EID 101: Engineering Design and Problem Solving
SECTION D: Low Cost Solutions for Diabetes Management

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Class Meeting Time Tue 11-12, Th 1-3 **NAB 502**

Credit: 3 units This 3-credit course requires 3 hours of classroom interaction/direct faculty instruction and on average 2-6 hours of out-of-class student work each week for approximately 15 weeks. Out-of-class work may include but is not limited to: required reading, Written assignments, site visits, discussion with experts, visiting local stores for working on the prototype in the machine shop,.

Office Hours: Tuesday 2-4pm, Thursday 3-4pm or by appointment (Rm 214)

Course Syllabus: Refer to EID 101 general syllabus first. This document supplements the general syllabus.

Course Notes and Schedule: Available on course moodle site.

Section E Project Description

Diabetes, once considered a disease of the rich, is now known to affect developing countries at a staggering rate. In Africa, approximately 19.8 million adults have diabetes, and projections for 2035 are as high as 41.1 million. The health and economic burdens of this epidemic in countries like Uganda are crippling. Diabetes requires frequent monitoring of blood sugar; however access to glucose monitors and test strips is limited. Also, when combined with injury and other complications, diabetes can often lead to amputations. The cost for a prosthetic limb in Uganda is between $250 and $500, a number that is prohibitive for most in a country where the median income is about $650 per year. The inability to afford monitors and prosthetics results in loss of mobility and significantly diminishes quality of life with many patients succumbing to the disease in the first year.

The objective of this section is to allow students to work in multidisciplinary teams to design, fabricate and build low-cost devices for diabetes management. The prototypes must be very robust and usable in rugged terrains that are typical in Uganda. It should be easily repairable and use locally available material as much as possible. The designs should be simple, precise and well-documented so that hospitals and medical professionals can replicate it locally in a self-taught fashion. Students will learn the fundamentals of engineering design and analysis while using tools from the machine shop, finite element analysis and stress analysis tools, and smart sensors as part of the process.

Students will work with our partners in the Global Diabetes Institute at Albert Einstein Medical Center, the Regional Referral Hospital in Soroti, Uganda as well as experts in local hospitals. The 2016 prototypes as well as the feedback received from our partners in Uganda on the prototypes will be shared with the class as background information. This project has the potential to make a significant, life-altering difference for the people of Soroti and beyond. Online Tech Article on the 2016 EID 101 work: http://www.huffingtonpost.com/entry/591f70a4e4b0b28a33f62c31

Grading Schema:

Class Attendance, Class Participation, Pop Quizzes	15%
Team Participation	15%
Assignments	15%
Midterm Presentation	15%

Final Deliverable 40%

The final deliverable will include a presentation in Rose Auditorium, final report (detailed specifications for the content will be provided), a professional project website and a 3 minute video of the project.

Project Administration and Organization

- The class is divided into **five groups**. The members in each group will elect one person to represent it as the **project leader**. All project leaders will form a **management group** that is responsible for the conduct of the project as a whole and for managing the oral presentations.
- The members of each group will elect a **recorder** for the group. Each recorder will begin the initial meeting of the group, record the **minutes of the meetings**, and centralize the gathered information. This documentation is kept in the **group folder** and **must be brought to class every time**; it will be submitted to the instructor along with the final report at the end.
- The **instructor serves as a consultant, agitator, and mediator** to the groups and interacts through the project leaders as well as directly with the groups.
- The project is divided into several phases, each lasting approximately 1-2 weeks. For each new phase, **a new phase leader** and a new recorder will be elected.
- Scheduled class time is used for group discussion and the decision-making process as the project evolves. Research, analysis, design, and development work is mostly conducted outside of class hours.
- At the beginning of each class session, **each project leader makes a brief two- minute oral presentation**, in the presence of the instructor and other groups, about the work completed thus far, the solutions obtained, the problems encountered, and the anticipated work for the next phase.
- **Two oral presentations**, coordinated primarily by the management group but contributed by all, are required (in the middle and end of the semester). The attire for each oral presentation should be commensurate with the occasion. The presentations will be video-taped.
- A **formal, type-written report by each group** is due at the completion of the project. The report must be professionally prepared with proper illustrations, figures, and supporting documentation. This is the responsibility of the management group in coordination with the rest of the class. Also due are a project website and short video of the project of professional quality. The content details for the report, website and video will be discussed in class.

Course and Classroom Policies:

- Make sure you check your cooper email. I will often email the class using moodle or student self-service.
- Reading assignments for each week and will be specified in the syllabus.
- Attendance is mandatory. Prior approval is needed for missing classes (health or religious reasons only).
- Arrive in class on time. Late arrival will disrupt group discussions.
- Assignments should be submitted by specified time on the due date.
- Since assignments often involve in-class discussions the day after it is due, late submissions will not be allowed unless otherwise specified.
- Outside sources (online or otherwise) used in assignment solutions should always be acknowledged. Copying “individual” assignments from other teams/ individuals will result in an F for all parties involved. “Team assignments” should include proper acknowledgement of individual roles. Read the section on Academic Standards and Regulations found in the Course Catalog and AcademicIntegrity.pdf in moodle. Feel free to talk to me to me if you have questions whether an action would violate the integrity code.

- The standards and requirements set forth in this syllabus may be modified at any time. Notice of such changes will be by announcement in class or or by changes to this syllabus posted on the course website.
- Students with disabilities or who need special accommodations for this class are required to meet with me and the Dean of Students immediately so that arrangements can be made. Cooper Union has limited resources and extra time is required for such arrangements to be feasible. In order to receive accommodations for an exam, you must notify me in writing at least two weeks before they are needed, and you must also be registered with the Dean of Students. Students will not be afforded any special accommodations retroactively, i.e., for academic work completed prior to disclosure of the disability to me and the Dean.
- Students who have medical excuses for missing class should contact the Dean of Students promptly. Students will be required to provide the Dean of Students with documentation from a medical provider justifying the absence. The Dean of Students will inform me when an absence is due to a valid medical issue/condition so that the absence can be considered excused. It is important to note that even with excused medical absences; a student is still responsible for completing all of the course requirements.
- The standards and requirements set forth in this syllabus may be modified at any time. Notice of such changes will be by announcement in class or by changes to this syllabus posted on the course website.

Expected Student Learning Outcomes:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function on multidisciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- a recognition of the need for and an ability to engage in life-long learning
- a knowledge of contemporary issues
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice