BIO-2060: PRINCIPLES OF GENETICS

Cuyahoga Community College

Viewing: BIO-2060 : Principles of Genetics
Board of Trustees:
2016-01-28

Academic Term:
2016-08-22

Subject Code
BIO - Biology

Course Number:
2060

Title:
Principles of Genetics

Catalog Description:
Introductory level course. Topics include: structure and function of DNA, patterns of inheritance, gene expression and mutations, population genetics and gene technology.

Credit Hour(s):
3

Lecture Hour(s):
3

Lab Hour(s):
0

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
BIO-1040 The Cell and DNA, or BIO-1420 Anatomy and Physiology of Domestic Animals II, or BIO-2341 Anatomy and Physiology, or BIO-1500 Principles of Biology I.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.
Understand the role of genetics, the structure of genomes, and cellular reproduction in prokaryotic and eukaryotic cells.

Course Outcome(s):

Blackboard accessibility information is available at http://access.blackboard.com.

III. ATTENDANCE TRACKING

Regular class attendance is expected. Tri-C is required by law to verify the enrollment of students who participate in federal Title IV student aid programs and/or who receive educational benefits through other funding sources. Eligibility for federal student financial aid is based in part on enrollment status.

Students who do not attend classes for the entire term are required to withdraw from the course(s). Additionally, students who withdraw from a course or stop attending class without officially withdrawing may be required to return all or a portion of their financial aid based on the date of last attendance. Students who do not attend the full session are responsible for withdrawing from the course(s).

Tri-C is responsible for identifying students who have not attended a course before financial aid funds can be applied to students’ accounts.

Therefore, attendance is recorded in the following ways:

- For in-person and blended-learning courses, students are required to attend the course by the 15th day of the semester (or equivalent for terms shorter than five weeks) to be considered attending. Students who have not met all attendance requirements for in-person and blended courses, as described herein, within the first two weeks or equivalent, will be considered not attending.
- For online courses, students are required to login at least two times per week and submit one assignment per week for the first two weeks of the semester, or equivalent to the 15th day of the term. Students who have not met all attendance requirements for online courses, as described herein, within the first two weeks or equivalent, will be considered not attending.

At the conclusion of the first two weeks of a semester or equivalent, instructors report any registered students who have “Never Attended” a course. Those students will be administratively withdrawn from that course. However, after the time period in the previous paragraphs, if a student stops attending a class or wants or needs to withdraw, for any reason, it is the student’s responsibility to take action to withdraw from the course. Students must complete and submit the appropriate Tri-C form by the established withdrawal deadline.

Tri-C is required to ensure that students receive financial aid only for courses that they attend and complete. Students reported for not attending at least one of their registered courses will have all financial aid funds held until confirmation of attendance in registered courses has been verified. Students who fail to complete at least one course may be required to repay all or a portion of their federal financial aid funds and may be ineligible to receive future federal financial aid awards. Students who withdraw from classes prior to completing more than 60 percent of their enrolled class time may be subject to the required federal refund policy.

If illness or emergency should necessitate a brief absence from class, students should confer with instructors upon their return. Students having problems with coursework due to a prolonged absence should confer with the instructor or a counselor.

IV. LEARNING OUTCOMES ASSESSMENT

Occasionally, in addition to submitting assignments to their instructors for evaluation and a grade, students will also be asked to submit completed assignments, called ‘artifacts’, for assessment of course and program outcomes and the College’s Essential Learning Outcomes (ELOs). The artifacts will be submitted in Blackboard or a similar technology. The level of mastery of the outcome demonstrated by the artifact DOES NOT affect the student’s grade or academic record in any way. However, some instructors require that students submit their artifact before receiving their final grade. Some artifacts will be randomly selected for assessment, which will help determine improvements and support needed to further student success. If you have any questions, please feel free to speak with your instructor or contact the Learning Outcomes Assessment office.

V. CONCEALED CARRY STATEMENT

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in a designated parking area only by an individual in possession of a valid conceal carry permit.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within the Tri-C student handbook, available at http://www.tri-c.edu/student-resources/documents/studenthandbook.pdf. You must also comply with the College’s Zero Tolerance for Violence on College Property available at http://www.tri-c.edu/policies-and-procedures/documents/3354-1-20-10-zero-tolerance-for-violence-policy.pdf.

Outcomes

Course Outcome(s):

Understand the role of genetics, the structure of genomes, and cellular reproduction in prokaryotic and eukaryotic cells.
Objective(s):
1. Explain the role of genetics in biology, diversity and evolution.
2. Compare and contrast prokaryotic and eukaryotic genomes and cellular reproduction.
3. Describe the phases of the eukaryotic cell cycle and explain how it is regulated.
4. Relate the deregulation of the cell cycle to the development of cancer.
5. Compare and contrast mitosis and meiosis.
6. Explain how meiosis contributes to genetic diversity.

Course Outcome(s):
Evaluate how genotype, environmental factors and chromosomal abnormalities influence phenotype.

Objective(s):
1. Identify patterns of inheritance determined by Mendelian and non-Mendelian genetics.
2. Explain gene linkage as it relates to inheritance, recombination and gene mapping.
3. Explain the effect of abnormal chromosome number on development and phenotype.

Course Outcome(s):
Explain how molecular genetics determines genotype and phenotype.

Objective(s):
1. Describe the structure of DNA and the process of semiconservative replication.
2. Describe how genes are expressed through the transcription of DNA and translation of RNA into an amino acid sequence.
3. Compare and contrast gene regulation in prokaryotic and eukaryotic cells.
4. Explain how mutations affect genotype and phenotype.

Course Outcome(s):
Determine how genes in a population change over time.

Objective(s):
1. Describe a population that is in Hardy-Weinberg equilibrium.
2. Differentiate among the evolutionary forces that result in changes in allele frequencies in a population.

Course Outcome(s):
Explain how genetic technology, genomics, and proteomics are used to study genes and proteins.

Objective(s):
1. Describe the techniques and the applications of molecular genetic analysis.
3. Describe how proteomics is used to determine the structure and function of proteins.

Methods of Evaluation:
1. Quizzes
2. Exams
3. Written reports
4. Research papers
5. Projects (individual or group)
6. Presentations (individual or group)
7. Article discussions/reviews/summaries
8. Discussion boards
9. Homework assignments
10. Case studies

Course Content Outline:
1. CONCEPTS
   a. Prokaryotic and eukaryotic cell structure and genome
   b. Prokaryotic cell division
   c. Eukaryotic cell cycle and mechanisms of control
d. Mitosis
e. Loss of cell cycle control and cancer
f. Oncogenes and tumor suppressor genes
g. Eukaryotic chromosomes and chromosome number
h. Chromosomes, chromatids, and homologues
i. Meiosis and crossing-over
j. Independent assortment and segregation of chromosomes
k. Nondisjunction of chromosomes
l. Alleles
m. Patterns of inheritance
n. Phenotype versus genotype
o. Monohybrid, dihybrid, and test crosses
p. Sex determination
q. Sex-linked inheritance
r. X inactivation
s. Dominant and recessive alleles
t. Codominance and incomplete dominance
u. Penetrance and expressivity
v. Lethal alleles
w. Multiple alleles
x. Pleiotropy
y. Epistasis
z. Polygenic traits
aa. Multifactorial traits
bb. Assortment and recombination of linked and non-linked genes
c. Nondisjunction, aneuploidy, and chromosomal mutations
d. Horizontal gene transfer
e. Primary and secondary structure of DNA
f. DNA packaging in prokaryotic and eukaryotic cells
g. Telomeres
ii. Semi-conservative replication of DNA
jj. Levels of gene expression in eukaryotes, including chromatin structure, transcription factors, RNAi, and epigenetics
kk. The genetic code
ll. Evolutionary importance of mutations
mm. Types and phenotypic effects of mutations
nn. DNA repair mechanisms
oo. Hardy-Weinberg equilibrium
pp. Agents of evolution, including natural selection, mutation, genetic drift, gene flow, and nonrandom mating
qq. Genetic cloning and gene amplification
rr. DNA sequencing and analysis
ss. Genetic testing and gene therapy
tt. Human genome project
uu. Determination of cellular proteins

2. SKILLS
a. Determining haploid and diploid number of cells.
b. Differentiate between sister chromatids and homologous chromosomes.
c. Construct Punnett squares to predict genotypic and phenotypic probabilities of offspring.
d. Identify patterns of inheritance using a pedigree.
e. Solve Mendelian genetics problems.
f. Interpret a karyotype to determine gender and chromosomal abnormalities.
g. Transcribe a DNA sequence and translate an RNA sequence.
h. Determine how mutations in DNA sequence alter protein structure.
i. Determine genotypic and phenotypic frequencies using the Hardy-Weinberg equation.

3. ISSUES
a. Analysis of genetic disorders and ethical decision making
Resources


Resources Other
Websites:
2. Learn Genetics - http://learn.genetics.utah.edu/
4. PBS - http://www.pbs.org
5. NOVA - http://www.pbs.org/wgbh/nova/
6. NSF National Center for Case Study Teaching in Science - http://sciencecases.lib.buffalo.edu/cs/

Journals:
1. Science
2. Nature

Instructional Services
OAN Number:
TMNS

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