CHELMSFORD HIGH SCHOOL

Biotechnology 2 Honors SYLLABUS
2023-2024

COURSE DESCRIPTION

Biotechnology II is an intensive course focusing on topics necessary for the understanding of the biotechnology industry, industry regulations and multidisciplinary skills required for careers in research. Topics will include plasmid design, protein expression, purification, quantification, validation, and quality control. Focus will be on knowledge of protein peptide formulation. In protein purification, the students will learn about or utilize techniques used in purification; different procedures in chromatography; affinity ion exchange, absorption, and reduced vs. non-reduced SDS-PAGE. Students will also gain theoretical knowledge of HPLC, fluorescence, and Mass Spectrometry. Students will also explore new technologies, including CRISPR. Course material will be taken directly from the current, primary literature with emphasis on laboratory research, student presentations, and discussion.

Prerequisites: Successful completion of Biology course, successful completion of Biotechnology I or AP Biology, concurrent enrollment and good standing in Chemistry, or successful completion of Chemistry

REQUIRED TEXTS & RESOURCES

Academic articles to supplement learning will be provided when needed during class
An account for LabXchange will be established.

COURSE GOALS and STUDENT LEARNING OUTCOMES:

By the end of the course, students will receive…

- A multidisciplinary approach to biotechnology focusing on novel research ideas and how to address real life problems through research.
- Continued application of Good Laboratory Practices
- Introduction to specialized lab techniques
- Creating and presenting novel research ideas and learning how to use biotechnology techniques to discover solutions.

COURSE STANDARDS

DESE STANDARDS LINK

PERSONS WITH DISABILITIES

Chelmsford High School is committed to supporting the success and well-being of all students, regardless of varying abilities and levels of adaptive skills. The Special Education office provides services and resources to empower each student to attain their highest level of academic success and learning independence.

ACADEMIC INTEGRITY

At Chelmsford High School, students are expected to maintain high moral and ethical standards, as exemplified by the final sentence of our mission statement: "*A spirit of respect is fostered, as members take*

responsibility for their actions and acknowledge the rights and differences of others." (CHS Mission Statement)

Students should respect themselves, other students, staff members and the school. The acts of cheating and plagiarism violate expectations that students will exhibit respectful, ethical behavior.

The Academic Honor Code exists to address the issues of cheating and plagiarism.

GRADING POLICIES

Please connect with individual teachers for specific information regarding grading. Students will be able to monitor academic progress biweekly through X2/ASPEN.

Students are strongly encouraged to take advantage of the academic support programs and services (such as PRIDE Block, after-school help, etc.) available to them to help ensure and support success. Information about these services can be provided by your teacher, guidance counselor, or administration.

COURSE SKILLS

The following skills are addressed in this course:

- Use tools standard to the industry, such as: micropipettes, centrifuge, gel electrophoresis, cell culture, polymerase chain reactions, genetic recombination,
- Apply proper aseptic technique following Good Laboratory Practices.

COURSE OUTLINE

Biotechnology 2 Honors is divided into 7 units:

1. Lab Safety
2. Government and industry standards for quality control
3. Designing a protein based therapeutic
    a. DNA Database research
        i. Associated research of protein properties
    b. Plasmid design
        i. PCR and PCR Primer design
        ii. Review of Restriction enzymes
    c. Advanced look at cell culture
        i. Research on cell lysis
    d. Protein purification
    e. Protein analysis
        i. Quantity
        ii. Quality
4. Presentation of results through publications
5. Other Science techniques
    a. CRISPR
    b. Personalized medicine
    c. Agricultural applications
    d. 3D printing

This syllabus and course outline are subject to change as Chelmsford High School seeks to continually improve the learning experiences for all students.

"We foster PRIDE* in our pursuit of excellence."

PRIDE refers to our five core values – Perseverance, Respect, Integrity, Dedication, and Empathy. These five pillars represent our points of emphasis in supporting the development of quality students and quality citizens.