



Biomedical Innovations

Course Syllabus 2021-2022

Ms. Tyler Hamilton – Tyler.Hamilton@hcps.org

Course Description

In the final course of the PLTW Biomedical Science sequence, students build on the knowledge and skills gained from previous courses to design innovative solutions for the most pressing health challenges of the 21st century. Students address topics ranging from public health and biomedical engineering to clinical medicine and physiology. They have the opportunity to work on an independent design project with a mentor or advisor from a university, medical facility, or research institution.

Goals for Student Learning

Independent Project Students will be required to complete an Independent Project during the course. Thorough instructions and some class time will be afforded, but the majority of the project will be completed outside of class. [The project will have required portions due during each quarter of the school year.](#) Students must [complete and present their Independent Project](#) in order to be eligible to receive [college credits](#) and to receive a certificate of completion for the Biomedical Sciences Program.

Problem 1: Design of an Effective Emergency Room In this problem students apply their knowledge of emergency medical careers, diagnostic testing and patient evaluation, human body systems, and medical interventions to analyze the workings of an emergency room and discuss inefficiencies that may hinder appropriate clinical care. Student teams will work collaboratively to design a more efficient emergency medicine delivery system. As students work through their designs, they will review research methods, practice effective presentation skills, and learn project management techniques.

Problem 2: Exploring Human Physiology In this problem students build upon what they know about the research process in order to design, conduct, and analyze an experimental study. Students will choose a question relating to one or more body systems that they are interested in studying and will work with a team to investigate and answer that question. As students work through the experimental process, they will review and expand what they know about experimental design, collection of data, statistical analysis of data, and the presentation of data.

Problem 3: Design of a Medical Innovation In this problem students review the diseases and disorders, as well as the corresponding medical interventions they have investigated in the previous courses, and propose a new or better medical device, pharmaceutical, surgical procedure, or genetic intervention. Students will work with a team to build a prototype, model, or schematic of the intervention as well as develop a marketing plan for the product. As students

work through this problem, they will review the design process, complete a literature review, and further practice effective presentation skills

Problem 4: Investigating Environmental Health In this problem students will explore how substances or chemicals in the environment impact human health. Students will investigate a disease cluster in a fictional family and assess the activities of the individuals for environmental risks. Students will test water samples for the presence of contaminants that could be detrimental to human health and use molecular biology techniques to identify specific microorganisms. Students will explore the field of toxicology and design an experiment to test the effects of a particular chemical and doses of that chemical on plant growth. Students will then compile a comprehensive environmental health profile and action plan for their local area.

Unit 5: Combating a Public Health Issue In this problem students draw on information they have learned in the previous courses about public health, epidemiology, and disease diagnosis to work through one of two epidemiology studies. In each study students will analyze data to define the outbreak, generate a hypothesis by diagnosing the patients' symptoms and identifying the disease pathogen, design and analyze an epidemiological study to test the hypothesis, and outline a plan for initiating control and prevention measures. Students will then identify a local, national, or global public health crisis and write a mini-grant proposal, based on the National Institutes of Health grant structure, outlining a plan with intervention strategies. As students work through this problem, they will review evidence analysis, the design process, methodology, and analyze study data to evaluate risk.

Problem 7: Forensic Autopsy In this problem students will work as medical experts to work through mysterious death cases. First, as forensic pathologists, students will examine a fetal pig using the same protocol as a human autopsy. Second, students will draw on information they have learned in the previous courses about human body systems to design a fictional death case. Students will showcase the clues left behind in the body and tell the story of how the person died through medical documents, including an autopsy report and medical history forms. Students will finally be tasked with solving another group's proposed case.

Textbook and Materials

- *1.5-2 inch Binder & Paper*
- *Colored Pencils*
- *Lab Gloves*
- *Pens/Pencils*
- *HCPL Library Card*
- *Headphone/Earbuds*
- *School Issued Laptop*
- *Accounts with various online services will also be required throughout the year.*

HCPS Grading Policy

Examples of Product, Process, and Practice		
PRODUCT (50%) <i>Culminating Demonstration of Knowledge</i>	PROCESS (30%) <i>Addressing Specific Short-Term Learning Outcomes</i>	PRACTICE (20%) <i>Building Attitudes, Habits, and Skills</i>
Does it measure how well students achieved specific learning goals, standards, and/or competencies?	Does it provide feedback to students regarding growth towards the attainment of specific learning goals, standards and competencies?	Does it allow students to practice skills and/or reinforce content learning?
<ul style="list-style-type: none">• Primarily completed in presence of teacher• Rubric aligned to standards• Accuracy graded	<ul style="list-style-type: none">• Primarily completed in presence of teacher• Rubric aligned to standards• Accuracy graded	<ul style="list-style-type: none">• Graded for completion and participation

****Extra credit will not be given for non-academic purposes****

Absent Work Policy

All assignments should be submitted on time. Students will be given the number of class periods equal to the number of lawful class periods absent to turn in completed make up assignments without penalty. If a student is unlawfully absent, work will be accepted (for the next 2 class periods after the due date) with a penalty of one letter grade off the assessed value.

Long term projects (e.g. the Independent Project, end of problem projects, etc.) are exempt from the unlawful absence policy above and are due on the assigned date.

Late Work Policy

All assignments should be submitted on time. If a student submits an assignment late (past the due date) the student can submit the assignment before the next HAC grade update with no penalty. After that period, the late penalty will be one letter grade.

Long term projects (e.g. the Independent Project, end of problem projects, etc.) are exempt from the above policy and are due on the assigned date.

Academic Integrity

Academic integrity is taking responsibility for the quality and completion of one's own work. Academic dishonesty is taking someone else's work and claiming it as one's own. Students at Bel Air High School are responsible for knowing what is considered to be Academic Dishonesty and the subsequent consequences. More information can be found in the BAHS Student Planner.

Classroom Rules and Procedures

Dissections: There is a participation grade associated with the dissections. The animals used in this class are to be treated with respect and care. Any cruelty to these animals will result in a zero for the participation grade of that dissection and you will be excluded from all future dissections.

Collaboration: A large portion of this course is collaborative, which means you will be working with your classmates. You will be responsible for not only the content of an assignment, but for the effective function of your group. If you have issues with your group or its function at any time, you must see Ms. Hamilton immediately to develop a resolution. **Issues with groups that are brought up on or near due dates, after projects are handed in, or after grades are given will not be addressed!**

Projects: The foundation of Biomedical Innovation is the projects (or tasks) that you complete at the end of each problem. These projects are incredibly important as they demonstrate your understanding and comprehension of all of the work you will have completed to that point. Please understand that, because of the size and intricacy of the projects and the large amount of time spent on their completion, they will comprise a very large portion of your grade. Plan accordingly, work to the absolute best of your ability, and be sure to carefully follow instructions and rubrics when completing these projects.

Assignment Submissions: Assignments will be turned in almost exclusively as digital versions. It is imperative that instructions for turn-in procedures are followed precisely. If an assignment is completed on time as demonstrated by time-stamped evidence, but was turned in late or improperly (e.g. incorrect naming conventions, incorrect file formats, incorrect turn-in locations), a 10% deduction will be taken from the grade achieved. This policy applies to individual and group assignments.

Cell Phone Policy

Students will place their electronic devices (including, but not limited to, cell phones, listening devices, smart watches, laptops, and iPads), either on silent or off, in a teacher designated area as they enter each classroom. Teachers will review with students the specific location for each room. The devices will remain in the teacher designated areas unless teachers explicitly tell students to use them as a part of classroom instruction.

- Devices will remain in the teacher designated area during bathroom visits.
- Devices will be retrieved from the teacher designated area at the end of the class at the direction of the teacher.
- School-appropriate cellphone use is permitted during class changes and lunch. Students are not permitted to make phone calls during school hours.
- Students will NOT be permitted to carry their electronic devices in a book bag throughout the school day.

If the electronic device policy is violated, the student shall then be subject to disciplinary action up to, and including, confiscation of the device as well as an office referral.