Biomedical Innovation (ENRH 116)
Fall 2021 Course Syllabus

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Version 1.0

This document will be periodically revised throughout the course of the semester.

1 Course Description

1.1 Course Details

- Course Directors/Student Liaisons: Keerthana Chakka, Daanish Khazi-Syed
- Faculty Sponsor: Bradley Phelan
- Department: Technology Commercialization
- Minimum Course Participants Count: 5
- Maximum Course Participants Count: None

1.2 Rationale

Through the Biomedical Innovation Program, students will acquire the skills and mindset required to accurately assess clinical needs and develop feasible solutions in a team-based environment. Using these skills and the aid of course facilitators, students will tackle real world deficiencies in healthcare through device design and implementation.

1.3 Objectives

- Think holistically about the current standard of care and how that standard could be improved.
- Identify unmet clinical needs via effective communication with members of the healthcare team and keen understanding of the context of care delivery.
- Use a structured process to evaluate the practical impact of a problem, adverse contributing factors, stakeholders, competing solutions, and economic implications.
- Understand the life-cycle of products in the healthcare industry, including the strategic and operational events from conception through commercialization.
- Work collaboratively on teams that bridge the gap between the clinic, research, and business to deliver high quality patient care.

1.4 Format

This class will be mostly virtual, consisting of 12 Zoom sessions that are either lectures, guest speakers, or interactive workshops/demos. Each student will be paired with a mentor to work on a research project as well towards the end of the semester.

1.5 Student Evaluation

Grades will be pass/fail. Attendance is required to receive credit for the course. To receive transcript acknowledgment, students must:

- Attend 10 out of 12 course sessions.
- Complete the online REDCap course evaluation form.

2 Course Schedule

The course schedule for this semester is presented in the table below. All class meetings are on Thursdays from 12:00 to 1:00 p.m. on Zoom.

Week No.	Date	Session Agenda
1	2021-09-16	Course Introduction
2	2021-09-23	Careers in Biomedical Innovation
3	2021-09-30	Guest Lecture
4	2021-10-07	Research Project Discussion
5	2021-10-14	CAD Modeling Workshop
6	2021-10-21	Scientific Communication Presentation/Lecture
7	2021-10-28	Programming Workshop I
8	2021-11-04	Programming Workshop II
9	2021-11-11	Project Management
10	2021-11-18	Work Day
11	2021-12-02	Final Pitch Presentations I
12	2021-12-09	Final Pitch Presentations II

3 Session Descriptions

1. Overview of Course, Needs Finding, and Previous Projects
    - Learning Objectives
        - Provide a brief overview of the course goals and expectations.
        - Describe and define innovation and the common traits of innovators.
        - Use examples of past projects to explain how needs are discovered and addressed.
        - Explain the mentor-mentee relationship and shadowing experiences.
2. Careers in Biomedical Innovation
    - Learning Objectives
        - Introduce students to the different career paths in biomedical innovation.
    - Speaker
        - Bradley Phelan, TBD
3. Guest Lecture
    - Learning Objectives
        - TBD
    - Speaker
        - TBD
4. Research Project Discussion
    - Learning Objectives
        - Introduce students to the expectations for the research project.
        - Form the project teams and begin discussio about timelines, objectives, and design.
5. CAD Modeling Workshop
    - Learning Objectives
        - Give students an opportunity to learn about CAD modeling software.
        - Offer students an instructive workshop on basic 3D design.
        - Discuss the considerations when 3D-printing a model designed in CAD software.
        - Understand the principles of prototyping.

6. Scientific Communication
    - Learning Objectives
        - Present useful skills and information to know when communicating scientific findings to the general public.
7. Programming Workshop I
    - Learning Objectives
        - Understand the advantages of data analysis in a Jupyter Lab environment over the "traditional" Excel-based approach.
        - Understand foundational programming concepts in Python.
8. Programming Workshop II
    - Learning Objectives
        - Load a sample dataset into a Pandas data structure.
        - Understand different ways of filtering and manipulating data in accordance with a hypothesis.
        - Visualize trends in the data to make conclusions about the proposed hypotheses.
9. Project Management
    - Learning Objectives
        - Students will learn about the fundamentals of project management.
        - Teams will participate in a demo to make a schedule/plan for project cases.
10. Work Day
    - Learning Objectives
        - Students will be assigned to clinical mentors with real problems that need solutions.
        - Advise students on the idea generation and pitch process.
        - Aid students in creating slides that will explain the underlying technology, the process of developing a solution, the stakeholders who stand to benefit from this solution, and the potential market size for the given project.

11. Final Pitch Presentations I
    - Learning Objectives
        - Students will pitch their project and proposed solution to a panel of judges
        - The judges will pick the most enticing idea in a Shark Tank-esque competition. (There may even be prizes!)
12. Final Pitch Presentations II
    - Learning Objectives
        - Students will pitch their project and proposed solution to a panel of judges
        - The judges will pick the most enticing idea in a Shark Tank-esque competition. (There may even be prizes!)