

I. CATALOG INFORMATION

- A. Discipline: BIOLOGY
- B. Subject Code and Number: BIOL M13
- C. Course Title: Introduction to Biotechnology & Molecular Biology

D. Credit Course units:

Units: 4

Lecture Hours per week: 3

Lab Hours per week : 3

Variable Units : No

E. Student Learning Hours:

Lecture Hours:

Classroom hours: 52.5 - 52.5

Laboratory/Activity Hours:

Laboratory/Activity Hours 52.5 - 52.5**Total Combined Hours** in a 17.5 week term: 105 - 105

F. Non-Credit Course hours per week _____

G. May be taken a total of: 1 2 3 4 time(s) for creditH. Is the course co-designated (same as) another course: No Yes
If YES, designate course Subject Code & Number: BIOT M10

I. Course Description:

Examines the role of molecular biology in the manufacturing of commercial pharmaceutical and agricultural products. Introduces students to basic biotechnology laboratory skills, including documentation, safety, and solution and buffer preparation. Develops student proficiency in aseptic techniques, spectrophotometry, molecular biology techniques, and electrophoresis.

J. Entrance Skills

*Prerequisite: No Yes Course(s)
_____*Corequisite: No Yes Course(s)
_____Limitation on Enrollment: No Yes
_____Recommended Preparation: No Yes Course(s)
_____Other: No Yes

K. Other Catalog Information:

(Formerly BIOL M11A.)(Same course as BIOT M10).

II. COURSE OBJECTIVES

Upon successful completion of the course, a student will be able to:

		Methods of evaluation will be consistent with, but not limited by, the following types or examples.
1	explain, identify, and demonstrate use of standard laboratory equipment including spectrophotometers, centrifuges, balances, pH meters, micropipettes, and power supplies.	Quizzes and lab practical
2	demonstrate/explain the importance of maintaining an accurate laboratory notebook.	Assessment of lab notebook based on assessment rubric
3	write and follow laboratory protocols.	Assessment of lab notebook based on assessment rubric
4	explain basic DNA replication and its application in molecular biological techniques.	Quizzes and final exam
5	perform calculations for solution preparation.	Quizzes and lab practical
6	prepare solutions (molarity, percent, serial dilutions, pH and buffers).	Lab practical
7	describe basic cell types and structures.	Quizzes and final exam
8	explain the structure/function of cells and how they are utilized for molecular biology.	Quizzes, final exam, case study
9	discuss/describe differences between prokaryotes and eukaryotes.	Quizzes and final exam
10	explain the necessity of maintaining sterile solutions and media and demonstrate aseptic technique in growing pure cultures.	Quizzes and lab practical
11	explain and demonstrate validation of sterility.	Quizzes and lab exercises

12	generate a bacterial growth curve using spectrophotometry for optical density (O.D.) determination.	Quizzes and lab exercises
13	describe/demonstrate various types of chromatography (ion exchange, size-exclusion, affinity chromatography).	Quizzes and lab exercises
14	describe/demonstrate protein activity assays and total protein concentration assays.	Quizzes and lab exercises
15	describe/demonstrate the use of electrophoresis to analyze proteins.	Quizzes and final exam
16	describe the biology and process of cloning.	Quizzes, case study and final exam
17	describe the four fundamental biological macromolecules and their functions.	Quizzes and final exam
18	describe the processes in molecular inheritance and gene expression.	Quizzes and final exam
19	discuss the impact of genetic engineering on our ability to prevent and treat disease.	Quizzes, case study, final exam
20	describe the basic techniques and molecular tools used in DNA recombinant work.	Quizzes and final exam
21	discuss the significance and application of plant genetic engineering to our world.	Quizzes and final exam
22	discuss the significance and applications of animal bioengineering.	Quizzes and final exam
23	describe the contribution of DNA technology to forensic science.	Quizzes and final exam
24	debate the ethics of recombinant DNA technology in society.	Quizzes, case study and class discussion

III. COURSE CONTENT

		Learning
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Estimated %	Topic	Outcomes
Lecture (must total 100%)		
10.00%	Molecular Biology and Biotechnology Overview History of biotechnology Type of biotechnology industry Biotechnology products	19, 21, 22, 23
5.00%	Documentation Laboratory notebooks Standard operating procedure	1, 2, 3, 5, 6, 12
10.00%	Laboratory Safety Chemical safety Personal protection Electric safety Risk assessment	1, 2, 3
10.00%	Chemistry Solutions, volume, mass, molarity, pH and buffers Measurement, metric, exponents, logarithms Serial dilutions	1, 2, 3, 5, 6, 10, 11
15.00%	Protein Chemistry Structure and function Macromolecules	1, 2, 3, 14, 15, 18
15.00%	Cell Biology Structure and function Identification of cell types Cloning and reproduction	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 20
15.00%	Microbial Techniques Identification of micro-organism Aseptic technique Preparing liquid and solid media Grow pure cultures of bacteria cells Calibrate growth curve to optical density Serial dilution	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 20, 24
10.00%	Molecular Biology History of DNA DNA structure and function Isolating DNA and manipulating DNA Protein synthesis	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 16, 18, 19, 20, 21, 22, 23, 24
10.00%	Spectrophotometry Electromagnetic radiation Absorption and action spectra Solution and dilutions Calibration curves Application of Beer's Law Determination of unknowns	1, 2, 3, 5, 6, 10, 12
Lab (must total 100%)		
15.00%	Laboratory safety and good documentation practices	1, 2, 3
10.00%	Laboratory measurements, spectrophotometry	1, 2, 3, 5, 11, 12
	Solutions, dilutions, buffers, and pH	1, 2, 3, 5,

20.00%		6, 10, 13
20.00%	Protein extraction, purification, and assay	1, 2, 3, 5, 6, 13, 14, 15
15.00%	Aseptic technique, bacterial culture, and growth	1, 2, 3, 5, 6, 10, 11, 12
20.00%	Molecular Biology techniques (e.g., PCR (polymerase chain reaction), gene cloning)	3, 4, 20

IV. TYPICAL ASSIGNMENTS

A. Writing assignments

Writing assignments are required. Possible assignments may include, but are not limited to:	
1	keep a formal laboratory notebook with experimental protocols, results and conclusions included.
2	write essays on examinations.
3	write analyses of Internet assignments on manufacturing techniques on biotech products.
4	write flow charts for all laboratory experiments.

B. Appropriate outside assignments

Appropriate outside assignments are required. Possible assignments may include, but are not limited to:	
1	complete assigned reading from text and other sources.
2	complete problem sets, such as: molarity and dilution calculations.
3	research and plan for oral presentations.

C. Critical thinking assignments

Critical thinking assignments are required. Possible assignments may include, but are not limited to:	
1	conduct analysis and problem solving based on case study in biotechnology lab.
2	analyze experimental data to draw appropriate conclusions.
3	debate the pros and cons of genetic engineering for genetically modified organisms (GMOs).

V. METHODS OF INSTRUCTION

Methods of instruction may include, but are not limited to:

- Distance Education – When any portion of class contact hours is replaced by distance education delivery mode (Complete DE Addendum, Section XV)

- Lecture/Discussion
- Laboratory/Activity
- Other (Specify)
Guest speakers, discussion forums and technique demonstrations.
- Optional Field Trips
- Required Field Trips

VI. METHODS OF EVALUATION

Methods of evaluation may include, but are not limited to:

- Essay Exam
- Classroom Discussion
- Skill Demonstration
- Problem Solving Exam
- Reports/Papers/Journals
- Participation
- Objective Exams
- Projects
- Other (specify)

Lab practicals

VII. REPRESENTATIVE TEXTS AND OTHER COURSE MATERIALS

Barnum, Susan. Biotechnology: An Introduction. 2nd ed. Cengage, 2006.

Micklos, David, and Greg Freyer. DNA Science: A First Course. 2nd ed. Cold Spring Harbor Laboratory, 2003.

Seidman, Lisa, and Cynthia Moore. Basic Laboratory Methods for Biotechnology. 2nd ed. Benjamin Cummings, 2009.

Daugherty, Ellyn. Biotechnology, Science for the New Millennium. Revised ed. Paradigm, 2012.

VIII. STUDENT MATERIALS FEES

- No Yes

IX. PARALLEL COURSES

<i>College</i>	<i>Course Number</i>	<i>Course Title</i>	<i>Units</i>
Ventura College	BIOL V30 & 31	Introduction to Biotechnology and Molecular Biology and Intro to Methods of Biotechnology and Molecular Biology	3;2
College of the Canyons	BIOSCI 230	Introduction to Biotechnology	4
SD Miramar College	BIOL 131	Introduction to Biotechnology	4
UC Santa Cruz	BME 5	Introduction to Biotechnology	5
CSU Bakersfield	CHEM 241	Introduction to Biotechnology	3
Foothill College	BTEC 51A & 51AL	Cell Biology for Biotechnology	3; 5.5

X. MINIMUM QUALIFICATIONS**Courses Requiring a Masters Degree:**

Master's degree in any biological science OR bachelor's degree in any biological science AND master's degree in biochemistry, biophysics, or marine science OR the equivalent.

XI. ARTICULATION INFORMATION**A. Title V Course Classification:**

1. This course is designed to be taken either:

- Pass/No Pass only (no letter grade possible); or
 Letter grade (P/NP possible at student option)

2. Degree status:

- Either Associate Degree Applicable; or Non-associate Degree Applicable

B. Moorpark College General Education:

1. Do you recommend this course for inclusion on the Associate Degree General Education list?

Yes: No: If YES, what section(s)?

- A1 - Natural Sciences - Biological Science
 A2 - Natural Sciences - Physical Science
 B1 - Social and Behavioral Sciences - American History/Institutions
 B2 - Social and Behavioral Sciences - Other Social Behavioral Science
 C1 - Humanities - Fine or Performing Arts
 C2 - Humanities - Other Humanities
 D1 - Language and Rationality - English Composition
 D2 - Language and Rationality - Communication and Analytical Thinking
 E1 - Health/Physical Education
 E2 - PE or Dance
 F - Ethnic/Gender Studies

C. California State University(CSU) Articulation:

1. Do you recommend this course for transfer credit to CSU? Yes: No:

2. If YES do you recommend this course for inclusion on the CSU General Education list?

Yes: No: If YES, which area(s)?

- A1 A2 A3 B1 B2 B3 B4
C1 C2 D1 D2 D3 D4 D5

D6 D7 D8 D9 D10 E

D. University of California (UC) Articulation:

1. Do you recommend this course for transfer to the UC? Yes: No:
2. If YES do you recommend this course for the Intersegmental General Education Transfer Curriculum (IGETC)? Yes: No:

IGETC Area 1: English Communication

- English Composition
 Critical Thinking-English Composition
 Oral Communication

IGETC Area 2: Mathematical Concepts and Quantitative Reasoning

- Mathematical Concepts

IGETC Area 3: Arts and Humanities

- Arts
 Humanities

IGETC Area 4: Social and Behavioral Sciences

- Anthropology and Archaeology
 Economics
 Ethnic Studies
 Gender Studies
 Geography
 History
 Interdisciplinary, Social & Behavioral Sciences
 Political Science, Government & Legal Institutions
 Psychology
 Sociology & Criminology

IGETC Area 5: Physical and Biological Sciences (mark all that apply)

- Physical Science Lab or Physical Science Lab only (non-sequence)
 Physical Science Lecture only (non-sequence)
 Biological Science
 Physical Science Courses
 Physical Science Lab or Biological Science Lab Only (non-sequence)
 Biological Science Courses
 Biological Science Lab course
 First Science course in a Special sequence
 Second Science course in a Special Sequence
 Laboratory Activity
 Physical Sciences

IGETC Area 6: Language other than English

- Languages other than English (UC Requirement Only)
- U.S. History, Constitution, and American Ideals (CSU Requirement ONLY)
- U.S. History, Constitution, and American Ideals (CSU Requirement ONLY)

XII. REVIEW OF LIBRARY RESOURCES

- A. What planned assignment(s) will require library resources and use?

The following assignments require library resources:

Using the Library's print and online resources, research paper topics appropriate to the course.

- B. Are the currently held library resources sufficient to support the course assignment?

YES: NO:

If NO, please list additional library resources needed to support this course.

XIII. PREREQUISITE AND/OR COREQUISITE JUSTIFICATION

BIOL M13: Not Applicable

XIV. WORKPLACE PREPARATION

Required for career technical courses only. A career technical course/program is one with the primary goal to prepare students for employment immediately upon course/program completion, and/or upgrading employment skills.

Detail how the course meets the Secretary of Labors Commission on the Achievement of Necessary Skills (SCANS) areas. (For a description of the competencies and skills with a listing of what students should be able to do, go to:

<http://www.ncrel.org/sdrs/areas/issues/methods/assment/as7scans.htm>)

The course will address the SCANS competency areas:

1. Resources: the students will read and follow laboratory textbook for protocols to perform experiments; consult MSDS (material safety data sheets) for chemical information in the process of performing lab exercises; identify all resources needed to perform given laboratory protocols; determine equipment to be utilized; and allocate time required for each procedure.
2. Interpersonal: the students will work in pairs or groups and plan and perform laboratory protocols; organize themselves to set up, calibrate, and put away all laboratory equipment; learn to share resources with others in the class; monitor each other's activities during the lab; and help each other perform tasks correctly.
3. Information: the students will record all laboratory information in notebooks for later analysis; read data outputs from laboratory instruments and interpret the information; organize data and present their findings in a laboratory notebook; and use computers to analyze and present data.
4. Systems: the students will know how organizational and technological systems work to maintain safety and reliability in the laboratory; and know how to monitor and correct performances related to lack of sterility in cell culture.

5. Technology: the students will choose appropriate technology to perform the required task or to grow the required organisms; understand the intent and proper procedures for set up and operation of equipment; and prevent, identify, or solve problems with equipment, including computers and other technologies.

The course also addresses the SCANS skills and personal qualities:

1. Basic Skills: the students will learn basic principles of chemistry, biochemistry and microbiology; be able to explain the role of DNA in the cell and how DNA is used in the biotechnology field; and understand the standard lab operating procedures including safety, following directions, documentations, experimental design, data analysis, working with volumes, solutions, pH, and dilutions and sterile techniques.
2. Thinking Skills: the students will learn how to problem solve and learn how to troubleshoot when problems occur in the lab; apply mathematics to real world situations; understand the role of safety in the laboratory and manufacturing environment; and be able to understand the need and be able to apply the concepts of compliance and validation.
3. Personal Qualities: the students will be able to follow protocols and work in groups; be able to understand the importance of safety and compliance; and be able to complete complex tasks in a timely manner and document their activities.

XV. DISTANCE LEARNING COURSE OUTLINE ADDENDUM

1. Mode of Delivery

- Online (course will be delivered 100% online)
- Online with onsite examinations (100% of the instruction will occur online, but examinations and an orientation will be scheduled onsite)
- Online/Hybrid (a percentage of instruction will be held online and the remaining percentage of instruction will be held onsite)
 - Lab activities will be conducted onsite
- Televideo (Examinations and an orientation will be held onsite)
- Teleconference
- Other

2. Need/Justification

Improve General Student Access

3. Describe how instructors teaching this course will ensure regular, effective contact with and among students.

There will be an on-site lab minimum 3 hours per week (per semester), in addition to live instructor-student on-line interaction (e.g. on-line lecture, live chat)

4. Describe how instructors teaching this course will involve students in active learning.

Students may perform interactive online activities, engage in asynchronous discussion groups, participate in chat rooms, submit written assignments via

email, computer lab simulations, and other electronically based assignments, in addition to any typical assignments an instructor may choose to require. The on-site lab portion of the course will reinforce on-line learning and provide additional avenues for active learning.

5. Explain how instructors teaching this course will provide multiple methods of content representation.

Web-based materials, computer lab simulations, interactive online assignments and others as determined by the instructor, in addition to the more traditional materials and resources.

6. Describe how instructors teaching this course will evaluate student performance.

Methods of evaluation may consist of electronically based assessments, exams and/or assignments, participation in chat sessions and/or asynchronous discussion forums, submission of written work electronically, lab write-ups of computer lab simulations, and other evaluation methods as determined by the instructor. Instructor may also evaluate performance via on-site quizzes & exams, lab practicals, and case study evaluations.

XVI. GENERAL EDUCATION COURSE OUTLINE ADDENDUM

BIOL M13: Not Applicable

XVII. STUDENT MATERIALS FEE ADDENDUM

BIOL M13: Not Applicable

XVIII. REPEATABILITY JUSTIFICATION TITLE 5, SECTION 55041

BIOL M13: Not Applicable

XIX. CURRICULUM APPROVAL

Course Information:

Discipline: BIOLOGY

Discipline Code and Number: BIOL M13

Course Revision Category: Technical Course Revision

Course Proposed By:

Originating Faculty Norman Marten 10/03/2014

Faculty Peer: _____

Curriculum Rep: _____

Department Chair: Norman Marten 10/03/2014

Division Dean: _____

Approved By:

Curriculum Chair: Jerry Mansfield 10/27/2014

Executive Vice President: Lori Bennett 10/28/2014

Articulation Officer: Letrisha Mai 10/08/2014

Librarian: _____

Implementation Term and Year: Fall 2015

Approval Dates:

Approved by Moorpark College Curriculum Committee: 10/07/2014

Approved by Board of Trustees (if applicable): _____

Approved by State (if applicable): _____