**BIOMEDICAL ENGINEERING & WORLD HEALTH AT DEBAKEY HIGH SCHOOL FOR HEALTH PROFESSIONALS**

**COURSE SYLLABUS: 2014-2015**

**TEACHER: MRS. S. NIAVES EMAIL:** **SNIAVES@houstonisd.org**

**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 like biomedical Imaging and Nanotechnology.

11. Identify biomedical engineering developments, which address: screening, diagnosing, preventing, and treating of diseases and conditions.

12. Research the newest biomedical treatments for HIV/AIDS, Cardiovascular disease, and Cancer.

13. Evaluate the advances in stem cell research, regenerative medicine, and gene therapy.

14. 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.
* Introduction to Biomedical Engineering project

 **Unit 3: Research, Regulations, and Ethics of Biomedical Engineering** (TEKS 130.209. 6 A, 6 B, 6 C)

* Explain Engineering Design process.
* Create Engineering Design models.
* Describe the steps of technology assessment.
* Research 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 4: 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 5: 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 6: Leading Chronic Health Conditions-Cancer & Cardiovascular Disease** (TEKS 130.209. 1 A, 3 C, 3 D, 3 E, 3 F)

* Evaluate what cancer is and the most innovative treatments
* Review the cardiovascular system
* Research cardiovascular diseases and treatments

**Unit 7: 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 8: 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

Salmonelosis

* Explain symptoms, transmission, diagnosis, and prevention of the previous diseases.
* Research possible ideas for prevention of these infectious diseases.

**Unit 9: AIDS/HIV** (TEKS 130.209. 1A, 3A)

* Review the history of HIV/AIDS
* Examine the signs and symptoms, transmission, diagnosis, and prevention of HIV/AIDS
* Research treatments like antiviral therapy and look at the future of AIDS around the world

**Unit 10: Biomedical Innovations** (TEKS 130.209. 3A)

**A. Stem Cells, Regenerative Medicine, and Tissue Engineering**

* Investigate stem cells and what future the cells hold in unlocking cures for diseases.
* Research regenerative medicine and tissue engineering and how stem cells play a role in the success of these innovations.

**B. Prosthetics** (TEKS 130.209 1B)

* Examine the use of prosthetics related to different physical disabilities.
* Research the newest technologies available for paralyzed and amputated patients.
* Create an engineering design model of a prosthetic device.

**C. Biomedical Imaging**

* Explain the different imaging modalities such as XRAY, CT, MRI, Nuclear Medicine, & Ultrasound.
* Investigate safety practices that need to be used with radiation professions.
* Discuss the biomedical imaging modalities and how they can be used as screening tools.
* Present imaging case studies

**Unit 12: Presentations/Projects** (TEKS 130.209. 7 A, 7 B)

* Produce a senior portfolio that will include resume, recommendation letters, awards and accomplishments, ect.
* Investigate patients with amputations and design a prosthetics arm prototype.
* Design a biomedical engineering device and present.
* Participate in group dress rehearsal presentations.
* Deliver end-of-year professional presentation to peers and teacher.

**Textbook& Reference Material**

* *Bioengineering for Global Health*, Rebecca Richards-Kortum
* All handouts

**Edmodo**

I have adopted a new system this year. We will have an open communication system through **Edmodo.** I will be having students create an account for their particular class with a special code to join. Your student will be able to communicate with me, along with the other students in their class. This is for educational purposes only, so all students need to be aware of what they post on this particular site. If they post anything inappropriate on the site they will be referred to the office for disciplinary action. I will be monitoring everything that is posted on this site. The student’s lecture notes will be posted daily, so if a student misses class for any reason they have access to what we did in class. The students can also post messages to me, if they have any questions about the class. I think this system is going to help the student’s stay organized and increase productivity in the classroom. Students can log into Edmodo by hisd.Edmodo.com and using the code I will give them in class to join Biomedical Engineering group.

**Dress Code for Senior Health Science Rotation**

* All senior 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 impression might make a long lasting impression on a future employer.

**Supplies Needed**

* 3 ring binder-portfolio
* Plastic page protectors
* Dividers
* Folder with pockets
* Flash drive (you must provide)
* 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. The teacher’s assistant will put all handouts in the class folder. Take out all missed work and sign the log that you received the handouts. You can always check with the teacher’s assistant in your class for help on the missed assignments. 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 RESPONSIBILTY 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!

**Portfolio**

* In Biomedical Engineering & World Health, you will be required to keep a senior portfolio of your accomplishments while at DeBakey HSHP. This will count as a major test grade. I will go over in detail at a later date of what will be included in this portfolio.

**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

**Grading Break Down**

* 50% Major Grades (Tests, Portfolio, Major Projects)
* 40% Daily Grades (Quizzes, Lab Exercises, Class Assignments)
* 10% Participation (Homework and Class Participation)

**Note**: If work is not turned in on the assigned date a 30 point deduction will occur. After the third day not turned in a zero will be awarded. If absent the day of a major exam, you are to make up the exam the day you return to school. Makeup work can be done by appointment with the teacher before school, during study hall, or after school. If you are absent for quizzes, lab exercises, or any class work, it is your responsibility to arrange make up within three days or you will receive a zero.

**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%.

**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.

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Printed Name of Student Student’s Signature Date

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.**