ARIZONA STATE UNIVERSITY

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GENERAL STUDIES PROGRAM COURSE PROPOSAL COVER FORM

Courses submitted to the GSC between 2/1 and 4/30 if approved, will be effective the following Spring.

Courses submitted between 5/1 and 1/31 if approved, will be effective the following Fall.

(SUBMISSION VIA ADOBE.PDF FILES IS PREFERRED)

DATE 3/5/2009

1. ACADEMIC UNIT: School of Life Sciences

2. COURSE PROPOSED: MBB 343 Genetic Engineering and Society 4
(prefix) (number) (title) (semester hours)

3. CONTACT PERSON: Name: Hugh Mason Phone: 78228
Mail Code: 5401 E-Mail: hugh.mason@asu.edu

4. ELIGIBILITY: New courses must be approved by the Tempe Campus Curriculum Subcommittee and must have a regular course number. For the rules governing approval of omnibus courses, contact the General Studies Program Office at 965–0739.

5. AREA(S) PROPOSED COURSE WILL SERVE. A single course may be proposed for more than one core or awareness area. A course may satisfy a core area requirement and more than one awareness area requirements concurrently, but may not satisfy requirements in two core areas simultaneously, even if approved for those areas. With departmental consent, an approved General Studies course may be counted toward both the General Studies requirement and the major program of study. **(Please submit one designation per proposal)**

Core Areas

Literacy and Critical Inquiry–L ☑
Mathematical Studies–MA ☐ CS ☐
Humanities, Fine Arts and Design–HU ☐
Social and Behavioral Sciences–SB ☐
Natural Sciences–SQ ☐ SG ☐

Awareness Areas

Global Awareness–G ☐
Historical Awareness–H ☐
Cultural Diversity in the United States–C ☐

6. DOCUMENTATION REQUIRED.
(1) Course Description
(2) Course Syllabus
(3) Criteria Checklist for the area
(4) Table of Contents from the textbook used, if available

7. ***In the space provided below (or on a separate sheet), please also provide a description of how the course meets the specific criteria in the area for which the course is being proposed.***

CROSS-LISTED COURSES: ☐ No ☒ Yes; Please identify courses: Bio 343

Is this a multisection course?: ☒ No ☐ Yes; Is it governed by a common syllabus? _____

Dr. Andrew T Smith
Chair/Director (Print or Type)

Chair/Director (Signature)

Date: 3/5/2009

Mandatory Review

Rev. 1/94, 4/95, 7/98, 4/00, 1/02, 10/08

Proposer: Please complete the following section and attach appropriate documentation.

ASU - [L] CRITERIA

TO QUALIFY FOR **[L]** DESIGNATION, THE COURSE DESIGN MUST PLACE A MAJOR EMPHASIS ON COMPLETING CRITICAL DISCOURSE--**AS EVIDENCED BY THE FOLLOWING CRITERIA:**

YES	NO		Identify Documentation Submitted
☑	☐	**CRITERION 1:** At least 50 percent of the grade in the course should depend upon writing, including prepared essays, speeches, or in-class essay examinations. *Group projects are acceptable only if each student gathers, interprets, and evaluates evidence, and prepares a summary report*	See "Lecture and Laboratory Aims & Expectations"

1. Please describe the assignments that are considered in the computation of course grades--and indicate the proportion of the final grade that is determined by each assignment.

2. **Also:**

Please **circle, underline, or otherwise mark** the information presented in the most recent course syllabus (or other material you have submitted) that verifies **this description** of the grading process--and label this information **"C-1".**

C-1

☑	☐	**CRITERION 2:** The composition tasks involve the gathering, interpretation, and evaluation of evidence	See "Lecture and Laboratory Aims & Expectations"

1. Please describe the way(s) in which this criterion is addressed in the course design

2. **Also:**

Please **circle, underline,** or **otherwise mark** the information presented in the most recent course syllabus (or other material you have submitted) that verifies **this description** of the grading process--and label this information **"C-2".**

C-2

☑	☐	**CRITERION 3:** The syllabus should include a minimum of two substantial writing or speaking tasks, other than or in addition to in-class essay exams	See "Lecture and Laboratory Aims and Expectations"

1. Please provide relatively detailed descriptions of two or more substantial writing or speaking tasks that are included in the course requirements

2. **Also:**

Please **circle, underline,** or **otherwise mark** the information presented in the most recent course syllabus (or other material you have submitted) that verifies **this description** of the grading process--and label this information **"C-3".**

C-3

ASU - [L] CRITERIA

YES	NO		Identify Documentation Submitted
☑	☐	**CRITERION 4:** These substantial writing or speaking assignments should be arranged so that the students will get timely feedback from the instructor on each assignment in time to help them do better on subsequent assignments. *Intervention at earlier stages in the writing process is especially welcomed*	See "Lecture and Laboratory Aims and Expectations"

1. Please describe the sequence of course assignments--and the nature of the feedback the current (or most recent) course instructor provides to help students do better on subsequent assignments

2. **Also:**

Please **circle, underline,** or **otherwise mark** the information presented in the most recent course syllabus (or other material you have submitted) that verifies **this description** of the grading process--and label this information **"C-4".**

C-4

Course Prefix	Number	Title	Designation
MBB/BIO	343	Genetic Engineering & Society	L

Explain in detail which student activities correspond to the specific designation criteria. Please use the following organizer to explain how the criteria are being met.

Criteria (from checksheet)	How course meets spirit (contextualize specific examples in next column)	Please provide detailed evidence of how course meets criteria (i.e., where in syllabus)
1. At least 50% of the grade should depend on writing.	The course grade is determined by the average score on the 4 quizzes (40%), the grade in the laboratory section (30%), the in-class performance as evidenced by "clicker" responses to questions (10%), and by the final exam (20%). The quizzes and final exam are 95% essay, and require interpretation of written material provided on the quiz. The grade for the laboratory section of the course is determined by laboratory reports (contributing 50% of the final lab grade), biweekly report updates (contributing 25%), and laboratory performance (contributing 25%). The lab reports are rigorous and must adhere to a format typical of scientific journals. Thus, >80% of the course grade depends on writing.	See descriptions of course aims and grading highlighted in the attached document "Lecture and Laboratory Aims & Expectations".
2. Composition tasks involve the gathering, interpretation, and evaluation of evidence.	The laboratory reports involve experimentation in genetic engineering (data acquisition), and interpretation and evaluation of the evidence, using the rigorous style that is typical of peer-reviewed scientific journals.	See highlighted sections in the attached "Lab Aims and Expectations."
3. The course should contain at least 2 speaking or writing tasks other than in-class essay exams. 4. Writing assignments should be arranged to allow feedback that enables improved performance on subsequent assignments.	3. The laboratory part of the course involves 3 separate reports for different experiments. 4. The 3 lab reports are preceeded by report updates, which are drafts that are graded and returned to students before the final report is due.	See highlighted sections in the attached "Lab Aims and Expectations."

ARIZONA STATE UNIVERSITY

COLLEGE OF LIBERAL ARTS AND SCIENCES

MBB 343
BIO 343

Detailed Lecture Schedule

(subject to change)

PART I, Molecular Biology Background

August 26	Introduction and review; chapters 1, 2 and start of 3
August 28	Review: DNA, RNA, and proteins; chapter 3
September 2	Restriction mapping, cloning, Southern blotting; chapter 4
September 4	cDNA, DNA libraries; prokaryotic transformation; chapter 4
September 9	DNA synthesis and sequencing; chapter 5
September 11	DNA amplification (PCR); chapter 5
September 16	Quiz I (chapters 1-5)

PART II, Applications and Implications of DNA Technology: the Basics

September 18	Manipulation of gene expression in prokaryotes; plasmids and genomic integration; chapter 6
September 23	Protein overexpression systems: chapters 6 and 7
September 25	Directed and combinatorial mutagenesis: examples; chapter 8
September 30	Mutagenesis procedures: PCR, oligonucleotide-directed, combinatorial, random, transposon mutagenesis, protein engineering; chapter 8
October 2	DNA diagnostics vs. ELISA; chapter 9
October 7	Producing human proteins in bacteria; expression optimization; chapter 10
October 9	Vaccines: subunit and peptide vaccines; chapter 11
October 14	Quiz II (chapters 6-11)

PART III, Genomics and Impacts on Biomedicine, Bioethics, and the Future of Biotechnology

October 16	Concept of linkage mapping to identify human disease genes; chapter 20
October 21	Genome projects: concepts, scope, and implications
October 23	A primer to genomics and proteomics
October 28	Bioterrorism; regulation and patenting rules; chapters 21-22

October 30	Stem cell research: facts and fiction
November 4	Perspective on future directions in biotechnology
November 6	Quiz III (Chapters 20-22)

PART IV, Applications and Implications of DNA Technology: Industrial and Field Applications

November 13	Examples of pathway engineering and overexpression to produce useful organic compounds; start on bioremediation; chapter 12 and 13
November 18	Bioremediation and biomass utilization; chapter 13
November 20	Microbes aiding in crop productivity and biological insecticides: the Bt toxin; chapters 14 and 15
November 25	Large-scale production using microorganisms: examples and scale-up challenges; chapter 16
December 2	Plant genetic engineering; Transgenic plants; chapters 17-18
December 4	Transgenic animals; chapter 19
December 9	Quiz IV

Return to Contents

Instructors | Aims
Lecture Part: Schedule | Expected Background & Textbook Info | Historical Perspective
Intro to Biotechnology | DNA, RNA and Protein Synthesis | Chemical Synthesis, Sequencing, and Amplification of DNA |
Directed Mutagenesis and Protein Engineering | Vaccines | Antibiotics & Proteins | Bioremediation |
Microbial Insecticides | Plant Genetic Engineering: Methodology | Plant Genetic Engineering: Applications | Transgenic Animals
Human Molecular Genetics | Regulatory & Ethical Aspects | Biotech Inventions | Additional Materials
Lab Part: Aims and Expectations | Schedule

Center for Bioenergy & Photosynthesis
Arizona State University
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Contact Webmaster Larry Orr

22 August 2008

ARIZONA STATE UNIVERSITY

COLLEGE OF LIBERAL ARTS AND SCIENCES

Lab Schedule Overview

Week	Date	Exp-Week	Protocol	Homework due
1	8/25/08	I-1	Outline and Overview Restriction digest Ligation to construct pET28-GFP	
2	9/1/08*	I-2	Transformation/plating of ligation Pick colonies (day after lab)	1st Update Expt. I
		II-2	Outline and Overview A) Transformation/plating of wild-type *Synechocystis* with the pKCP43 plasmid; plate cells on agar w/antibiotic B) PCR wild-type *Synechocystis* psbC gene	
3	9/8/08	I-3	PCR colony screen Plasmid prepration	
		II-3	A) Observe *Synechocystis* transformation plate	
4	9/15/08	I-4	Restriction digest recombinant plasmids Gel electrophoresis of PCR & digests Transformation of BL21(DE3) Inoculate cultures BL21 (day after lab)	
		II-4	A) Segregation of *Synechocystis* transformants: Transfer to a new plate with higher antibiotic concentration B) Gel electrophoresisof PCR products	1st Update Expt. 2
5	9/22/08	I-5	Collect and extract cell samples (native)	
		II-5	B) Purification of PCR product	
6	9/29/08	I-6	Extract cell samples SDS-PAGE electrophoresis	2nd Update Expt. I
		II-6	A) Continue segregation for *Synechocystis* transformants with higher antibiotic B) Restriction digestion of the psbC PCR product and pUC19 plasmid	
7	10/6/08	I-7	Metal affinity chromatography of GFP-6His	
		II-7	B) Start a plate of wild-type *Synechocystis* sp. PCC 6803 B) Ligate digests of psbC and pUC19	
8	10/13/08	II-8	A) Continue segregation for *Synechocystis* transformants with higher antibiotic B) Transform *E. coli* with ligation mix; plate cells B) Start cultures of *E. coli* transformants (one day prior to week 10 lab period)	2nd Update Expt. II
9	10/20/08	II-9	B) Prepare recombinant plasmid; submit for sequencing	**Report I**
		III-9	Bioinformatics (Part I)	

10	10/27/08	II-10	A) Continue segregation for *Synechocystis* transformants with higher antibiotic	
		III-10	Bioinformatics (Part II)	
11	11/3/08	III-11	Genomics (Part I)	
			Lab facilities tour	
12	11/10/08**	II-12	A) Small scale DNA preparation from wild-type and the psbC- mutant of *Synechocystis* B) Gel electrophoresis of recombinant plasmid	3rd Update Expt. II
13	11/17/08	III-13	Genomics (Part II)	
		II-13	A/B) Transform psbC-*Synechocystis* with recombinant plasmid and wild-type DNA A) PCR of DNA from wild type and the psbC- transformant of *Synechocystis*	
14	11/24/08	II-14	A) Analysis of PCR products by gel electrophoresis A/B) Check plates for restored photoautotrophic phenotype by transformation of psbC- mutant	**Report III**
15	12/1/08	Clean-up	Mandatory	**Report II** (Report III M& T labs)
16	12/8--9/08	Clean-up	For Mon. and Tues. labs only	Report II M& T labs

*The Monday lab will not meet September 1 (Labor Day), and thus will be one week late for all subsequent lab meetings and lab reports.
**The Tuesday labs will not meet November 11 (Veteran's Day) and thus will be one week late for all subsequent lab meetings and lab reports.

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05 September 2008

Hugh Mason
Roberto Gaxiola

Arizona State University College of Liberal Arts and Sciences

MBB/Bio343
Aims and Expectations

DNA (deoxyribonucleic acid) is the carrier of genetic information in each living cell, and eventually determines the potential of the cell. Recent advances in the understanding and the practical use of the ways in which the information contained in the DNA is expressed and can be specifically altered have revolutionized much of the biosciences. Applications are increasingly powerful and have given rise to the field of biotechnology. This discipline is evolving rapidly as exciting developments in this area follow each other in a rapid pace. The start of the century was marked by the announcement of the virtual completion of the important part of the human DNA sequence, years ahead of schedule, and hundreds of organisms now have a known genome sequence.

The applications of recombinant DNA technology are powerful and uses (and potential misuses) are many. However, this area is often perceived as complex and somewhat inaccessible. This course is designed to remedy this problem, and to provide information on the development and current status of DNA technology and its wide range of impacts on society. From this course, the student hopefully will be able to develop a balanced view of the various aspects of gene technology, as it affects society at many different levels (health care, forensics, agriculture, basic science, product development, etc.).

The aim of the course is that you understand the material so that you can work with it and apply it. Therefore, emphasis in quizzes and exams is on testing whether you understand the concepts and can use your knowledge. Labs are aimed at becoming proficient in some standard lab techniques, and at becoming familiar with procedures and content of scientific reporting. "Regurgitation" of memorized material is not expected; one forgets the memorized material within weeks after having finished the course, while concepts and working knowledge stick around much longer, and are far more useful in the long run. An important thing to stress with this course is that keeping up with the material is essential. As lectures and laboratory experiments build on what was covered

earlier in the course, a student has a real good chance to get lost quickly if materials covered before are not thoroughly understood. To help you in the process of keeping up with the material, attendance at lectures and your assigned lab section is mandatory. If you have a valid excuse for missing a lecture or lab, please notify Dr. Mason or Dr. Gaxiola by Email or phone beforehand, and for laboratories suggest arrangements how you can catch up that same week (e.g., by participating in another lab section that same week). Note that such one-time exceptions need to be granted beforehand. There are no make-up labs.

A few notes on "clickers": Students are responsible for having them registered with their full name and ASU ID number, for bringing them to class each lecture, and for having them always in working order (remember the battery!). For help with clickers, please go to the einstruction.com website or call their toll-free number.

The lecture portion of this course consists of four modules, each of which is concluded with a quiz. Quizzes are cumulative and are designed to have you use the material you have learned, but now in a different context. A final exam is given as well, at the time shown in the Schedule of Classes. Quizzes and the final exam are open-book and consist of essay questions. Any written materials may be used that you can bring with you without being in the way of your neighbors but the use of electronic devices (laptops, blackberries, etc.) is not allowed.

The quizzes and the final exam will focus on your comprehensive grasp of the material rather than on factual trivia.

The laboratory portion of the course is designed to get practical experience in basic techniques and applications in molecular biology and genetic engineering, including DNA isolation, transformation, DNA amplification, construction of recombinant DNA, gel electrophoresis, etc. Moreover, the laboratory experience serves to aid in the understanding of the materials covered in lectures. In addition to the laboratory work, students are expected to write laboratory reports.

The course satisfies the General Studies Literacy and Critical Inquiry (L) requirement. A minimum of six "L" course semester hours are

required on a Program of Study. The tests and laboratory reports are writing-intensive, and will help the student to learn to organize ideas logically and coherently. For help achieving your maximum writing potential, the Writing Center ((480) 965-4272; writingcenter@asu.edu; http://www.asu.edu/duas/wcenter/; UASB 140) has resources and tutors available.

Your final grade is determined by your average score on the quizzes (Qav), your grade in the laboratory section (Lab), your in-class performance as evidenced by your "clicker" response to questions (C), and by your score on the final exam (F). Qav contributes 40% to the final grade, F 20%, Lab 30%, and C 10%. The grade for C is a combination of "being there" and actually providing the right answer.

Over the past years, on average the following correlation between scores and grades has existed for the MBB 343/BIO 343 course (the average grade has been about a B):

86 -100 %	A
71 - 85 %	B
56 - 70 %	C
35 - 55 %	D
< 34%	E

This does not mean that exactly the same grading scale will be used this year (it depends on how easy or how hard the quizzes and exam turn out to be), but it gives you a good indication of what to expect.

Cheating, plagiarism, and academic dishonesty will not be tolerated in this course. Note that also the use of another student's clicker is considered cheating. Please be aware of the University policies that allow sanctions ranging from reduction in grade to expulsion from the University without expectation of readmission.
ASU's Student Academic Integrity Policy
http://www.asu.edu/studentaffairs/studentlife/judicial/academic_integrity.htm
Student Code of Conduct and Sanctions
http://www.abor.asu.edu/1%5Fthe%5Fregents/policymanual/chap5/chapter_v.htm#5-303,
http://www.abor.asu.edu/1%5Fthe%5Fregents/policymanual/chap5

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/chapter_v.htm#5-308 and
http://www.abor.asu.edu/1%5Fthe%5Fregents/policymanual/chap5
/chapter_v.htm#5-304

MBB/BIO 343
Laboratory
Aims and Expectations

The laboratory serves three main functions:

1.

Students obtain practical experience in basic techniques and applications in molecular biology and genetic engineering, including DNA isolation, transformation, DNA amplification, construction of recombinant DNA, gel electrophoresis, bioinformatics, etc.

2.

Students learn to write laboratory reports based on research data and theoretical background.

3.

The laboratory experience serves to aid in the understanding of the materials covered in lectures.

Each student will write a full laboratory report for each experiment (I-III). This report typically is due the week after an experiment has been finished. As experiments in a biological laboratory usually run for several days or weeks, students will need to update and expand reports regularly (typically every other week) based on what they have done those weeks. In this way, all results and concepts have been written up before memory fades. A schedule of what is due and when is available in the lab schedule overview . Students are encouraged to use the time they are waiting in the lab (during sample incubation, etc.) to get a headstart on the report update. Reports are due at the start of the laboratory time, and are corrected and graded by the following week. The week after an

experiment has been finished, the full laboratory report for that experiment is due.

Each laboratory report (including report updates) will have:

1. Cover page
This page should contain your name, the experiment being reported, lab section, and an original title.

2. Introduction
The purpose of an introduction is to give the reader background information pertaining to the line of investigation followed during each experiment. It should detail general knowledge about the field of research and significant past experiments that have been carried out, and delineate the goal(s) of the current experiment.

3. Materials and Methods
This section should describe the procedures that were followed for each experiment. Because most of the Materials and Methods for this course are contained on the course website, it may be sufficient to cite these materials. It is important to appending any major procedural changes that were made during the lab.

4. Results
a) This section is reserved for presenting the data or results obtained from experiments. This may be done by summarizing observations, charting data or preparing tables and figures. Avoid interpreting (discussing) results in this section.

b) It is not sufficient to paste a figure or table into this section. The results found in the figures and tables must be described, and the most important features highlighted.

c) Figure and Table labeling:

i. Note that Figures are numbered sequentially and have their legends at the bottom.
ii. Tables, on the other hand, always are labeled at the top, and are numbered sequentially but separately from the Figures.
iii. The reader should be able to look at figures, tables and their captions and understand what the figure or table represents without

reading the text of the results. On the other hand, the reader should also be able to read the text of the results without referring to the figure or table. Each of these items supports the other, and neither is complete without the other.

5. Discussion
The Discussion is used to interpret the data presented in the Results section. The Discussion is also used to revisit and answer the questions presented in the introduction, giving a general summary of what the experiment has demonstrated. In addition, if the results did not quite come out as expected, a discussion of the potential reasons for this discrepancy is appropriate.

6. References
Cite literature references in standard format. (For example: Doe, J., and Deer, J. (2004) DNA fingerprinting of endangered elk populations. J. Wildlife Res. 75: 124-137.)

7. Page numbering
Pages should be numbered (except for the cover page), and each page should have your name in the upper right corner. Page 1 is the Introduction.

In addition to biweekly report updates, at the beginning of each laboratory period students will also turn in the answer to prelab questions for that day. The purpose of these prelab questions is to assure that you get a timely feedback from the instructor. Please make sure to include your name on your answer, and number the pages.

Laboratory reports are due at the time of YOUR lab during the following periods:

Experiment I: October 20-22*

Experiment II: December 1-3**

Experiment III: November 24-26**

Hugh Mason
Roberto Gaxiola

*The Monday lab will not meet September 1 (Labor Day), and thus will be one week late for all subsequent lab meetings and lab reports.
**The Tuesday labs will not meet November 11 (Veteran's Day) and thus will be one week late for all subsequent lab meetings and lab reports.

The grading for the laboratory section of the course will be the composite of grades for laboratory reports (contributing 50% of the final lab grade), biweekly report updates (contributing 25%), and laboratory performance (contributing 25%). Lab reports for the five experiments are weighted as follows:

Report I: 35%

Report II: 45%

Report III: 20%

Criteria used in evaluating laboratory performance are as follows:

1. Preparation as evidenced by successful completion of prelab questions (50%)

2. Involvement and motivation in the laboratory, as evidenced by attention, precision, and participation in cleanup (50%)

Report update and laboratory report grades will be assigned within a week, and with this timely feedback you can monitor your progress and make necessary adjustments early in the semester, so your lab experience will be as successful as possible.