The "Physician Innovator Training Program (PITP)" presents:

Our Elective Course for UCI Medical Students for the 2025-2026 year

Elective Title: ***"Foundations of Innovation & Engineering (FIE) – Part A" (MS1s given priority)****
"Foundations of Innovation & Engineering (FIE) – Part B" (MS2s given priority)*

Course Directors: Yama Akbari, MD, PhD
Warren Wiechmann, MD, MBA, MSEd (SOM)
Engineering Faculty Co-Directors: Christine King, PhD & Elliot Hui, PhD

DESCRIPTION OF THE ELECTIVE

Elective Goal: To develop and foster an innovation, engineering, and entrepreneurial mindset amongst medical students.

Guest Lecturers during the year include: Many engineering faculty, entrepreneurs, Beall Applied Innovation speakers, Industry speakers, including highly successful ones.

Description: This elective provides students with the core principles of innovation and will foster an innovative mindset that will enable them to identify unmet clinical needs, develop the tools to meet those needs, and take these tools from IP (intellectual property) to potential IPO. The course will leverage the expertise of physicians, engineers, entrepreneurs, investors, and patent attorneys actively involved in innovation at UCI. This 2-part course (each course will encompass 1 academic year) will cover the following 4 themes:

1. ***Identification***: to identify unmet clinical needs & gaps
2. ***Ideation***: to ideate and develop the *tools* to meet the newly identified needs
3. ***Innovation***: to innovate by the creation, development, prototyping, and refinement of the new ideas.
4. ***Implementation***: how take innovation from IP to IPO

Many sessions will have a focused didactics component while some will have case-based discussions and hands-on components followed by a case-based discussions, including examples of real clinical challenge and the solutions created. For some of the sessions in the ideation theme, there will be opportunity for hands-on training with tools involved in innovation and engineering. Students will sometimes work in small groups to work through case examples and include the opportunity to work with a biomedical engineering student team on a longitudinal capstone project. During the end of the 2-year curriculum, students will be asked to propose a solution for an unmet clinical need and describe its evolution through the identification, ideation (Part A), innovation, and implementation phases (Part B).

Objectives:

1. Describe the clinical needs assessment process and illustrate how biomedical engineering principles and practices can contribute to this process
2. Identify and explain the utility of at least three approaches for ideation
3. Describe the processes for innovation, including prototyping, testing, validation, and quality control that transform ideas into potential solutions and products

4. Define and describe implementation principles that will safeguard their innovations (i.e. intellectual property, patents, trademark, copyright) as well as steps for commercialization, fundraising, industry partnership, and FDA clearance

Prerequisites: This course is intended for 1st and 2nd year medical students. **An engineering background is not required**, though it may be helpful.

Requirements: Course spans 2 years with a Part A (1 year) & B (1 year). Part A is strongly recommended, but not required for Part B. To obtain credit for Part A, students must attend 6 of 8 sessions. To obtain credit for part B, students must attend 8 of 10 sessions. Each session consists of approximately 1 hour (sometimes 1.5 hours), including lecture and discussion + possible hands on demo/lab. *Students who are interested in the PITP mission based program are required to have attended both FIE Part A and Part B electives.*

Part A sessions (2025-2026)

1. Unmet Clinical Needs in Medicine: October 21, 12pm-1pm, location MedEd 4020 (speaker Joe Kiani, Founder and prior CEO/President of Masimo and current leader of several other companies)
2. Engineering Analysis/Design: Data Acquisition (Professor Daryl Preece)
3. Engineering Analysis/Design: Data Analysis
4. Biomedical Signals & Systems (signal processing)
5. Engineering Analysis/Design: Computer-Aided Design (CAD)
6. Biomechanics
7. Biophotonics
8. Micro-nano-engineering & Course Wrap-Up

Part B sessions (2025-2026)

1. Refresher: Unmet Clinical Needs: October 21, 12pm-1pm, location TBD (Speaker Joe Kiani, Founder and prior CEO/President of Masimo and current leader of several other companies)
2. Wireless Health Design (Josh Kim, PhD, COO and Co-Founder of Vena Vitals)
3. Academia/Industry speaker on devices: Electrical design (diagnostics & therapeutics). (Prof David Reinkensmeyer, Co-Inventor of T-Wrex and MusicGlove rehab devices)
4. Industry speaker on devices at bedside: Mechanical design
5. Prototyping, testing/validation, quality control
6. Design: from concept to clinical trial, including validation, pre-market approval
7. Design considerations & ethical challenges for healthcare
8. Basics of intellectual property
9. Principles of commercialization, fundraising, industry, partnership, FDA, lean launch
10. Course wrap-up

For questions, please contact:

Yama Akbari, MD, PhD, FNCS
Departments of Neurology, Neurological Surgery, and Anatomy & Neurobiology

Beckman Laser Institute & Medical Clinic
University of California, Irvine
yakbari@hs.uci.edu