General Education Course Proposal

Proposed Course: BIOSC (Prefix) 1A (No.) Introductory Biology (Title) Units 4

Department: Biology School: Natural Sciences

GE Category (Indicate one category only):

Foundation: A1___; A2___; A3___; B4___

Breadth: B1___; B2_X_; C1___; C2___; D___; E___

Integration: B___; C___; D___; International/Multicultural___

Existing Course_X_; Revised Course___; New Course___

Course Included in Current GE Program____

New courses require the Undergraduate Course Proposal form in addition to this form.

Revised courses require the Undergraduate Course Change Request in addition to this form.

Proposed catalog description: Limit course description to 40 words using succinct phrases. Include prerequisites, limitations, lecture/lab hours. Indicate former course number, e.g., (Former Biol 105)

1A. Introductory Biology (4)
Course one of two-semester sequence required of all biology majors.Thematic introduction to the unifying concepts of life science: chemical basis of life; cellular processes; energy metabolism; genetics; evolution. General Education BREADTH, B2. (3 lecture, 3 lab hours)

Enrollment limit per section: 220 (24/lab section)

Expected number of sections per semester – Year 1 1; Year 3 1

Attachments:

1. A statement presenting the ways in which this course meets the Specifications provided in the appropriate section of the General Education Policy as well as in the Policies for Inclusion and Evaluation of General Education Courses.
2. A statement of elements common to all sections of this course, identifying content, objectives, required student activities, grading policy, representative texts, and an approximate schedule for the course. Required student activities include such things as papers, research projects, homework, laboratory and/or studio performance, recitations, participation, attendance, and exams.
3. A typical syllabus for a particular offering of the course.
4. Any special cost factors associated with this course.

Approval for Inclusion in General Education

Department Chair — Date 3/20/98

School Curriculum Committee — Date 9/2/98

School Dean — Date 3/24/98

General Education Subcommittee — Date 12/15/98

Associate Provost — Date 12/22/98

1/14/98

ATTACHMENT 2

ELEMENTS COMMON TO ALL SECTIONS OF THIS COURSE

Content - See attached conceptual outline

Objectives - Presentation of basic factual base and organizing ideas of biology involved in the following topics: physical and chemical basis of life, cell structure, the biology of DNA, genetics, and evolution. Give the student an opportunity to work with data collection and interpretation.

Required student activities -

Three midterms and a comprehensive final exam.
Weekly three hour laboratory with attendance required.
Eleven lab quizzes and two lab exams.
Three page biotechnology paper based on library research.
Rewrite the biotechnology paper.
Poster presentation on animal behavior.
Oral presentations of biotechnology paper and animal behavior observations.

Grading policy -

The grading curve will be 90% = A, 80% = B, 70% = C, 60% = D.
One midterm grade will be dropped.
Numerical scores at the end of the semester will be raised to produce a 70% average.
Lab grades are one fourth of the course grades.
Numerical scores in the labs will be raised to a common percentage for all labs so differences in teaching assistant grading are normalized.
Student must pass both the lecture and the lab to pass the course.

Representative texts -

Purves, W. K., Orians, G. H., Heller, H. C., and Sadava, D. (1998) Life: The Science of Biology. Fifth edit. Freeman and Company.
Campbell, N. A. (1996) Biology. Fourth edit. Benjamin/Cummings Company.

Approximate schedule for the course -

Lecture at 8:10 - 9:00, MWF (taught in McLane 121 with a capacity of 220).
Labs are 8:10 - 11:00, 11:10 - 2:00, 2:10 - 5:00, TTh with additional labs added on MWF as needed for larger enrollments (24 students per lab).

CONCEPTUAL OUTLINE OF BIOSC 1A, INTRODUCTORY BIOLOGY

1. Science is a way of thinking about the natural world.
    A. The two main characteristics of scientific thinking are careful reasoning and testing ideas by observation and experiment.
    B. Scientists have developed rules for scientific thinking and making theories.
    C. Science and technology are different kinds of investigation.
2. Atomic structure explains the aspects of chemistry relevant to life's chemistry.
    A. Atomic structure explains chemical bonds, polarity, ionization, solubility, and molecular structure.
    B. Applying knowledge of atomic structure to water explains the characteristics of this molecule.
3. The structure and chemistry of large molecules explain much of cellular structure and function.
    A. Lipids are grouped together because of their water insolubility. Triglycerides, phospholipids, and steroids have unique structures and functions.
    B. Carbohydrate polymers are chains of sugars and function as energy reserves or skeletons.
    C. Proteins are polymers of amino acids and fold into 3-D structures with diverse functions.
    D. Nucleic acids are polymers of bases which occur in sequences specific for every species.
4. Cells are the simplest structure that can be called alive. All organisms are made of one or more cells.
    A. Cells are small because of limitations based on physics.
    B. Cells evolved into two types, prokaryotes and eukaryotes.
    C. Eukaryotes have internal membrane bound organelles with distinctive functions.
    D. Prokaryotes (bacteria) have simple structure and very diverse metabolism.
    E. The discovery of bacteria revolutionized public health and greatly reduced human suffering.
5. Membranes are bilayers of phospholipids with embedded proteins. Membranes are barriers.
    A. The hydrophobic interior of membranes and embedded proteins lead to specific types of transport across membranes.
6. Enzyme function is explained by energetics and protein structure.
    A. The first and second laws of thermodynamics explain reaction stoichiometry and rate.
    B. The specific 3-D structure and reactive functional groups explain enzyme rate and specificity.
7. The second law of thermodynamics explains organisms' need for continual energy input.
    A. Energy is obtained from the reducing potential of molecules.
    B. Energy is obtained through pathways: glycolysis, citric acid cycle, and electron transport.
8. The sun is the ultimate energy source for organisms via photosynthesis.
    A. Photosynthesis reverses the energy inputs and metabolic pathways of energy metabolism.
    B. The physics of light absorption explains how light energy is transformed to chemical energy.
    C. The products of the light reactions drive carbon fixation and the Calvin cycle.
9. Hereditary material is DNA, located in chromosomes.
    A. Mitosis produces two genetically identical cells from one original.
    B. Meiosis produces four genetically unique cells with half the DNA of the original cell.
10. Mendel first described the basic principles of how traits are passed from one generation to the next.
    A. Mendel's principles can be explained by the process of meiosis.
    B. Gene effects are explained by dominance and recessiveness, pleiotropy, multiple alleles, and epistasis.
    C. Sex chromosomes determine the sex of many but not all organisms.
    D. Eugenics was a social movement to improve the human race based on an incomplete knowledge of genetics.
11. DNA function is based on the sequence of bases in the molecule.
    A. The DNA base sequence is the information for its own replication.
    B. The DNA base sequence is the information for protein synthesis via ribosomes and mRNA.

12. Since DNA is just a molecule, it can be altered chemically like any other molecule - biotechnology.
    A. Genes can be transferred from one species to another and work normally.
    B. DNA technology allows us to study DNA in detail - PCR and gene sequencing.
13. Historical geology provides evidence for evolution and a description of the sequence of events.
14. The primary mechanism of evolution is natural selection acting on variation produced by mutation.
    A. Numerous speciation mechanisms are known.
    B. Phylogenies, evolutionary relationships between organisms, have traditionally been constructed using morphology. They are now also being constructed using DNA sequences.

Biological Science 1A - Introductory Biology

This course is the first semester of a two semester sequence required for biology majors. If you are a transfer student, and have already taken introductory biology elsewhere, check to see if this course is required. This course will cover some of the major ideas in biology. **I. Living organisms are very complex and highly organized.** We will cover cell structure and chromosome organization. **II. Living organisms follow the relevant principles of physics and chemistry.** We will cover basic chemistry, a tiny bit of physics, metabolism, photosynthesis, and some molecular biology. **III. Living organisms are related to each other by ancient ancestors. We evolved.** We will cover genetics, evolution and systematics. **IV. Living organisms are information systems.** We will cover information content from the molecular level to the genetic level.

Lecture instructor: Dr. Schreiber · Science 328 278-2410 or 278-2001

Text: Life: The Science of Biology, Fifth edition, by Purves, et al.

Exam materials: Scantron 882 and No. 2 pencils

Office Hours: My office is in Science building (room 328). My office hours are _____. Other times can be arranged by seeing me before or after lecture. You may also just stop by my office to see if I am available. I enjoy talking to students, discussing biology and assisting students to do their best; consider yourself welcome. My policy is to keep my office open to students as long as I do not have other pressing work. Call me or make an appointment after lecture if you have long distances to drive to campus.

Course description: This course will cover the following topics: basic chemistry, cell biology, membranes, enzymes, metabolism, genetics, and evolution. Each of these topics represents the basis for one or more upper division or graduate courses, so what we will do is cover basic terminology, facts and concepts. Of these three, the last is the most important, as it is where we make sense of biology. However, to understand the concepts, you have to learn the terminology and facts first. If you compare the list of topics to the table of contents in your text, you will see that we are covering a selection from the first 25 chapters of the book. Thus, we will have to cover a minimum of one chapter each week. We will follow the order in the text, except that chapter 25 will be combined with chapter 7. It is critical that you keep up with the text reading. Each midterm will cover four to seven chapters. It is expected that you will attend class and will remain current on exam expectations. There is no direct penalty for missing class and attendance will not be taken but, I'll be blunt here, it's dumb to cut class.

Read the text to learn the bold-faced terms and major facts. Then read to understand the concepts. Note that I am suggesting that you read the text a minimum of twice each week. The figures and diagrams are important and may also show up on tests. There are summaries and questions at the end of each chapter, review them. It is possible that material in the text which I have not covered in lecture will appear on exams, so a careful review of the book is essential. Lecture notes should be read 3 or 4 times each week. Simply read the lecture notes, ensuring that you <u>understand</u> them, then go on to other things. Anything that you read in the notes that is not clear to you should be checked with the text, with your study partners, or with the instructor. You must read the notes with understanding. If you read the <u>accumulated</u> notes this way 3 or 4 times a week, you will have a major portion of them memorized and understood by the time of the midterm exam. This is the learning, forgetting, re-learning, forgetting, re-learning, forgetting, re-learning technique. It is the most time-efficient way for you to master your notes. This technique will not only help you to do your best on the midterms, but will give you the best long-term retention of the material for the comprehensive final examination. Please note that I have recommended a similar repetition of material for learning the textbook material. You may tape record the lectures if you wish, but using effective note taking technique is a much better learning method.

While I am on the subject of note taking, I would like to give you some hints. I tend to write fairly complete information on the chalk board. However, there will be times I talk without chalk board notes. You are responsible for all of the lecture, so take notes even when I am not writing on the board. So how do you take notes? Listen for the main fact, main idea, or how I am summarizing the material. Don't try to take down every word. Every word is not what I test on. I test on the organizing ideas, your ability to use the information in lecture, your understanding of the ideas in the course. I test for some recall of facts but that is not the dominant part of the exams.

Study time: You should have at least twelve hours available each week to devote to this course. You should review course material on your own and then you should spend several hours a week reviewing with some fellow students. Quiz each other; see if you have memorized the basic facts; test each other from the questions at the ends of the chapters; see if you can construct an outline of the material in the chapters and the notes.

Doing well in this course takes time and lots of it. College science courses take significantly more time than your high school courses and more time than many non-science college courses. If you do not have the twelve hours per week I have suggested as a **minimum** time available, you should realize that you may not get the grade desired. Science courses are a lot of work. They require regular studying, not cramming two days before tests.

Exams: Tests will be multiple choice. Test questions will be derived from both the lecture notes and text. The final examination is comprehensive. **No make up exams will be given**. You may miss or drop one of the midterms. If you take all three of the midterms, the lowest grade will be dropped. If you miss an exam, that is the grade that is dropped. Remember that the material from all exams will be on the final, so you still have to study the midterm material even if you plan on missing an exam. Point values of exams and the laboratory will be adjusted so that they fit the course percentages as follows.

Midterm I	20%	September 18
Midterm II	20%	October 16
Midterm III	-	November 13
Final	35%	Wednesday, December 16, 8:45-10:45
Laboratory grade	25%	
	100%	

Grades: A curve of 90, 80, 70 and 60 percent will be used.

Every effort will be made to adhere to the above schedule and procedures listed in this syllabus, but extenuating circumstances may force a change. For instance, some chapters may not be covered or an exam may be rescheduled. These, or any other changes, will be announced in class. It is expected that you will attend class and that if you miss class, you will check with your classmates or with me about any changes made in the class schedule or requirements.

At the end of the semester, lab grades and attendance records will be submitted to me by the teaching assistants (T.A.s). The T.A.s may also give their recommendations for raising a borderline grade based upon their perception of your lab performance. All of the grades from the higher two midterms, lab and final will be weighted so they count toward the total grade as indicated in the percentages above. Then, a course average will be taken. If the course average is below 70%, the average may be raised at that time, depending on my perception of overall class performance.

Following each midterm, I will give you a course average and the number of points to be added to raise the average to 70%, if needed. This will give you an approximate idea of where you stand, however, this will not give you the ability to completely accurately calculate your final grade, as I use a different method at the end of the semester for calculation (I add points to the course average). The points that I tell you to add after a midterm, thus, are estimates.

Course objectives: This course reviews a wide range of biology subjects. As previously mentioned, you will learn basic terminology, essential facts and organizing concepts that make sense of the facts. You will be taught enough material in this course, to enable you to enter upper division courses prepared to make sense of the more advanced material. Science courses are fairly strictly sequenced because you require some background information to make sense of advanced material. Providing an adequate foundation is one of the primary functions of this course. A second objective is to begin the process of teaching you to "think science" and "think biology". After you have accumulated a certain body of facts, you can begin to put them in some organization in your mind (try outlining your notes and the text chapters). This course will introduce you to basic facts, but also to the organizing ideas that scientists/ biologists use to make sense of the facts. You will return to the facts and the organizing ideas over and over during your career as a biology student at CSUF. By the time we are done with you, we hope to have you "thinking biology".

NOTE: if you have special needs as addressed by the Americans with Disabilities Act (ADA), and require course materials in alternative formats, notify your instructor immediately. Reasonable efforts will be make to accommodate your special needs.

University policies on cheating and plagiarism are listed on pages 483-4 in the 98-99 catalog and on page 37 of the fall 1998 Schedule of Courses. They will be strictly followed.

You will be required to sign the following statement on each exam.

> "I have not used old exams from this course that are not available to the rest of the class and which may be stolen from previous classes. I do not know of anyone else in this course who used such exams."

University policies on dropping courses are listed on page 59 of the 98-99 catalog. I will strictly adhere to the standards for withdrawal and will require that you provide documentation of your reasons at the time you request my signature.

LECTURE AND EXAM OUTLINE

Topics and reading are from Purves, et al. Life: The Science of Biology, fifth edition.

Week	Topics		Reading
1.	Basic principles of biology, science and non-science.		Chapt. 1
2.	Atomic structure, bonds, polarity, pH. Water.		Chapt. 2
3.	Macromolecules: lipids, carbohydrates, proteins, and nucleic acids.		Chapt. 3
4.	Cell structure, prokaryotes and eukaryotes.		Chapts. 4, 25
5.	Membranes, membrane transport.	Exam I.	Chapt. 5
6.	Energetics and kinetics, ATP, enzyme structure and function.		Chapt. 6
7.	Glycolysis and anaerobic metabolism.		Chapt. 7
8.	Photosynthesis.		Chapt. 8
9.	Mitosis and meiosis.	Exam II.	Chapt. 9
10.	Mendelian inheritance.		Chapt. 10
11.	DNA replication. Transcription and translation.		Chapts. 11, 12
12.	Transcription regulation and DNA technology.		Chapts. 14, 16
13.	Evolutionary history.	Exam III.	Chapt. 19
14.	Population genetics. Speciation.		Chapts. 20,21
15.	Phylogeny. Molecular evolution.		Chapts. 22, 23

BioSci 1A Laboratory Syllabus - Spring 1997

BioSci 1A is designed to introduce biology majors to the fundamental methods and tools used in biological investigation. Our goal is to assist you in building a functional body of knowledge, rather than a collection of facts. This is an exciting lab to teach, and we hope you have as much fun with it as we do!

Successful lab work requires pre-lab preparation. You need to know what you are going to do before you perform an experiment. To assist you, experiments in the lab manual include a section to be completed before you come to class. This is important for your safety as well as your understanding. There will usually be a question on this introductory material on the weekly quizzes, so this material is also important to your grade.

Students will work in teams of four members. Sharing your observations with your team members as you work will increase their and your understanding of the experiment. Discussion with your group members is strongly encouraged. Why did the lab work the way it did? What do the results mean? If there is something you don't understand? Ask your T.A.

Lab Quizzes (200 points): Most lab periods will begin with a 20 point quiz. The quiz will cover important points from the previous week's work and the experimentation to be done that day. You must be on time to take the quiz. We do not give make-up quizzes. The lowest quiz score of 11 will be dropped. The T.A. will usually use your presence for the quiz as their method of taking roll; if you took the quiz, you were present. If, however, the T.A. notices that you leave soon after the exam, you will still be counted as absent. We give credit for being present for the **whole** lab.

Lab Exams (200 points): Lab exams will cover the topics under investigation and the methods and tools used. You will need a working understanding of the experiments performed, including the ability to draw conclusions from sample data. Look at your team members' results as they perform their experiments, and be certain that you understand unfamiliar techniques. In a few labs, the work is divided up between team members and different teams will do something different. Results will be shared. Take careful notes during class discussion. Make sure to ask questions, and spend time reading and thinking about each experiment.

We do not give make-up exams. If you must miss an exam, see your lab T.A. prior to the date of the exam. It may be possible for you to take an exam in an alternate lab period. This is entirely at the discretion of the T.A. and may be disallowed because there is not enough room in the section or for the convenience of the T.A. (They have heavy schedules so if they say they say they can't, then they can't.) You should expect to take whatever quiz or exam is given that lab period, not necessarily the test given during your own lab.

Lab Presentations and Reports (100 points): Each student will make short presentations to the class. The first concerns the field of biotechnology and is worth 40 points. The second will be a poster presentation worth 40 points, and the third report will pertain to the decomposition laboratory exercise, worth 20 points.

Biotechnology (40 points) - This will involve researching some aspect of biotechnology that is of interest to you. Biotechnology is expanding rapidly, and it covers many areas of life. Some examples are agriculture (pesticides), medicine (gene therapy), nutrition (food substitutes) and drugs (new treatments). A three page paper will be turned in with your oral presentation. This is to assist you in organization before speaking in front of the class. Make overheads or note cards from your paper. The paper will consist of 1) an introduction, 2) methods and 3) conclusions.

1) Introduction - should explain some background of your presentation.

2) Methods - should characterize the mechanism of what you are presenting and how it works.

This is where your text book may come in handy.

3) Conclusion - this is where you construct an opinion. This is important; your opinion should be adequately supported with facts. It is also important that you show you have thought about your report. Is the gene therapy in your report a good idea? Why or why not? Should this pesticide be used? Under what circumstances?

You need to cite your references. Here is how you do this; after the sentence or paragraph that you wrote using an article, you would write the author and year, (Smith, 1997). Then, at the end of your report write the full citation. You should have citations from at least two articles in magazines and from your text book. Some suggested magazines you may use are Science News, New Scientist, Scientific American, Discover, American Scientist, California Agriculture, Natural History, Bioscience, Issues in Science and Technology, Technology Review, or Environmental Science and Technology. An occasional article may come from Time or Newsweek but use this kind of source once. Do not use technical journals such as Science, Nature, or Cell; they are well beyond your training. Do not use the newspaper as a source. **Turn in a photocopy of each article you cite for your paper.** Attach them to the back of the paper. Do not photocopy anything you use from the text book.

A full citation at the end of your paper should take the following format.

Annon., 1996, Chocolate, as hearty as red wine. Science News, vol. 150, p.235.

Purves, W. K. et al. Life: The Science of Biology. Fifth edit., pages 372-6.

Holmes, B., 1996, Growth blocker stops spinal pain at source. New Scientist, vol. 152, p. 18

After your paper has been graded, it will be returned to you for rewriting. You will have one week to rewrite the paper and turn it in to your teaching assistant. The teaching assistant may require you to improve both your content and writing skills as they deem appropriate.

Poster presentation (40 points) - You must work in groups of two, with perhaps one group of three in your class. This should make it easier, but it won't. Working with others is often the hardest part of research, and this will help you develop teamwork skills. The poster will regard the Feeding Behavior of Animals as described in the lab manual. You should go to the Zoo to do this, and you do not have to observe the flamingo and hummingbird, as suggested in the laboratory exercise. Every person in the group should make observations on one animal, being certain to observe the same behaviors as the rest of the group. If your animal spends two hours doing nothing, use another animal or come back at a better time. The poster will consist of a title, abstract, introduction, results and conclusion. Start with the introduction, explain what the behaviors are, your hypothesis and why you are studying them. Then write one paragraph on each animal. The results should be a graph that shows what each animal did. This is why it is important that each member of your team observe the same behaviors from one animal to the next. The conclusions should be one page and consist of a well formed explanation of your results, and whether they correspond to your hypothesis. Remember to cite your references; you should have one for each animal. The citation format is given above. These references are likely to be books rather than magazine/journals. But if you use magazines or journals, turn in a photocopy with your poster. This is a poster, it should be easily read from four feet away, use a 16-18 size font. Examples will be shown to you in lab.

Decomposition report (20 points) - Read the laboratory exercise and do the write up. Include a graph

along with your write up. Ask your T.A. for suggestions.

Grading: There are 500 points possible in lab. The lab will be graded to the same standards as the lecture; 70% is a C. The laboratory counts as 25% of your course grade. Lab point totals will be reported to the lecture instructor, who is responsible for determining the final grades in the course. Further, if you fail lab, you fail the course and vice versa; if you fail lecture, you fail the course. *Laboratory attendance is required.* Three absences from lab will result in your grade for the course being lowered by one letter grade, and five absences from lab results in an F.

You may also want to purchase a lab book, a Sharpie marking pen and a plastic metric ruler.

ONE FINAL NOTE: Safety is a number one priority, clean up spills, and notify the T.A. of broken glass or any other potential hazards. Use common sense, and dispose of materials in their proper place. Most of the lab uses low hazard materials but failure to follow directions can increase your risk unnecessarily.

Here is a summary of the lab points.

Quizzes	200 points	20 points per quiz	
Exams	200 points	100 points per exam	
Presentations and reports	100 points	Decomposition report	20 points
		Biotechnology presentation	40 points
		Feeding behavior presentation	40 points
Total	500 points		

Remember that the point value of the lab will be adjusted at the end of the semester so the lab will count for 25% of the course grade.

All lab due dates are given on the next page. **There are a couple of shorter lab exercises in the lab manual that are not listed in the schedule for the sake of brevity.**

LABORATORY SCHEDULE - SPRING 1997

Week of:	Activity	Laboratory Exercise
Aug 24	Orientation/explain decomposition column	Diffusion
Aug 31	Quiz 1	Osmosis and plasmolysis
Sept 7	Quiz 2	Organic molecules
Sept 14	Quiz 3	Amylase and pepsin activity
Sept 21	Quiz 4	Respiration, start chromatic adaptation
Sept 28	Quiz 5, decomposition report due	Photosynthesis
Oct 5	Quiz 6, exam review	Chromatic adaptation
Oct 12	Exam 1, discuss biotech and feeding presentations	
Oct 19	Quiz 7	Mitosis and meiosis, Mendelian genetics
Oct 26	Quiz 8	DNA Spooling, start bacterial transformation
Nov 2	Quiz 9	Bacterial transformation, population genetics
Nov 9	Quiz 10, Biotech presentation due	Bacterial transformation
Nov 16	Quiz 11, Feeding presentation due, Review	
Nov 30	Exam 2	

The original version of this manual was developed under the direction of Dr. Ethelynda Harding while funded by an N. S. F. grant. Students working with her in lab development include Marilyn Key, R. Scott Kimsey, Bill Traylor, Mehrzad Akhavan, Adrienne Williams, and Harold Kochounian.