Introduction to Biomedical Innovation – Course Description ENRH 116

Course Directors:

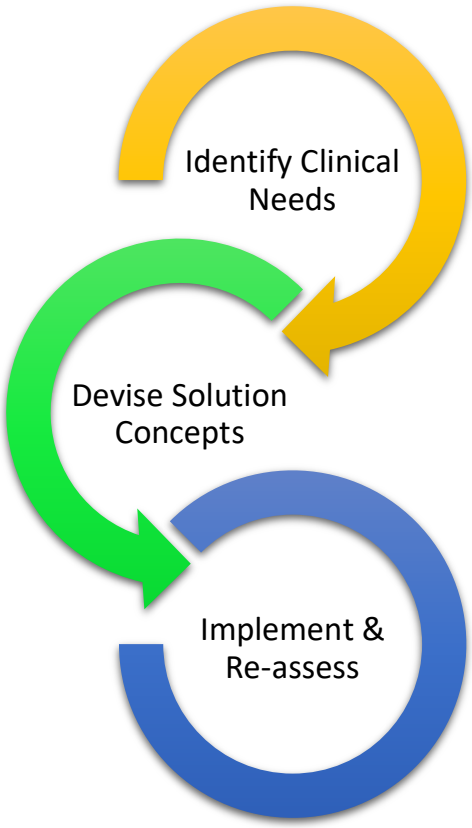
Ann Majewicz Fey, PhD
Caroline Park, MD
Connie Hsia, MD

Student Facilitators:

Ev Kakadiaris
Khadyoth Nanneboyina
Nimay Kulkarni
Yash Kadakia

Requirements:

Maximum of 24 students



Mission:

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.

Course 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 lifecycle of products in the healthcare industry, including the strategic and operational events from conception through commercialization
- Lead multidisciplinary teams that bridge the gap between the clinic, research, and business to deliver high quality patient care

Course Text:

All required reading will be provided to students in class. The following text may be useful as a supplement to course material.

Biodesign: The Process of Innovating Medical Technologies.
Zenios, Makower, Yock. Edition 1. ISBN-10: 0521517427
Free Website: ebiodesign.com

Managing Discovery in the Life Sciences: Harnessing Creativity to Drive Biomedical Innovation
Rea, Pauly, Burns. ISBN-10: 974-1-107-57730-5

Schedule and Specific Objectives

Session 1: Overview of Course, Needs Finding, and Previous Projects
Monday, August 31st, 2020: 12:00-1:00 PM

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

Speaker

- Ann Majewicz Fey, PhD (Course Director & UTD/UTSW Engineering)
- Dr. Gilberto Salazar

Session 2: Angioplasty Case Study
Monday, September 14th, 2020: 12:00-1:00 PM

Learning Objectives

- Introduce students to the origin of angioplasty as a treatment for stenotic blood vessels
- Offer insight into the iterative process of device development
- Discuss the commercialization and various stakeholder as the technology came to market

Speaker

- Yash Kadakia and TBD

Session 3: Intro to 3D Design
Monday, September 21st, 2020: 12:00-1:00 PM

Learning Objectives

- Give students an opportunity to learn about CAD software
- Offer students an instructive workshop on basic 3D Design

- Discuss the considerations when 3D printing a model designed in CAD softwares
- Understand the principles of prototyping

Speaker

- Ann Majewicz Fey, PhD (Course Director & UTD/UTSW Engineering)

Session 4: The Discovery and Commercialization of Statins

Monday, September 28th, 2020: 12:00-1:00 PM

Learning Objectives

- Introduce students to the combination of research and serendipidity that led to the discovery of statins.
- Review the relevant biochemical pathways targeted by statins
- Discuss the various players who advocated for its development to management teams
- Discuss the modification made to statins and the associated intellectual property ramifications.

Speaker

- Dr. Phillip Rea (Dept of Biochemistry, University of Pennsylvania)

Session 5: High throughput Genetics/ App-Based Diagnosis of Mental Health Disorders

Monday, October 5th, 2020: 12:00-1:00 PM

Speakers and Objectives

- TBD

Session 6: Intro to Coding in Python

Monday, October 12th, 2020: 12:00-1:00 PM

Learning Objectives

- Understand the advantages of programming over a tradition Excel based data-analysis approach
- Understand foundational programming concepts in python

Speaker

- Nimay Kulkarni

Session 7: Basic Data Tables + Visualization

Monday, October 19th, 2020: 12:00-1:00 PM

Learning Objectives

- Load a sample dataset into a Pandas datastructure

- Understand different ways of filtering and manipulating to data structure according to a hypothesis
- Visualize trends in the data to make conclusions about the proposed hypotheses.

Speaker

- Nimay Kulkarni

Session 8: **Car T Cell Case Study**

Monday, October 26th, 2020: 12:00-1:00 PM

- Discuss the differences between biomedical device and pharmaceutical innovation
- Discuss the technology and biology required to generate Car T cells.
- Discuss the process of converting a laboratory experiment into a clinically usable treatment.
- Understand the associated intellectual property and FDA approval process

Speaker

- Ev Kakadiaris and TBD

Session 9: Pitch Workday

Monday, November 2nd, 2020: 12:00-1:00PM

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

Speakers

- Dr. Caroline Park, Dr. Ann Majewicz, Dr. Connie Hsia

Session 10: Pitch Presentation

Monday, November 16th, 2020: 12:00-1:00PM

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)

Speakers

- Student teams