

I. CATALOG INFORMATION

- A. Discipline: BIOLOGY
- B. Subject Code and Number: BIOL M02C
- C. Course Title: Genetics and Molecular Biology

- D. Credit Course units:
 Units: 5
 Lecture Hours per week: 4
 Lab Hours per week : 3
 Variable Units : No

- E. Student Learning Hours:
 Lecture Hours:
 Classroom hours: 70 - 70
 Laboratory/Activity Hours:
 Laboratory/Activity Hours 52.5 - 52.5

Total Combined Hours in a 17.5 week term: 122.5 - 122.5

- F. Non-Credit Course hours per week _____

- G. May be taken a total of: 1 2 3 4 time(s) for credit

- H. Is the course co-designated (same as) another course: No Yes
 If YES, designate course Subject Code & Number: _____

- I. Course Description:

Focuses on inheritance and macromolecular functioning of the cell. Emphasizes data analysis and problem solving skills. Includes analysis of inheritance patterns, structure and expression of DNA in viruses, bacteria, and eukaryotes. Covers regulation of gene expression, RNA and protein functioning, and examination of current DNA analysis technologies and their applications.

- J. Entrance Skills

*Prerequisite: No Yes Course(s)
BIOL M02A or BIOL M02AH

*Corequisite: No Yes Course(s)

Limitation on Enrollment: No Yes

Recommended Preparation: No Yes Course(s)
CHEM M07A or CHEM M11 or CHEM 13 or equivalent

Other: No Yes

K. Other Catalog Information:

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	analyze inheritance patterns, and solve problems related to pedigree and linkage analyses.	Objective and subjective midterm and final examinations, term papers, projects, homework problems, laboratory reports
2	explain the experimental underpinnings that support the major theories in genetics and molecular biology.	Objective and subjective midterm and final examinations, term papers, projects, homework problems, laboratory reports, laboratory practica
3	demonstrate an understanding of the relationship between chromosomes and genes and the relationship of structure to the function for both.	Objective and subjective midterm and final examinations, term papers, projects
4	solve problems to determine the map position of genes in eukaryotes and prokaryotes; discuss the techniques used to determine map positions.	Homework problems
5	compare and contrast the role of DNA and RNA in the cell and the synthesis of each.	Objective and subjective midterm and final examinations, term papers, projects
6	compare and contrast the regulation of gene expression in eukaryotes and prokaryotes; analyze data to determine the effects of genetically altering regulatory controls.	Objective and subjective midterm and final examinations, term papers, projects, homework problems, laboratory reports
7	compare and contrast genome organization in eukaryotes and prokaryotes.	Objective and subjective midterm and final examinations, term papers, projects, homework problems

8	explain the role of cell structures in the processing, targeting, and regulation of proteins.	Objective and subjective midterm and final examinations, term papers, projects, homework problems
9	describe molecular mechanisms by which the cell senses and responds to its environment.	Objective and subjective midterm and final examinations, term papers, projects
10	describe types of mutations, both at the molecular and chromosomal level, and discuss their role in the development of cancer.	Objective and subjective midterm and final examinations, term papers, projects, homework problems, laboratory reports
11	describe mechanisms of recombination and discuss the role of recombination on the variation in populations.	objective and subjective midterm and final examinations, term papers, projects, homework problems
12	correlate genetic change with evolution.	Objective and subjective midterm and final examinations, term papers, projects
13	analyze and correlate data obtained from classical and contemporary methods of gene and chromosomal analysis.	Objective and subjective midterm and final examinations, term papers, projects, homework problems, laboratory reports, laboratory practica
14	describe the steps and procedures involved in the cloning of a specific genetic sequence.	Objective and subjective midterm and final examinations, term papers, projects, laboratory practica
15	discuss the analytical techniques utilized in recombinant DNA technology and their impact on other fields of human endeavor.	Objective and subjective midterm and final examinations, term papers, projects
16	demonstrate a variety of specific skills required in the contemporary analysis of genomes and proteins.	Laboratory reports, laboratory practica

III. COURSE CONTENT

Estimated %	Topic	Learning Outcomes
Lecture (must total 100%)		
4.00%	Chromosomal basis of inheritance Experimental basis Chromosome structure Sequence organization	2, 3
4.00%	Gene interaction Interactions between alleles Mechanisms in specific examples	1, 3, 5
4.00%	Eukaryotic mapping Methods of mapping	1, 3, 4
4.00%	Genetic transfer in bacteria Conjugation Transformation Transduction	6, 7, 11
3.00%	DNA replication DNA structure Mechanism of replication	3, 5
4.00%	Review of information flow Genetic code Transcription Translation	5, 6
4.00%	Gene regulation in prokaryotes Positive control Negative control Attenuation	6, 7, 8
4.00%	Transcriptional control in eukaryotes Regulatory sequences Activators Repressors Molecular mechanisms	3, 6
4.00%	Post-transcriptional control RNA processing RNA transport RNA editing	5, 6, 7, 8
4.00%	Membrane transporter systems Uniporter, symporter, antiporter Pumps Regulation	8, 9
3.00%	Gene mutation Types Occurrence Mechanisms	1, 2, 10, 11
3.00%	Chromosomal mutations Rearrangements Alterations in chromosome number Plant breeding	2, 3, 10, 11, 12, 13
	Mechanisms of recombination	

4.00%	Chiasmata Holliday model Enzymatic mechanism	11, 12
3.00%	Transposable elements Prokaryotic transposons Eukaryotic transposable elements Mechanisms	2, 7, 10, 12
4.00%	Developmental genetics Sex determination Pattern formation Plant development	3, 9
2.00%	Population genetics Variation Selection Polymorphism	11, 12, 13, 16
2.00%	Quantitative genetics Distributions Norms Heritability	1, 2, 12
2.00%	Evolutionary genetics Variation Speciation Molecular evolution	1, 2, 12, 16
6.00%	Review of Mendelian genetics Mendel's experiments Genetic ratios Sex-linkage	1, 2, 3, 13
4.00%	Linkage analyses Linkage maps Three-point testcross Molecular markers	4
6.00%	Genome organization in eukaryotes Coding and non-coding DNA Mobile DNA Functional rearrangements Organelle DNA	3, 7
4.00%	Cell cycle regulation and cancer Molecular mechanisms Control in mammalian cells Genetics of cancer	5
4.00%	Protein trafficking Synthesis and targeting Role of ER (endoplasmic reticulum) Role of Golgi complex Sorting Vesicular traffic	5, 6, 8, 10, 12
4.00%	Cell motility Microfilaments Microtubules Intermediate filaments	8, 9
6.00%	Cell signaling Hormones and cell receptors Molecular mechanisms Secondary messengers	8, 9

	Regulation	
4.00%	Techniques and applications in recombinant DNA technology Cloning RFLP (restriction fragment length polymorphism) analysis Gene therapy	14, 15, 16
Lab (must total 100%)		
4.00%	Bioinformatics	2, 7, 12, 16
8.00%	RNA interference (RNAi)	2, 3, 5, 6, 15
8.00%	Restriction digests and restriction mapping	1, 4, 15
8.00%	Transformation or cloning exercise	14, 15
14.00%	DNA fingerprinting analysis	10, 16
7.00%	DNA extraction, purification and quantification	15
14.00%	PCR (polymerase chain reaction)	2, 5, 15, 16
8.00%	PCR screening for genetically modified organisms	2, 14, 15, 16
8.00%	Real Time PCR	1, 12, 13, 16
7.00%	Analysis of Mendelian inheritance in corn	1, 2, 3
7.00%	Human chromosome analysis	2, 10, 11, 12, 13
7.00%	Evolution of vertebrate genomes	7, 11, 12

IV. TYPICAL ASSIGNMENTS

A. Writing assignments

Writing assignments are required. Possible assignments may include, but are not limited to:	
1	essays on examinations and analyses of such Internet research assignments as the evolution of vertebrate genomes.
2	laboratory reports.
3	written summaries of case studies involving the cloning of a genetic sequence.

B. Appropriate outside assignments

Appropriate outside assignments are required. Possible assignments may include, but are not limited to:	
1	readings from scientific literature on bioinformatics and how this field develops methods of understanding biological data.
2	computer simulations related to course content.

C. Critical thinking assignments

Critical thinking assignments are required. Possible assignments may include, but are not	
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limited to:	
1	comparison of mutation mechanisms.
2	comparison of gene regulation in prokaryotic vs. eukaryotic organisms.
3	discussion on the role of activator and repressors in cancer development.

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)
Audio visual, Discussion/seminar, Group projects, Computer-assisted instruction, Guest Speakers

- 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)

Written reviews of outside reading assignments.

VII. REPRESENTATIVE TEXTS AND OTHER COURSE MATERIALS

Griffiths, Anthony, et al. An Introduction to Genetic Analysis. 11th ed. Freeman, 2017.

Booker, Robert. Concepts of Genetics. McGraw-Hill, 2011.

Lodish, Harvey, et al. Molecular Cell Biology. 8th ed. Freeman, 2018.

VIII. STUDENT MATERIALS FEES

- No Yes

IX. PARALLEL COURSES

College	Course Number	Course Title	Units
UC, Irvine	BIO SCI 97	Genetics	4
UC, Merced	BIO 2 & 2L	Intro to Molecular Biology and Lab	4, 1

CSU, Monterey Bay	BIO 241 & 241L	Cellular & Molecular Biology and Lab	3 & 1
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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:

Utilize Library resources, print and online, for outside-of-class assignments and research on topics related to cell biology.

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

Requisite Justification for BIOL M02A

A. Sequential course within a discipline.

1. understand and discuss the basic themes of biology that permeate all levels of organization:

a. Define the basic vocabulary

b. Compare and contrast the interactions between the basic vocabulary words

c. Construct mental models for the various systems studied

d. Evaluate and appraise the evidence behind the various models discussed

e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

2. discuss the chemical basis of biological systems including the structure and function of biological molecules:

a. Define the basic vocabulary

b. Compare and contrast the interactions between the basic vocabulary words

c. Construct mental models for the various systems studied

d. Evaluate and appraise the evidence behind the various models discussed

e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

3. explain the concepts and processes of cellular metabolism including photosynthesis, cellular respiration and the role of adenosine triphosphate in the thermodynamics of living systems:

a. Define the basic vocabulary

b. Compare and contrast the interactions between the basic vocabulary words

- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

4. identify and describe prokaryotic and eukaryotic cell structures, relating structure to function, including the current model of membrane structure and function and a discussion of cellular transport:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

5. describe current models of cell communication:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

6. discuss cellular reproduction and its controls in prokaryotes and eukaryotes including sexual and asexual life cycles:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

7. apply the principles of classical and molecular genetics to solve problems in genetics or biotechnology:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

8. explain prokaryotic and eukaryotic genome organization, DNA structure, DNA replication, gene expression and the control of gene expression. Relate theoretical models to the practical applications of biotechnology:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

9. discuss and relate evolutionary processes to the origin and evolution of cells, species and populations:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

10. explain and apply the scientific method in the study of biological concepts and laboratory exercises:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

11. acquire, read, evaluate, apply and cite scientific literature.

- B. Standard Prerequisite or Corequisite required by universities.
- C. Corequisite is linked to companion lecture course.
- D. Prerequisite or Corequisite is authorized by legal statute or regulation.
Code Section: _____
- E. Prerequisite or Corequisite is necessary to protect the students' health and safety.
- F. Computation or communication skill is needed.
- G. Performance courses: Audition, portfolio, tryouts, etc. needed.

or

Requisite Justification for BIOL M02AH



A. Sequential course within a discipline.

1. understand and discuss the basic themes of biology that permeate all levels of organization:

a. Define the basic vocabulary

b. Compare and contrast the interactions between the basic vocabulary words

c. Construct mental models for the various systems studied

d. Evaluate and appraise the evidence behind the various models discussed

e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

2. discuss the chemical basis of biological systems including the structure and function of biological molecules:

a. Define the basic vocabulary

b. Compare and contrast the interactions between the basic vocabulary words

c. Construct mental models for the various systems studied

d. Evaluate and appraise the evidence behind the various models discussed

e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

3. explain the concepts and processes of cellular metabolism including photosynthesis, cellular respiration and the role of adenosine triphosphate in the thermodynamics of living systems:

a. Define the basic vocabulary

b. Compare and contrast the interactions between the basic vocabulary words

c. Construct mental models for the various systems studied

d. Evaluate and appraise the evidence behind the various models discussed

e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

4. identify and describe prokaryotic and eukaryotic cell structures, relating structure to function, including the current model of membrane structure and function and a discussion of cellular transport:

a. Define the basic vocabulary

- b. Compare and contrast the interactions between the basic vocabulary words
 - c. Construct mental models for the various systems studied
 - d. Evaluate and appraise the evidence behind the various models discussed
 - e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.
5. describe current models of cell communication:
- a. Define the basic vocabulary
 - b. Compare and contrast the interactions between the basic vocabulary words
 - c. Construct mental models for the various systems studied
 - d. Evaluate and appraise the evidence behind the various models discussed
 - e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.
6. discuss cellular reproduction and its controls in prokaryotes and eukaryotes including sexual and asexual life cycles:
- a. Define the basic vocabulary
 - b. Compare and contrast the interactions between the basic vocabulary words
 - c. Construct mental models for the various systems studied
 - d. Evaluate and appraise the evidence behind the various models discussed
 - e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.
7. apply the principles of classical and molecular genetics to solve problems in genetics or biotechnology:
- a. Define the basic vocabulary
 - b. Compare and contrast the interactions between the basic vocabulary words
 - c. Construct mental models for the various systems studied
 - d. Evaluate and appraise the evidence behind the various models discussed
 - e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

8. explain prokaryotic and eukaryotic genome organization, DNA structure, DNA replication, gene expression and the control of gene expression. Relate theoretical models to the practical applications of biotechnology:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

9. discuss and relate evolutionary processes to the origin and evolution of cells, species and populations:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

10. explain and apply the scientific method in the study of biological concepts and laboratory exercises:

- a. Define the basic vocabulary
- b. Compare and contrast the interactions between the basic vocabulary words
- c. Construct mental models for the various systems studied
- d. Evaluate and appraise the evidence behind the various models discussed
- e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

11. acquire, read, evaluate, apply and cite scientific literature.

12. HONORS: critically read, analyze and summarize original scientific data and research.

13. HONORS: report on seminars, conferences or presentations within the academic setting or community.

14. HONORS: identify, discuss and provide scientific significance and explanations for current biological issues impacting society.

a. Define the basic vocabulary

b. Compare and contrast the interactions between the basic vocabulary words

c. Construct mental models for the various systems studied

d. Evaluate and appraise the evidence behind the various models discussed

e. Given a body of data from a scientific paper, analyze how that evidence affects the scientific models studied.

- B. Standard Prerequisite or Corequisite required by universities.
- C. Corequisite is linked to companion lecture course.
- D. Prerequisite or Corequisite is authorized by legal statute or regulation.
Code Section: _____
- E. Prerequisite or Corequisite is necessary to protect the students' health and safety.
- F. Computation or communication skill is needed.
- G. Performance courses: Audition, portfolio, tryouts, etc. needed.

XIV. WORKPLACE PREPARATION

BIOL M02C: Not Applicable

XV. DISTANCE LEARNING COURSE OUTLINE ADDENDUM

BIOL M02C: Not Applicable

XVI. GENERAL EDUCATION COURSE OUTLINE ADDENDUM

General Education Division of Learning [check all applicable boxes]:

- Natural Sciences
 - Biological Science
 - Physical Science
- Social and Behavioral Sciences
 - American History/Institutions
 -

- Other Social Science
- Humanities
 - Fine or Performing Arts
 - Other Humanities
- Language and Rationality
 - English Composition
 - Communication and Analytical Thinking
- Health/Physical Education
- Ethnic/Women's Studies

Check either Option 1 or Option 2

- OPTION #1:** Moorpark College has already received approval from the CSU and/or UC systems for this course to fulfill a GE requirement. Note: This option applies only to technical revisions and updated courses.
- OPTION #2:** Moorpark College has not received approval from the CSU and/or UC systems for this course to fulfill a GE requirement. This option applies to all new and substantively revised courses.

XVII. STUDENT MATERIALS FEE ADDENDUM

BIOL M02C: Not Applicable

XVIII. REPEATABILITY JUSTIFICATION TITLE 5, SECTION 55041

BIOL M02C: Not Applicable

XIX. CURRICULUM APPROVAL

Course Information:

Discipline: BIOLOGY

Discipline Code and Number: BIOL M02C

Course Revision Category: Outline Update

Course Proposed By:

Originating Faculty Paul Kores 09/06/2018

Faculty Peer: Jazmir Hernandez 09/06/2018

Curriculum Rep: Beth Miller 09/07/2018

Department Chair: Jazmir Hernandez 09/06/2018

Division Dean: Carol Higashida 09/10/2018

Approved By:

Curriculum Chair: Jerry Mansfield 02/08/2019

Executive Vice President: _____

Articulation Officer: Letrisha Mai 02/06/2019

Librarian: Mary LaBarge 02/04/2019

Implementation Term and Year: Fall 2019

Approval Dates:

Approved by Moorpark College Curriculum Committee: 02/19/2019

Approved by Board of Trustees (if applicable): _____

Approved by State (if applicable): 02/27/2019