DATE OF LAST REVIEW: 02/2013
CIP CODE: 24.0199
SEMESTER: Departmental Syllabus
COURSE TITLE: Introduction to Genetics
COURSE NUMBER: BIOL-0240
CREDIT HOURS: 4
INSTRUCTOR: Departmental Syllabus
OFFICE LOCATION: Departmental Syllabus
OFFICE HOURS: Departmental Syllabus
TELEPHONE: Departmental Syllabus
PREREQUISITES: BIOL-0121 General Biology and MATH-0105 College Algebra

REQUIRED TEXT AND MATERIALS: Please check with the KCKCC bookstore, http://www.kckccbookstore.com for the required text for your particular class.

COURSE DESCRIPTION: This course provides an introduction to basic genetic principles from classical Mendelian inheritance to modern molecular biotechnology. Emphasis will be placed on problem-solving. Topics include: inheritance, molecular genetics, regulation of genetic information, application of genetic technology and population genetics. The laboratory component supplies hands-on experience with relevant genetic techniques.

METHOD OF INSTRUCTION: A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, and panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE:

I. A Brief History of Genetics
   A. Mendel & Classical Genetics
   B. Molecular Genetics
II. Mendelian Genetics
   A. Dominance Relationships
   B. Segregation & Independent Assortment
   C. Mendelian Crosses
   D. Pedigrees
III. Beyond Mendel
   A. Incomplete & Codominance
   B. Multiple Alleles
   C. Epistasis
   D. Linkage & Mapping
IV. Chromosomes
A. Structure
B. Mitosis & Meiosis
C. Recombination
D. Chromosome Abnormalities
E. Cell Cycle

V. Molecular Genetics
   A. DNA Replication & Repair
   B. DNA Transcription and Translation
   C. Mutations
   D. Cancer

VI. Regulation of Genetic Information
   A. Bacteria
   B. Eukaryotes
   C. Transposons

VII. Recombinant Technology
    A. Molecular Analyses
    B. Polymerase Chain Reaction
    C. Applications of Recombinant Technology

VIII. Applied Genetics
    A. Disease Detection
    B. Gene therapy

IX. Population Genetics
    A. Hardy-Weinberg Equilibrium
    B. Effects of Selection & Genetic Drift

X. Laboratory
    A. Model Organisms
    B. Transformation
    C. Restriction Enzymes
    D. Electrophoresis
    E. Polymerase Chain Reaction
    F. Southern Blot
    G. Microarrays
    H. Bioinformatics
EXPECTED STUDENT OUTCOMES:
A. The student will be able to explain the basic history of genetics.
B. The student will be able to solve problems using Punnett squares and pedigrees.
C. The student will be able to discuss recombination and chromosomal abnormalities.
D. The student will be able to explain DNA replication, repair and expression.
E. The student will be able to discuss how genetic information is regulated.
F. The student will be able to explain the techniques of recombinant DNA technology.
G. The student will be able to discuss the application of genetic technology to disease detection and gene therapy.
H. The student will be able to solve problems in population genetics.
I. The student will demonstrate familiarity with the tools and techniques of laboratory genetics.

COURSE COMPETENCIES:

The student will be able to explain the basic history of genetics.
1. The student will be able to relate the key contributions of Gregor Mendel
2. The student will be able to discuss the history of molecular genetics from Watson and Crick to the Human Genome Project.

The student will be able to solve problems using Punnett squares and pedigrees.
3. The student will be able to predict outcomes and probabilities for the inheritance of genetic traits using Punnett squares.
4. The student will be able to evaluate data using Chi Square Analysis.
5. The student will be able to explain the importance of segregation and independent assortment.
6. The student will be able to use pedigrees to determine inheritance of particular traits.
7. The student will be able to solve problems involving multiple alleles, epistasis and X-linkage.
8. The student will be able to construct linkage maps based on recombination frequency and tetrad analysis.

The student will be able to discuss recombination and chromosomal abnormalities.
9. The student will be able to explain the structure of chromosomes.
10. The student will be able to relate the major events of mitosis and meiosis.
11. The student will be able to explain the cell cycle.
12. The student will be able to discuss the importance of recombination.
13. The student will be able to give examples of chromosome abnormalities.

The student will be able to explain DNA replication, repair and expression.
14. The student will be able to explain DNA replication and repair.
15. The student will be able to sequence the events of transcription and translation.
16. The student will be able to explain the various types of mutations.

The student will be able to discuss how genetic information is regulated.
17. The student will be able to relate the genetic basis of cancer.
18. The student will be able to explain how transposons work and their significance.
19. The student will be able to describe how operons function in prokaryotes.
20. The student will be able to describe horizontal gene transfer in prokaryotes.
21. The student will be able to describe the regulation of transcription in eukaryotes.

The student will be able to explain the techniques of recombinant DNA technology.
22. The student will be able to discuss the use of restriction enzymes and vectors in the production of recombinant DNA.
23. The student will be able to explain the uses of the polymerase chain reaction.
24. The student will be able to discuss the significance of the Human Genome Project.
25. The student will be able to relate the applications of recombinant technology.
The student will be able to discuss the application of genetic technology to disease detection and gene therapy.

26. The student will be able to explain the ways biotechnology can be used for disease detection.
27. The student will be able to discuss current research in gene therapy.

The student will be able to solve problems in population genetics.

28. The student will be able to calculate allelic frequencies in a population.
29. The student will be able to determine if a population is in Hardy-Weinberg Equilibrium.
30. The student will be able to discuss the various ways that allelic frequencies can be altered.

The student will demonstrate familiarity with the tools and techniques of laboratory genetics.

31. The student will be able to recognize and cultivate various model organisms important in genetics.
32. The student will be able to demonstrate knowledge of laboratory safety and sterile technique.
33. The student will be able to perform and evaluate monohybrid and dihybrid crosses using model organisms.
34. The student will be able to use restriction enzymes and electrophoresis to separate segments of DNA.
35. The student will be able to perform and evaluate the success of transformation in bacteria.
36. The student will use polymerase chain reaction to copy specific sequences of DNA.
37. The student will be able to analyze data collected from Southern Blotting.
38. The student will be able to access and use online biotechnology resources.
39. The student will be able to interpret data collected from a microarray.
40. The student will be able to utilize computer programs to analyze genetic data.

ASSESSMENT OF STUDENT OUTCOMES: Student progress is evaluated by means that include, but are not limited to, exams, written assignments, and class participation.

SPECIAL NOTES:
This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.

Kansas City Kansas Community College is committed to an appreciation of diversity with respect for the differences among the diverse groups comprising our students, faculty, and staff that is free of bigotry and discrimination. Kansas City Kansas Community College is committed to providing a multicultural education and environment that reflects and respects diversity and that seeks to increase understanding.

Kansas City Kansas Community College offers equal educational opportunity to all students as well as serving as an equal opportunity employer for all personnel. Various laws, including Title IX of the Educational Amendments of 1972, require the college’s policy on non-discrimination be administered without regard to race, color, age, sex, religion, national origin, physical handicap, or veteran status and that such policy be made known.

Kansas City Kansas Community College complies with the Americans with Disabilities Act. If you need accommodations due to a documented disability, please contact the Director of the Academic Resource Center, Rm. 3354 or call: 288-7670.