

## **BMED/MSE/CBPE – Biomedical Translation and Entrepreneurship**

### **Personell:**

Instructor: Dr. Vivek Kumar (Guest lectures by faculty, and leaders in industry)

### **Textbook(s)/ Materials:**

Students will require NJIT library access to download, print and read journal articles.

Reference texts (not required):

For immune system - Janeway's Immunobiology (9<sup>th</sup> edition, ISBN: 0815345054)

For characterization of materials – Biomaterials Science: Introduction to materials in medicine (3<sup>rd</sup> edition, ISBN: 0123746264)

For entrepreneurship: The Lean Startup (ISBN: 0307887898)

### **Enrollment**

Optimal (16), max (20), min (12). (Junior/Senior, Masters, PhD.)

**Pre-requisites:** Chem 243, Phys 121, MTSE 301 (recommended), BME 385 (recommended), BME 430 (recommended), MGMT 390 (recommended), BME 303/304 (recommended)

### **ACADEMIC INTEGRITY**

Plagiarism is will not be tolerated. It will be hard to cheat in a class that focuses on developing and stimulating your ideas. NJIT's Office of Student Integrity will handle all complaints.

### **Synopsis**

The focus of this course is to understand the fundamentals behind biomaterials design and biomaterials translation. A focus on materials synthesis, mechanics, and host responses will be followed by developing your idea for clinical translation. We will teach you how to take an idea, refine it scientifically, and develop components of what will ultimately form the basis of a company to take your idea to market. Part 1 will be a discussion of papers in the literature that provide the foundation for translational research at the "bench", followed by a quiz (2 quizzes in total for part 1). Part 2 will focus on translation of biomaterials with a focus on entrepreneurship. You will learn how to evaluate, critique, and pitch your technology to future investors in your own "startup". Overall, this course is designed to provide an understanding in the translation of biomedicine – defining on the bench to market paradigm.

### **Format**

Each 1.5 hr class will be divided into 2 x 40 min time periods.

There will be a 5 minute break at the end of the first time period. During the first period, Prof. Kumar will lecture on the subject listed. In the second period, students will work in groups of 4. Presentations and handouts will be provided after each class.

### **Course Learning Outcomes**

- Develop an appreciation for the facets of the immune system that govern materials' development and translation
- Develop a keen understanding of the chemical, materials and biological characteristics pertinent to material translation
- Develop a framework for moving a technology from bench to bedside to the market (understanding the barriers to translation)
- Develop a pitch deck (as a future start-up) to efficiently and succinctly present a research idea to potential investors

## **Grades / Scoring**

Overall:

- 2 quizzes (10% each) (20%)
  - o The Immune System – 40 multiple choice (2 pts each), 1 free response (20 pts, essay question).
  - o Characterization of materials – 40 multiple choice (2 pts each), 1 free response (20 pts, essay question).
- 13 short homeworks (1-2% each) (25%)
  - o Detailed in table below
- 4 large homeworks: (15%)
  - o Project summary (2.5%),
  - o Materials characteristics (2.5%),
  - o Executive Summary (5%),
  - o Business Plan (5%)
- 2 x 15min short presentations (5%)
  - o Project summary presentation (2.5%)
  - o Technology understanding and defense presentation (2.5%)
- 1 x 15 minute Final Pitch (30%)
- Final: Peer evaluations + Class discussion + Feedback

Assignments are required and help with the learning process and development of the class. A missed/ skipped assignment will be very detrimental to your development and final grade. As such, assignments are due at the beginning of class or as otherwise stated in the syllabus. Late submission of assignments *may* be reviewed, but will NOT receive a grade.

Attendance: No more than 2 absences.

-2% per subsequent absence. All other University policies apply.

### **Additional details:**

*Requirements for each homework and presentation will be clearly defined in handouts given in class.*

Class	Date	Location	Lecture	Lecturer	Group Discussion	Deliverable	Grading
1	TBD	TBD	Introduction to class	Dr. Kumar	How to choose a project	Break into teams of 4, by end of class	
2	TBD	TBD	Introduction to biomaterials	Dr. Kumar	Discussion of projects	Teams introduction (Bios and CV)	2%
3	TBD	TBD	Cells in the immune system	Dr. Kumar	Discussion of projects	What is your tech?	2%
4	TBD	TBD	Fundamentals of the immune system	Dr. Kumar	Presentation of projects	Immune response HW	2%
5	TBD	TBD	Macrophage polarization & hemostasis	Dr. Kumar	Choose a project	Explain Ab prod., FACS, IHC, ELISA to a layman?	2%
6	TBD	TBD	Project summary and defense presentations by teams			Project summary (2 page, due in 24 hr)	5%
7	TBD	TBD	Quiz 1: The immune system				10%
8	TBD	TBD	Chemical characterization	Dr. Kumar	Ultrastructural characterization		
9	TBD	TBD	Mechanical characterization	Dr. Kumar	Mechanical anisotropy		
10	TBD	TBD	Biological chracterization	Dr. Kumar			
11	TBD	TBD	Technology understanding and defense presentations			Material characteristics (2 page, due in 24 hr)	5%
12	TBD	TBD	Quiz 2: Characterization of materials				10%
13	TBD	TBD	IP	Dr. Nguyen	Developing an IP summary		
14	TBD	TBD	Navigating the FDA basics	Dr. Campbell	Which FDA divison / center?	IP summary	2%
15	TBD	TBD	Navigating the FDA (Route to clinic)	Dr. Nguyen	Target product profile	Clinical route summary	2%
16	TBD	TBD	Success stories of bench to bedside	TBD	Success story 2	Target product profile	2%
17	TBD	TBD	Company formation	Dr. Nguyen	Best company structure		
18	TBD	TBD	How to finance my NewCo	Dr. Ehrlich	SBIR STTR - define Aims	Company summary and structure	2%
19	TBD	TBD	iCorps and outreach to 10 experts	Dr. Ehrlich	Funding mechanisms		
20	TBD	TBD	Market	Dr. Sheft	Who/What is my market?	Determining a funding strategy (1 page, 1 slide)	2%
21	TBD	TBD	Competitors	Dr. Kumar	Pitch	Specific Aims page	2%
22	TBD	TBD	Path to market + Use of Proceeds	Dr. Kumar	Pitch	Competitive landscape (1 page, 1 slide)	2%
23	TBD	TBD	Assemble a board	Dr. Kumar	Pitch	Path to market + Use of Proceeds (1 page, 1 slide)	1%
24	TBD	TBD	Executive Summary	Dr. Kumar	Pitch	Market summary (1 page, 1 slide)	2%
25	TBD	TBD	Elements of a business plan	Dr. Kumar			
26	TBD	TBD	Pitch practice and critique				
27	TBD	TBD	Pitch practice and critique			Executive Summary (1 page, 1 slide)	5%
28	TBD	TBD	Pitch practice			Business plan (10 page max)	5%
29	TBD	TBD	Pitch finals				30%
30	TBD	TBD	Peer evaluations + Class discussion + Feedback				5%

