

**BIOMEDICAL ENGINEERING & WORLD HEALTH DEBAKEY HIGH
SCHOOL FOR HEALTH PROFESSIONS**

COURSE SYLLABUS: 2021-2022

TEACHER: Mr. Whitham

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Course Description

This twelve-week multidisciplinary senior Health Science course examines history of disease, epidemiology, health care systems, and emerging biomedical technologies as a solution to health concerns worldwide. This is a project-centered class whereby students are required to participate in investigations, labs, activities, research, and presentations. Lessons in this course are designed to improve the student's understanding of the biomedical field and how biomedical engineering can impact health throughout the world. The aim of this course is to encourage ideas as solutions to global medical problems.

Course Objectives

Students are expected to:

1. Identify and discuss the history of disease and the parallel development of medical technology.
2. Classify and compare healthcare systems around the world.
3. Investigate ways in which globalization has affected world health.
4. Describe the major human health problems in the world today.
5. Explore the leading chronic health conditions, which affect people worldwide.
6. Examine emerging and re-emerging infectious diseases and discuss treatment options in both developed and developing countries.
7. Define epidemiology and explain how epidemiologists track global diseases.
8. Calculate incidence and prevalence of diseases within a population.
9. Identify the type of vaccines and how they affect the spread of disease.
10. Explore the biomedical field by exploring prosthetics, biomedical imaging and forensics.
11. Research and implement the engineering design model.
12. Identify biomedical engineering developments, which address: screening, diagnosing, preventing, and treating of diseases and conditions.
13. Research the newest biomedical treatments for HIV/AIDS, Cardiovascular disease, and Cancer.
14. Evaluate the advances in stem cell research, regenerative medicine, and gene therapy.
15. Research, design, and present a novel medical project, which would be beneficial for developing countries.

Scope & Sequence of Topics

CORE LESSONS:

Unit 1: History of Disease and Medical Technology (TEKS 130.209. 1B)

- Examine parallels between disease and technology from pre-historical times to present.

Unit 2: Introduction to Biomedical Engineering & World Health

- Introduce Biomedical Engineering & World Health
- Describe the differences between Biotechnology and Biomedical Engineering.
- Define jobs that are encompassed in the Biomedical Engineering and Biotechnology fields.
- Discover the four central questions addressed in Biomedical Engineering and World Health.
- Research the history of Biomedical Engineering & Biotechnology.
- Define what technology is in a developing and developed country.
- Explain Engineering Design process.
- Create Engineering Design models
- Introduction to Biomedical Engineering project

Unit 3: Engineering and Research Design Process (TEKS 130.209. 7 A, 7 B)

- Explain Engineering Design process.
- Create Engineering Design models
- Introduce Research design model
- Investigate differences between quantitative and qualitative research design.
- Analyze a quantitative versus qualitative research design.

Unit 4: Clinical Trials, Regulations, and Ethics of Biomedical Engineering (TEKS 130.209. 6 A, 6 B, 6 C)

- Identify types of clinical trials.
- Recognize how clinical trials are designed, conducted and evaluated and how it is critical to understanding and developing medical research.
- Define and calculate a sample size.
- Analyze quantitative methods used to describe clinical trials.
- Describe the steps of technology assessment.
- Research the requirements for emerging medical technologies.
- Review the history of the FDA and how has the FDA impacted biomedical field.
- Explain the history of the FDA and how the FDA impacts the biomedical field.
- Discuss famous clinical trials and ethics related to the clinical trials.

Unit 5: Global Health (Economic Data, Public Health, Epidemiology, and Globalization (TEKS 130.209. 1 C, 1 D, 1 E, 1 F) (TEKS 130.209. 1 E; 4 A, B, C; 5 A, B, C, D) (TEKS 130.209. 1 F, 3 A, 2 A)

- Explain the difference between *developed countries*, *developing countries*, and *least developed countries*.
- Explain the responsibilities and functions of the World Health Organization (WHO) and Center for Disease Control and Prevention (CDC).
- Discuss the focus of Public Health.
- Describe types of health information collected by public health agencies.
- Define the following terms: morbidity, mortality, incidence, and prevalence.
- Explain the types of health events public health professionals explore.
- List the steps in an outbreak investigation.
- Describe the types of health data epidemiologists collect.

- Carry out the initial steps of an epidemiological investigation and develop biologically plausible hypotheses.
- Apply epidemiologic methods to the measurement of disease rates, prevention of infectious diseases, and the development and evaluation of health programs and policies
- Calculate incidence and prevalence rates of diseases in population.
- Give examples of reportable/notifiable diseases and explain why they are carefully monitored.
- Discuss and give an example of *Disability Adjusted Life Years* (DALYs)
- Explain how societies use health data.
- Identify the “Father of Epidemiology” and explain the economic data he collected in 1854 Soho, England to help identify the source of the cholera outbreak.
- Define globalization and explain how it relates to health.
- Describe how globalization is promoting both the rapid spread and effective treatment of highly contagious diseases.
- Define the goals of the Grand Challenges of Global Health.
- Research work done in Botswana by Baylor College of Medicine in the area of HIV/AIDS.

Unit 6: Healthcare Systems and Health Reform (TEKS 130.209. 2 A, 2 B, 2 C, 2 D, 2 E)

- Contrast US healthcare system with other developed countries and their healthcare systems.
- Compare the availability of healthcare in developed and developing worlds.
- Describe how health care expenditures have changed over time.
- Explain the major contributors to health care costs.
- Debate health reform in the U.S.

Unit 7: Leading Chronic Health Age Related Diseases-Diabetes, COPD, Cancer & Cardiovascular Disease (TEKS 130.209. 1 A, 3 C, 3 D, 3 E, 3 F)

- Identify and describe the most common chronic diseases around the world.
- Explain why chronic diseases have reached epidemic proportions in developing countries.
- Discuss why chronic diseases are so costly.
- Investigate strategies that help slow the spread of chronic diseases.
- Evaluate the cause of cancer, types of cancer, and the most innovative treatments.
- Review the anatomy and physiology of the cardiovascular system.
- Research cardiovascular diseases and the biomedical engineering innovations that will help treat cardiovascular disease.

Unit 8: Immunity & Vaccinations (TEKS 130.209. 3 B)

- Review and illustrate organs of the immune system.
- Describe functions of immune cells.
- Name the three lines of defense and tell how they each protect the body.
- Define *antibodies*, *antigens*, *allergens* and the *complement system*.
- Explain how hormones affect the immune system
- Investigate immunity and the role of vaccines.
- Examine the different types of vaccines available and take look at the future of vaccines

Unit 9: Infectious Diseases (TEKS 130.209. 1 A, 3 A)

- Describe the pathophysiology of the following infectious diseases:
Malaria
Chagas
Tuberculosis
Hepatitis (A, B, C)
Onchocerciasis (“River Blindness”)
Schistosomiasis
Typhoid fever
Yellow fever
Smallpox
West Nile Virus
Cholera
Bubonic Plague
Influenza
Salmonellosis
- Explain symptoms, transmission, diagnosis, and prevention of the previous diseases.
- Research possible ideas for prevention of these infectious diseases.
- Collaborate with Dr, Hatzenbuehler to investigate TB with a specific focus on latent TB.

Unit 10: Presentations/Projects (TEKS 130.209. 7 A, 7 B)

- Investigate patients with amputations and design a futuristic prosthetic device.
- Build a biomedical device (EKG monitor) that will be used in a developing country.
- Research and Design a biomedical engineering prototype that will solve a medical crisis in a developed or developing country. The students will create a website, scientific poster, research paper, and a prototype.
- Deliver end-of-year professional presentation to peers and teacher.

Textbook& Reference Material

- *Bioengineering for Global Health*, Rebecca Richards-Kortum
- All handouts on the HUB or given in class

Dress Code for Senior Health Science Rotation

- All seniors are allowed to wear scrubs, or a school approved uniform stated in the student tracker. If a student wears scrubs, he/she has to wear scrub pants with the matching scrub top. Students cannot wear scrub top with uniform pants or vice versa.
- Field lessons- On the days we go out on field lessons, students must wear scrubs, white lab coat, white shoes, and student badge. The scrubs and lab coat must be pressed and look very neat. Remember, the first impressions make a long-lasting impression on a future employer.

Supplies Needed

- Folder with pockets
- Pen & Pencils
- Notebook paper
- Supplies to make different projects in class.

Absences & Makeup Work

- If you are absent, it is your responsibility to get the makeup work. You can always check on Blendspace to see what we have done with assigned unit. You may also meet with me before, at break, or after class if you need any assistance. My door is always open to my students if they need help on any work. **IT IS YOUR RESPONSIBILITY TO MAKE UP THE WORK!**
- **Exams-** If you miss a test, you must schedule a time to make up the exam upon returning to school. All make-up exams must be taken within two days of your return. I will not seek you out and remind you to make up your exam—this is your responsibility!

End-of-Term Project/Presentation

- As a biomedical engineer, you will develop a world health-related project and presentation, which will be professionally presented to the class at the end of the term. This will count as a major test grade.

Field Lessons/Seminars

- During the year, field lessons and/or seminars may be scheduled at a medical and/or research facility. You will be expected to wear a white lab coat and blue scrub set if we are on a field lesson. You must always look and act professional because you are representing DeBakey HSHP.

Conference Period

- I am available for conference on “B-days” during 7th and 8th periods. (12:50 p.m. – 3:15 p.m.)
- Please make an appointment if you or your parents wish to speak with me during that time.

Grading Scale/Weights

Grades will be assigned on the following basis:

- "A" (90-100) for demonstrated competence with excellence
- "B" (80-89) for demonstrated competence that was above average (good)
- "C" (75-79) for competence that was average
- “D” (70-74) for competence that was marginal
- "F" (69 and below) for failing to meet the basic requirements of course

Final Exam:

- Two weeks before the end of this course, you will be given an end-of-term review, which will help you prepare for your comprehensive final exam.
- Your final exam will include an end-of-term essay. The essay portion will be assigned a week before the term is over.
- The written exam will count 90% and the essay portion will count 10%.

Computer Access

Biomedical Engineering & World Health is a technology-based class and having computer access is important in this class. Almost all work will be done in class, where the students have computer access. I understand that everyone does not always have access away from school and that is fine. Students need to please come see me if they have problems with computer access outside of class and I can work out a solution for each individual student. My door is always open for students!

Health Science Grading and Conduct Policy

I. GRADES

- A. Cheating will not be tolerated, and all penalties will be strictly enforced. See Code of Conduct.
- B. Late work will have 30 points deducted from the score the work would have earned had it been turned in on time. A zero will be recorded for work turned in more than 2 school days after the assignment was originally due.
 - i. New policy for 21-22 Freshmen regarding late work:
 - a. In cycle 1, work turned in one class day late will incur a 10-point penalty
 - b. In cycle 2, work turned in one class day late will incur a 20-point penalty
 - c. In cycles 3 and beyond, work turned in once class day late will incur the standard 30-point penalty
 - d. Work turned in more than one class day late will earn the standard zero
 - e. This applies only to 21-22 freshmen.
- C. Broken or damaged supplies due to student negligence will be paid for by the student.
- D. If you were absent for any daily work or quizzes, it is your responsibility to arrange and complete make up work within five (5) days. Consult with your teacher to create a plan for making up missing work in the allotted time. Major exams will be made up during the next class meeting if possible or at the soonest time agreed upon by the student and instructor.
- E. A comprehensive final exam will be given at the end of each rotation or semester.
- F. If a student receives a failing grade on a major grade, he/she may request a re-do or re-take of the assignment/test.
 1. The request must be **made in writing (via email or through the HUB for remote learning)** to the instructor on the day the failing major grade was issued.
 2. The re-do/re-take must be completed **within two school days** of receiving the failing grade.
 3. The re-do/re-take score will be an **average** of the original and new score with a maximum possible score not to exceed 70. **Regardless of the average of the two scores, a student will not earn a grade higher than a 70 for a re-take/re-do.**
 4. **Re-do/ re-takes are not allowed for non-major grades, common assessments, or for any major grade that is administered in the last week of any grading cycle.**

5. The re-do/retake can only be done before school, after school, or during lunch Monday through Thursday for in-person setting- The redo/retake will be conducted via a plan agreed upon by you and the instructor. If we revert to a totally online setting, a retake can be scheduled at a time and in a manner agreed upon by you and your teacher.

G. **All tests, quizzes and Scantrons are never to leave the classroom (in classroom setting) nor should they, in whole or in part, be copied/recorded in any manner via online administration (photo/video/hand recorded/verbally shared/any other means) These items are part of official records that are kept on file. . Review of any test or quiz can be arranged with your instructor.**

H. All students are different, and each has their own way of learning. Therefore, several methods will be used to evaluate a student’s performance. Grade breakdown will be as follows:

- a. **40%** Projects and Major Classwork
- b. **25%** Tests
- c. **15%** Participation/Warmups/Engagement
- d. **20%** Quizzes

***Note on Engagement/Warmups/Professionalism Grade:** This 20% of your overall grade will be determined by your participation in online classroom activities and completion of work apart from substantial assignments. Short assignments, videos, warm-ups, surveys, brainstorming activities, and games are examples of what will fall under this category. Such assignments will be labeled as an “Engagement Activity” on the HUB. You are expected to demonstrate professional standards and employability skills such as the ability to cooperate, contribute and collaborate as a member of a team (our classroom). Behavior that detracts from the team’s ability to conduct business and be productive may cause you to lose points from assignments in this category. If you are unable to participate in synchronous classroom sessions, you may still earn these points by being prompt in your communication with me and your fellow group members when required.

II. Tardy Policy (Per Semester) (In-person settings)

Being Tardy will not affect numerical grades, however it will affect your conduct grade. ***You must be in your assigned seat when the tardy bell rings. If you are not in the classroom when the tardy bell rings, you must obtain a permit from the office in order to enter the classroom.*** **TARDY POLICIES WILL BE STRICTLY ENFORCED!!!** The tardy policy as indicated on the DeBakey HSHP website.

<u>Offense</u>	<u>Consequence</u>
*1 st Unexcused Tardy	Warning – sign tardy log
*2 nd Unexcused Tardy	½ hour after-school detention (Thursday)
*3 rd Unexcused Tardy	1 hour after-school detention (Thursday) – Written notification to student and parent
*4 th Unexcused Tardy	2 hours Saturday detention Required parent conference Growth Plan

*5 th Unexcused Tardy	Detention during an in-school activity (i.e., Fall Festival, Talent Show, etc...)
	Parent Notification
	Disciplinary Probation (with requisite office conduct of “P”)
*6 th Unexcused Tardy	Disciplinary Probation
	Non-renewal Recommendation

A. Safety Violations (in-person setting)

1. Unauthorized or improper handling of instruments or equipment or supplies.
2. Failure to wear proper attire on daily basis (i.e., lab coat, standardize school attire, proper shoes etc.).
3. Failure to follow safety instructions given by teacher.
4. Failure to replace equipment and supplies in their designated areas.
5. Failure to clean up immediate surroundings and laboratory work areas.
6. Failure to disinfect all contaminated areas.

B. General Violations (both in-person and online)

7. Failure to bring required items: books, laptops, and notebooks to class on a daily basis.
8. Failure to take required notes.
9. Failure to participate in class activities.
10. Failure to follow teacher’s instructions on assignments (including working on outside assignments).

III. Conduct (Both in-person and online)

Students are expected to conduct themselves in a professional and courteous manner at all times. Conduct is a separate grade. Points will not be taken from your numerical grade for conduct violations, however poor conduct grades will prevent you from running for elected offices, going on clinical rotations and field trips, receiving scholarships and **being accepted into AP classes**.

Continued conduct violations will result in dismissal from this school. **CONDUCT POLICIES WILL BE STRICTLY ENFORCED!!!**

CONDUCT OFFENSES

The following is a list of the most common conduct violations that are listed on the conduct log. After **3** conduct violations the student will receive an “**S**” in conduct. After **4** conduct violations the student will receive a “**P**” in conduct and be sent to the *office* for discipline. After **5** or more conduct violations student will be sent to the office for discipline. Punishment may include parent conference, detention, office “**P**” or “**U**”, probation and review for exit. Please note that any one offense can be so egregious as to trigger a drop in conduct or official disciplinary action.

Common Violations (In-person settings)

- a. Failure to be in assigned seat (including leaving class without permission, & not signing out to leave)
- b. Use of insensitive/profane language
- c. Chewing gum, eating or drinking in class
- d. Applying makeup or combing hair in class
- e. Sleeping in class or putting your head down or feet up on desk
- f. Talking while test is in progress
- g. Writing or passing notes while teacher is lecturing
- h. Talking while teacher is lecturing or others are presenting (raise your hand if you wish to speak)
- i. Horse playing or game playing (cards, dice, listening to personal stereos, calculator games etc.)
- j. Talking too much or too loud
- k. Disrespecting Instructor or others (this includes taking items off teacher’s desk without permission)
- l. Failure to return required parent signature documents. (I.e. policy acknowledgement form, progress reports etc.).
- m. Failure to follow class policy on cell phones and electronic devices
- n. Failure to follow all cyber safety rules
- o. Other offense (See Student handbook)

Common Violations (online settings)

- a. Appearing on camera in an incomplete or inappropriate state of dress
- b. Engaging in inappropriate behaviors verbally and/or visually
- c. Willfully allowing audio or visual of someone else engaging in inappropriate behaviors or in a state of undress
- d. Allowing non-class participants into an online meeting
- e. Disruption of online activities
- f. Impeding the efforts of the instructor and/or other participants (muting, dropping from meeting, interruption with the intent to impede, etc)

- g. Using a false excuse for not attending class at the prescribed time. It is understood that genuine schedule conflicts may exist for students. You are strongly encouraged to discuss with your teacher any reasons that may prevent you from attending during class so he/she can be of the greatest assistance in developing a plan that works for you.
- h. Online bullying, intimidation, harassment, shaming or any other negative or hostile interactions with other students, faculty, or staff.

Expected Remote Learning Behaviors

- a. Be on time
- b. Make sure you are in a quiet environment-free of distractions
 - a. Turn off TVs, music, etc.
- c. Your focus should be on class
 - a. Students should not engage in activities that are not related to the lesson/course
- d. Dress in school-appropriate attire
- e. Be seated upright, preferably on a chair and at a table
- f. Keep your camera on at all times
- g. Mute your audio
 - a. Raise your virtual hand, wait until your teacher calls on you, then unmute yourself
- h. Chat is for questions/comments relevant to course content
 - a. Remember that this is public and a record of the chat is kept and archived.
- i. Create accounts on apps and join meetings using only your HISD email
Ex: S1234567@houstonisd.org You will not be able to attend meetings as a “guest”
- j. Open communication in a timely manner with instructor if you are not attending class synchronously. Be proactive and clear in your communication.
- k. Kind and respectful conduct toward others audibly, visually, and in written form.

Student/Parent Syllabus Signature Form

I have read and understand the syllabus for Biomedical Engineering & World Health. I understand that I need to follow the rules in the above syllabus to have a productive 12-week rotation in Biomedical Engineering and World Health.

Printed Name of Student	Student's Signature	Date
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Parent/Guardian printed name: _____

Parent/Guardian Signature: _____

Please fill out this form, detach it from the packet and have the student return it to me the next time he/she attends class.