Master Course Syllabus
Kennedy King College
One of the City Colleges of Chicago
Biotechnology
Semester/Academic Year (20__ - 20__)

Course Prefix and Number: Biotech 230

Course Title: Molecular Biology Techniques

Length of Course: 16 weeks

PCS Code: 1.2

IAI Code:

Semester Credit Hours: 3.0

Contact Hours: 5 (4000 minutes)

Lecture Hours: 1 (800 minutes)

Lab Hours: 4 (3200 minutes)

Method of Delivery (mark all that apply): Face to Face _X__ Online ____ Hybrid __X__

Course Catalog Description: The course covers basic concepts in molecular biology. The course will emphasize “classical” molecular biology techniques (DNA extraction, Gel electrophoresis, restriction enzyme analysis, cloning, Southern blotting and Western blotting). The course will also cover Polymerase Chain Reaction (PCR), bioinformatics, and will explore applications that are used to view and analyze the structure of DNA and proteins. Writing assignments, as appropriate to the discipline, are part of the course.

Prerequisites: Grade of C or better in Biology 121 and Chem 203 and Biotechnology 212 or consent of Department Chairperson.

Course Objectives:
This course covers:
1. The basic concepts of molecular biology.
2. Protein structure and function.
3. Nucleic acid structure and function.
4. Current molecular biology techniques as they apply to nucleic acids.
5. How to characterize the enzyme alpha amylase.
6. Genetic analysis and its use in molecular biology.
7. How DNA is replicated in various organisms.
8. How genomes are organized in eukaryotic and prokaryotic organisms.

Student Learning Outcomes:

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

1. Distinguish the various levels of protein organization (Primary to Quaternary).

2. Demonstrate their understanding of nucleic acid structure by creating a model (ie DNA).

3. Compare and contrast how eukaryotic genomes are organized versus prokaryotic genomes.

4. Apply and demonstrate their knowledge of chromosome structure in the process of cell division.

5. Categorize different types of proteins based on their use in a biotechnology laboratory.

6. Construct a model which compares DNA replication in various organisms.

7. Construct a series of protocols (SOP) in order to use bacteria to produce a protein of interest for biomanufacturing.

8. Choose the appropriate model organism (E. Coli, C. elegans etc.) for genetic analysis in molecular biology.

9. Utilize the correct basic skills and hazard avoidance in a biotechnology laboratory.

Suggested Topical Outline					
Class Units (# of units is dependent on course – adjust accordingly)	Topic (Required)	Content (Optional - provide details)	Lab Information	Desired Outcome(s)	Suggested Assessment Method(s)
Unit 1	The Beginnings of Molecular Biology	Reading: Problems: various	LAB 1 Starch Plate Assay Part 2 LAB 1 Starch Plate Assay Part 1 and 2	1, 7, 9	Quiz 1 Problem sets
Unit 2	Enzyme Assay		LAB 2 Quantitative Enzyme Assay Part 1, 2 and 3	1, 5, 9	Lab notebook check
Unit 3	The Structure of DNA	Reading: Problems: various	LAB 3 Factors Affecting Enzyme Function	1	Quiz 2 Problem sets
Unit 4	Analysis of protein structure		LAB 5 Analysis of α-Amylase Proteins LAB 4 Analysis of Protein Structure Using RasMol or equivalent LAB 5A SDS-PAGE	1, 9	Lab notebook check
Unit 5	The Versatility of RNA	Reading: Problems: various	LAB 5B Western Blotting	2	Quiz 3 Problem sets
Unit 6	Analysis of DNA and chromosomal structure		LAB 6 Analysis of DNA Structure Using RasMol or equivalent LAB 7 Isolation of Chromosomal DNA from B. licheniformis	2, 4,9	Lab notebook check

Unit 7	Protein Structure and Folding PCR and Southern blotting	Reading: Problems: various	LAB 8 PCR Amplification and Labeling of Probe DNA LAB 9 Southern Hybridization: LAB 9A Restriction Enzyme Cleavage of Chromosomal DNA	7, 9	Quiz 4 Problem sets
Unit 8	Southern Blotting		LAB 9B Denaturation and Transfer of DNA to a Membrane	9	Midterm Exam (Lecture) Lab notebook check
Unit 9	Genome Organization and Evolution Southern hybridization and analysis	Reading: Problems: various	LAB 9C Southern Hybridization and Detection	3, 9	Quiz 5 Problem sets
Unit 10	Cloning of DNA using a plasmid		LAB 10 Cloning the α-Amylase Gene: LAB 10A Cleavage of Chromosomal DNA LAB 10B Cleavage of Plasmid DNA LAB 10C Ligation of Chromosomal and Plasmid DNA	2, 9	Lab notebook check
Unit 11	Recombinant DNA Technology and Genetically Modified Organisms	Reading: Problems: various	LAB 10D Transformation	7	Quiz 6 Problem sets
Unit 12	Identifying clones and PCR		LAB 10E Identification of α-Amylase Clones	7, 9	Lab notebook check

			LAB 11 Verification and Mapping of α-Amylase Clones: LAB 11A Verification of α-Amylase Clones using PCR		
Unit 13	Lecture: Tools for Analyzing Organization, Expression and Function Analysis of Clones using PCR	Reading: Problem sets: Various texts (see note)	LAB 11A Verification of α-Amylase Clones using PCR	7	Quiz on chap. Problem sets
Unit 14	Plasmid DNA Preps and Restriction digestion		LAB 11B Isolation of Plasmid DNA from α-Amylase Clones LAB 11C Restriction Cleavage and Mapping of α-Amylase Plasmid DNA LAB 11D Preservation of Recombinant Strains	9	Lab notebook check
Unit 15	Lecture: DNA Replication and Telomere Maintenance Southern blotting	Reading: Problem sets: Various texts (see note)	LAB 11E Southern Analysis of α-Amylase Plasmid DNA LAB 12 Enzyme Activity of α-Amylase Clones	6	Quiz on chap. Problem sets
Unit 16			Poster Presentations		Final Comprehensive Exam

					Lab notebook submission

Students Course Is Expected to Serve: Students who are pursuing an Associates of Applied Science degree in Biotechnology.

Suggested Texts, Materials, and Resources:

Fundamental Molecular Biology, 3rd Edition, Lizabeth A. Allison, Wiley – Blackwell, July 2021
Biotechnology: DNA to Protein -- A Laboratory Project in Molecular Biology 1st Edition
By Teresa Thiel and Shirley T. Bissen

Materials: Various sources of problems.
Resources:
Supplies: a lab coat, goggles and gloves are helpful

Suggested Methods of Instruction: We will utilize lectures, discussion, laboratories, group activities.

Suggested Methods of Assessment and Evaluation:
(Formative and Summative): We will utilize quizzes, exams, lab reports, homework, problem sets and papers to assess students in this course.

Suggested Grading Scale:

Assignments:	Grade Distribution: 90 % to 100 % = A 80 % to 89% = B 70 % to 79 % = C 60 % to 69 % = D Below 60% = F

Suggested Exit Assessment/Competencies (as applicable):

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Processing Validation (To be completed by College)

Add – Effective Term/Year: _____ Reactivate – Effective Term/Year: _____
Inactivate – End Term/Year: _____ Withdraw – End Term/Year: _____

Approved College(s):

DA: ___ HW: ___ KK:__X MX:___ OH:___ TR:___ WR:___

Syllabus Preparer/Advocate: _____Clifford Wilson III_____

Title of Advocate: ____Assistant Professor_____

College of Advocate: ____Kennedy-King College_____

ICCB Submission Date: (/ /)
ICCB Approval Date: (/ /)
IAI Submission Date: (/ /) IAI Panel: _____
IAI Approval Date: (if applicable) (/ /) IAI Code: _____

PACC Master Course Syllabus Template –August 2020