |
| Assessment Timetable | Every spring semester before the start and end of the semester during the BIO 4053 Applications in Biotechnology course.  |
| Who is responsible for assessing and reporting on the results? | Drs. Fabricio Medina- Bolivar and Asela Wijeratne |

 *(Repeat if this new course will support additional program-level outcomes)*

 **Course-Level Outcomes**

24. What are the course-level outcomes for students enrolled in this course and the associated assessment measures?

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| **Outcome 1** | At the end of the BIO 4173 course, students should be able to do the following: * Interpreting and making inference of data generated from molecular biology case studies.
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| Which learning activities are responsible for this outcome? | Three cases studies pertaining to different subsection of molecular biology will be presented to students who will participate in these cases studies during the semesters.  |
| Assessment Measure  | Rubrics will be developed to evaluate the proposals and reports. |

*(Repeat if needed for additional outcomes)*

**Bulletin Changes**

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| **Instructions**  |
| **Please visit** [**http://www.astate.edu/a/registrar/students/bulletins/index.dot**](http://www.astate.edu/a/registrar/students/bulletins/index.dot) **and select the most recent version of the bulletin. Copy and paste all bulletin pages this proposal affects below. Follow the following guidelines for indicating necessary changes.** **\*Please note: Courses are often listed in multiple sections of the bulletin. To ensure that all affected sections have been located, please search the bulletin (ctrl+F) for the appropriate courses before submission of this form.** - Deleted courses/credit hours should be marked with a red strike-through (~~red strikethrough~~)- New credit hours and text changes should be listed in blue using enlarged font (blue using enlarged font). - Any new courses should be listed in blue bold italics using enlarged font (***blue bold italics using enlarged font***)*You can easily apply any of these changes by selecting the example text in the instructions above, double-clicking the ‘format painter’ icon 🡪 , and selecting the text you would like to apply the change to.* *Please visit* [*https://youtu.be/yjdL2n4lZm4*](https://youtu.be/yjdL2n4lZm4) *for more detailed instructions.* |

**BIO 4103. Virology** The structure, function, and classification of viruses, and their impact on modern society and the biological world. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 2103 or BIO 3013 or BIO 4104 or BIO 4133. Fall, even.

**BIO 4104. Microbiology** Morphology, physiology, taxonomy and cultivation of bacteria, viruses, fungi, and protozoans with an emphasis on medically relevant bacteria. Relationship of microorganisms to animals, plants, and the environment. Lecture two hours per week and labora­tory four hours per week. Prerequisites, CHEM 1023 and BIO 2013 or permission of instructor. Special course fees may apply. Fall, Spring, Summer, even.

**BIO 4111. Immunology Laboratory** Study of classical and current immunology techniques such as ELISA, immuno electrophoresis and Western Blot analysis. Laboratory 3 hours per week. Special course fees may apply. Prerequisites, BIO 2013 and CHEM 1013. Fall.

**BIO 4113. Immunology** Study of the human immune system. Topics include innate and acquired immunity, complement fixation and disorders of the immune system. Lecture 3 hours per week. Special course fees may apply. Prerequisites, BIO 2013 and CHEM 1013. Fall.

**BIO 4123. Cell Signaling** This course will provide an understanding of key concepts about cellular signaling mechanisms, major signaling pathways identified to date, and about the methods used to study these pathways. Three hours per week during spring semester. Special course fees may apply. Prerequisites, BIO 2013 or BIO 4133, or permission of the instructor. Spring, odd.

**BIO 4131. Cell Biology Lab** Two hours per week. To be taken concurrently with BIO 4133. Special course fees may apply. Spring.

**BIO 4133. Cell Biology** Organization and activities of cells, with emphasis on the ultrastructure and function of cellular organelles. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 2011, BIO 2013, CHEM 1023 and CHEM 1021. Spring.

**BIO 4143. Pharmacology** The study of drugs and their mechanisms of action at the system, cellular, and molecular levels. Special course fees may apply. Prerequisites, BIO 2203 and BIO 2223, or BIO 3223 and BIO 3233, BIO 4104, and CHEM 4243. Spring, even.

**BIO 4153. Laboratory in BioTechniques I** Laboratory techniques in protein chemistry and analytical techniques. Techniques also include a variety of chromatographic methods, electropho­resis, UV-vis spectroscopy and radiochemistry. Laboratory 4 hours per week. Special course fees may apply. Prerequisite, BIO 3013. Spring.

**BIO 4163. Laboratory in BioTechniques II** Laboratory techniques in DNA/RNA isolation, analysis and applications, including PCR, reverse transcriptase PCR, recombinant DNA and the production of gene expression products. Laboratory 8 hours per week. Special course fees may apply. Prerequisite, BIO 4153.

***BIO 4173. Molecular Biology Fundamental principles of molecular biology and their application. Emphasis on integrating technologies, past and present, to explore gene structure, regulation and function in driving biological processes. Prerequisite, BIO 3013 or permission of instructor. Spring.***

**BIO 4201. Issues in Human Ecology Laboratory** Two hours per week. To be taken concur­rently with BIO 4202. Special course fees may apply. Summer, odd.

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Major in Biotechnology

**Bachelor of Science**

A complete 8-semester degree plan is available at https://www.astate.edu/info/academics/degrees/

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| University Requirements:  |
| See University General Requirements for Baccalaureate degrees (p. 44)  |
| **First Year Making Connections Course:**  | Sem. Hrs.  |
| BIO 1013, Making Connections - Biology  | 3  |
| **General Education Requirements:**  | Sem. Hrs.  |
| See General Education Curriculum for Baccalaureate degrees (p. 89) Students with this major must take the following: *MATH 2194, Survey of Calculus OR* *MATH 2204, Calculus 1* *CHEM 1013 AND CHEM 1011, General Chemistry I and Laboratory* *BIO 2013 AND 2011, Biology of the Cell and Laboratory* *COMS 1203, Oral Communication (Required Departmental Gen. Ed. Option)*  | 36  |
| **Language Requirement:**  | Sem. Hrs.  |
| *A student must complete the foreign language requirements before being considered a Biotechnology Major. (Refer to Department of Biological Sciences Foreign Language Requirement).*  |
| **Major Requirements:**  | Sem. Hrs.  |
| BIO 2042, Biotechnology in a Global Society  | 2  |
| BIO 3013 AND BIO 3011, Genetics and Laboratory  | 4  |
| BIO 4033, Bioinformatics and Applications  | 3  |
| BIO 403V, Special Problems in Biology  | 3  |
| BIO 4053, Applications in Biotechnology  | 3  |
| BIO 4063, Biosafety and Ethics in Research  | 3  |
| BIO 4104, Microbiology  | 4  |
| BIO 4133 AND BIO 4131, Cell Biology and Laboratory  | 4  |
| BIO 4153, Laboratory in BioTechniques I  | 3  |
| BIO 4163, Laboratory in BioTechniques II  | 3  |
| ~~BIO 4164, Molecular Biology~~ BIO 4173 Molecular Biology | ~~4~~ 3 |
| CHEM 1023 AND CHEM 1021, General Chemistry II and Laboratory  | 4  |
| CHEM 3103 AND CHEM 3101, Organic Chemistry I and Laboratory  | 4  |
| CHEM 3113 AND CHEM 3111, Organic Chemistry II and Laboratory  | 4  |
| CHEM 4243 AND CHEM 4241, Biochemistry and Biochemistry Laboratory | 4  |
| PHYS 2054, General Physics I  | 4  |
| PHYS 2064, General Physics II  | 4  |
| STAT 3233, Applied Statistics I  | 3  |
| Biological Science electives  | 6  |
| Sub-total  | 68 |