

BI 005: MOLECULAR AND CELL BIOLOGY

Originator

amsimmons

Justification / Rationale

Approval dates for prior modification

Effective Term

Fall 2019

Credit Status

Credit - Degree Applicable

Subject

BI - Biology

Course Number

005

Full Course Title

Molecular and Cell Biology

Short Title

MOLECULAR & CELL BIO

Discipline**Disciplines List**

Biological Sciences

Modality

Face-to-Face

Catalog Description

This course presents a survey of basic biological principles with a strong emphasis on biochemistry, cell biology and genetics. Topics include: structure and function of prokaryotic and eukaryotic cells, origin and evolution of cellular life and molecular evolution, organelle structure and function, membrane structure and function, cellular transport, cellular chemistry and biomolecules, cellular metabolism (respiration and photosynthesis), cell reproduction and its controls, cell communication, classic and molecular genetics, DNA structure and function, gene structure, gene expression and control of gene expression, biotechnology, and scientific inquiry. This course is primarily designed for students pursuing careers in science, medicine, dentistry, veterinary medicine and other health fields requiring a strong foundation in biology. Together, BI 005 and BI 006, Biology of Organisms, provide students with the basic biology core curriculum for transfer.

Schedule Description

This course is one of a two semester sequence (BI 005 & BI 006) designed for science majors. Course topics include cellular structure and biochemical processes. Completing BI 005 and BI 006 in any order fulfills the transfer requirement of one year of major's introductory biology.

Prerequisite: CH 001A, BI 004 or high school biology, and prior completion of or concurrent enrollment in ENG 001A.

IGETC: 5B, 5C

Lecture Units

4

Lecture Semester Hours

72

Lab Units

1

Lab Semester Hours

54

In-class Hours

126

Out-of-class Hours

144

Total Course Units

5

Total Semester Hours

270

Prerequisite Course(s)

CH 001A; BI 004 or high school biology;
and prior completion of or concurrent enrollment in ENG 001A

Required Text and Other Instructional Materials**Resource Type**

Book

Author

Urry, M.L. Cain, S.A. Wasserman, P.V. Minorsky, Reece, J.B., L.A.

Title

Campbell Biology (w/Mastering Biology Access)

Edition

11th

City

Boston

Publisher

Pearson

Year

2017

College Level

Yes

Flesch-Kincaid Level

College

ISBN #

9780134082318

Resource Type

Manual

Author

Morgan, J. and M. Carter

Title

Investigating Biology Laboratory Manual COD Custom Version

Publisher

Pearson

Year

2014-01-01

Class Size Maximum

28

Entrance Skills

Demonstrate an understanding of basic biological concepts.

Prerequisite Course Objectives

BI 004-Demonstrate an understanding of the concepts and principles of basic biology.

BI 004-Demonstrate knowledge of essential life processes such as metabolism, photosynthesis, respiration, sensitivity, digestion, circulation, reproduction, ecology, evolution, and behavior.

Entrance Skills

Demonstrate an understanding of the fundamental form and function of organismal systems.

Prerequisite Course Objectives

BI 004-Identify and explain basic anatomical and physiological characteristics of life systems.

Entrance Skills

Demonstrate the ability to operate fundamental biology laboratory instrumentation (e.g. microscopes) and work independently when following laboratory protocol.

Prerequisite Course Objectives

BI 004-Use the microscope and other laboratory instruments.

Entrance Skills

Demonstrate the ability to construct focused theses on essay exams.

Prerequisite Course Objectives

ENG 001A-Develop ideas coherently in writing through the drafting process.

ENG 001A-Write thesis statements, topic sentences, and ideas in an organized way in multi-page essays.

Entrance Skills

Demonstrate an understanding of bond theory: ionic, covalent, hydrogen and Van der Waals interactions

Prerequisite Course Objectives

CH 001A-Distinguish between different types of chemical bonds.

Entrance Skills

Demonstrate the ability to relate molecular interactions to electron orbital theory and bonding theory.

Prerequisite Course Objectives

CH 001A-Describe the shapes of molecules in terms of valence bond theory, hybrid orbitals and molecular orbitals.

Entrance Skills

Demonstrate an understanding of REDOX reactions and their relationship to electronegativity.

Prerequisite Course Objectives

CH 001A-Recognize and describe the different varieties of chemical reactions, including balancing REDOX equations.

Entrance Skills

Demonstrate an understanding of concepts of pH and demonstrate the ability to perform calculations of pH.

Prerequisite Course Objectives

CH 001A-Recognize and describe the different varieties of chemical reactions, including balancing REDOX equations.
 CH 001A-Describe the properties of solutions and perform relevant calculations.

Course Content

1. Biological organization.
2. The structure and function of biological molecules.
3. Membrane structure and function.
4. Cell structure and function.
5. Cellular respiration and fermentation.
6. Bioenergetics.
7. Photosynthesis including: light reactions, the Calvin cycle, cyclic and non-cyclic electron flow, C₄ and CAM plants.
8. DNA replication and the genetic material of organisms.
9. Cellular and organismal reproduction: mitosis and meiosis.
10. Mendelian genetics: patterns of heredity.
11. Gene expression: from gene to protein
12. Regulation of gene expression
13. Viruses
14. Biotechnology
15. Embryonic development.

Lab Content

1. Scientific investigation
2. Microscopic structure of prokaryotic and eukaryotic cells
3. Microscopic investigation of mitosis, meiosis, and animal development
4. Molecular biology techniques: bacterial transformations, inducing gene expression, restriction enzyme digests, gel electrophoresis
5. Cellular respiration and fermentation
6. Photosynthetic pigments: isolation using paper chromatography and analysis using spectrophotometry
7. Classical genetics
8. Genomics and molecular evolution: comparing sequences using BLAST
9. Genomics and eukaryotic gene structure: homology based annotation of eukaryotic genes.
10. Writing formal laboratory reports: generation, graphical representation, and analysis of experimental data.

Course Objectives

Objectives	
Objective 1	Identify and describe biological molecules and cell structures and explain their functions.
Objective 2	Compare and contrast cellular processes and interactions between prokaryotes and eukaryotes (including metabolism, reproduction, communication).
Objective 3	Apply the principles of classical and molecular genetics to solve problems in genetics or biotechnology.
Objective 4	Relate evolutionary processes to the origin and evolution of cells.
Objective 5	Explain how DNA replicates and transmits genetic information within organisms.
Objective 6	Apply the processes of scientific inquiry and experimental design to the study of biological concepts.
Objective 7	Acquire, read, evaluate, apply and cite scientific literature.
Objective 8	Compose reports that communicate the background and significance, experimental design, results, and analysis of laboratory experiments.

Student Learning Outcomes

Upon satisfactory completion of this course, students will be able to:	
Outcome 1	Evaluate the roles of the major biological molecules in the structure and function of cells.
Outcome 2	Compare and contrast the two forms of eukaryotic cell division; mitosis and meiosis.
Outcome 3	Examine how cells capture, store, and process energy.
Outcome 4	Analyze how genetic information is stored, replicated, and expressed by cells.

Outcome 5 Compose reports that communicate the background and significance, experimental design, results, and analysis of experiments in molecular and cell biology.

Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Lecture	Instructors lecture on key concepts in molecular and cell biology
Participation	Students participate in activities and discussions to analyze biological processes.
Technology-based instruction	In class multi-media presentations illustrating key concepts, followed by class discussions to analyze the principles illustrated.
Laboratory	Students perform laboratory experiments to investigate concepts from lecture.
Collaborative/Team	Some laboratory experiments are performed in small groups in which students collaborate to design, execute, and analyze experiments.

Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Tests/Quizzes/Examinations	In lecture there are at least three midterm exams and one cumulative final to assess mastery of objectives and SLOs. In lab there are weekly short answer quizzes and laboratory practical exams. Students spend about 120 hours per semester outside of class studying for these quizzes and exams.	In and Out of Class
Laboratory projects	Students answer questions examining the experiments they perform. Students write formal lab reports analyzing the results of some experiments. Students spend at least 15 hours per semester outside of class on these writing assignments.	In and Out of Class
Group activity participation/observation	Students participate in in-class activities to examine lecture concepts	In Class Only
Other	Students have homework assignments that accompany every chapter. Assignments are completed on the Pearson Mastering Biology Website. Students spend approximately 9 hours per semester on these online homework assignments.	Out of Class Only

Assignments

Other In-class Assignments

1. Lecture exams
2. Laboratory quizzes
3. Laboratory practical exams
4. Laboratory exercises with data collection

Other Out-of-class Assignments

1. Lecture homework assignments completed through the Pearson Mastering Biology website.
2. Laboratory reports

Grade Methods

Letter Grade Only

COD GE

C1 - Natural Sciences

CSU GE

B2 - Life Science

B3 - Laboratory Activity

IGETC GE

5B - Biological Science
5C - Science Laboratory

MIS Course Data**CIP Code**

26.0101 - Biology/Biological Sciences, General.

TOP Code

040100 - Biology, General

SAM Code

E - Non-Occupational

Basic Skills Status

Not Basic Skills

Prior College Level

Not applicable

Cooperative Work Experience

Not a Coop Course

Course Classification Status

Credit Course

Approved Special Class

Not special class

Noncredit Category

Not Applicable, Credit Course

Funding Agency Category

Not Applicable

Program Status

Program Applicable

Transfer Status

Transferable to both UC and CSU

C-ID

BIOL 190

Allow Audit

No

Repeatability

No

Materials Fee

No

Additional Fees?

No

Approvals

Curriculum Committee Approval Date

04/02/2019

Academic Senate Approval Date

04/11/2019

Board of Trustees Approval Date

05/17/2019

Course Control Number

CCC000312154

Programs referencing this coursePsychology AA Degree (<http://catalog.collegeofthedesert.eduundefined?key=21>)Environmental Science AS-T (<http://catalog.collegeofthedesert.eduundefined?key=216>)Liberal Arts: Math and Science AA Degree (<http://catalog.collegeofthedesert.eduundefined?key=29>)Biology AS-T Degree (<http://catalog.collegeofthedesert.eduundefined?key=40>)Natural Resources AS Degree (transfer preparation) (<http://catalog.collegeofthedesert.eduundefined?key=71>)Chemistry AS Degree (<http://catalog.collegeofthedesert.eduundefined?key=75>)Environmental Sciences AS Degree (<http://catalog.collegeofthedesert.eduundefined?key=76>)Interdepartmental Environmental Studies AS Degree (<http://catalog.collegeofthedesert.eduundefined?key=77>)