BMDE 508

Micro & Nanobioengineering: Bridging physical and life sciences

Bridging the divide between biology/medicine and engineering/ physical sciences

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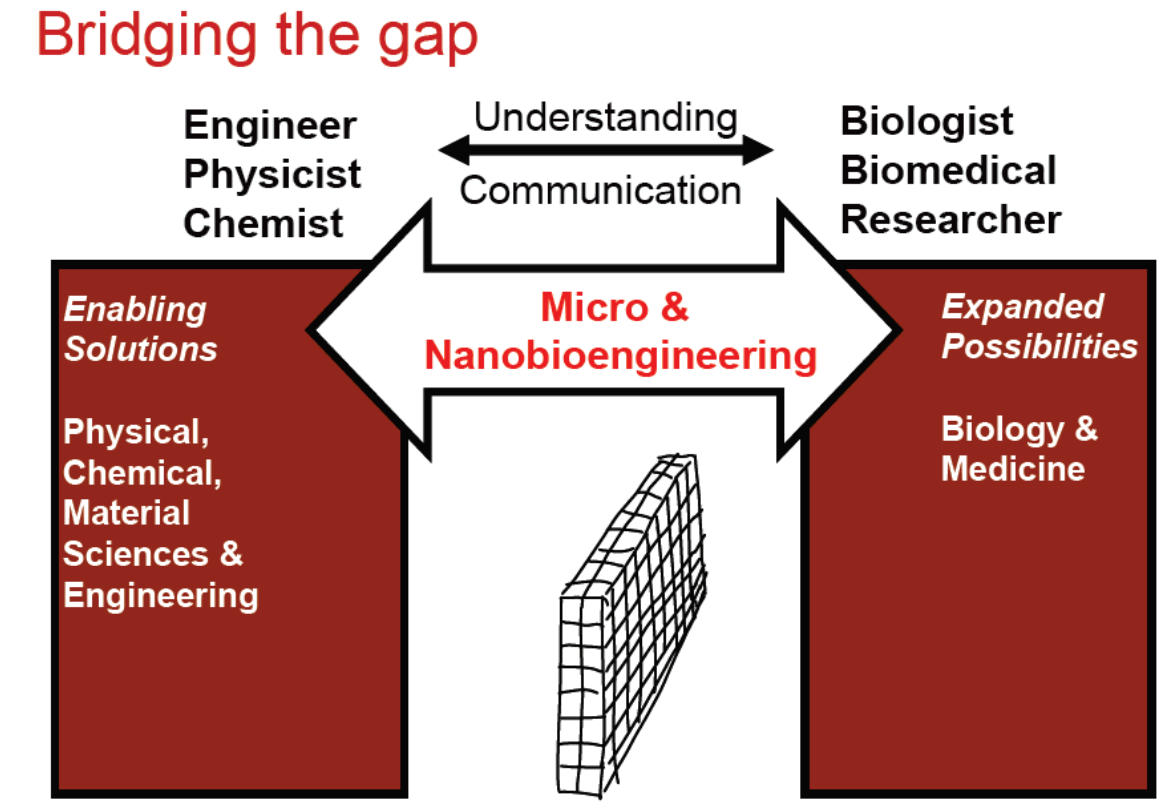
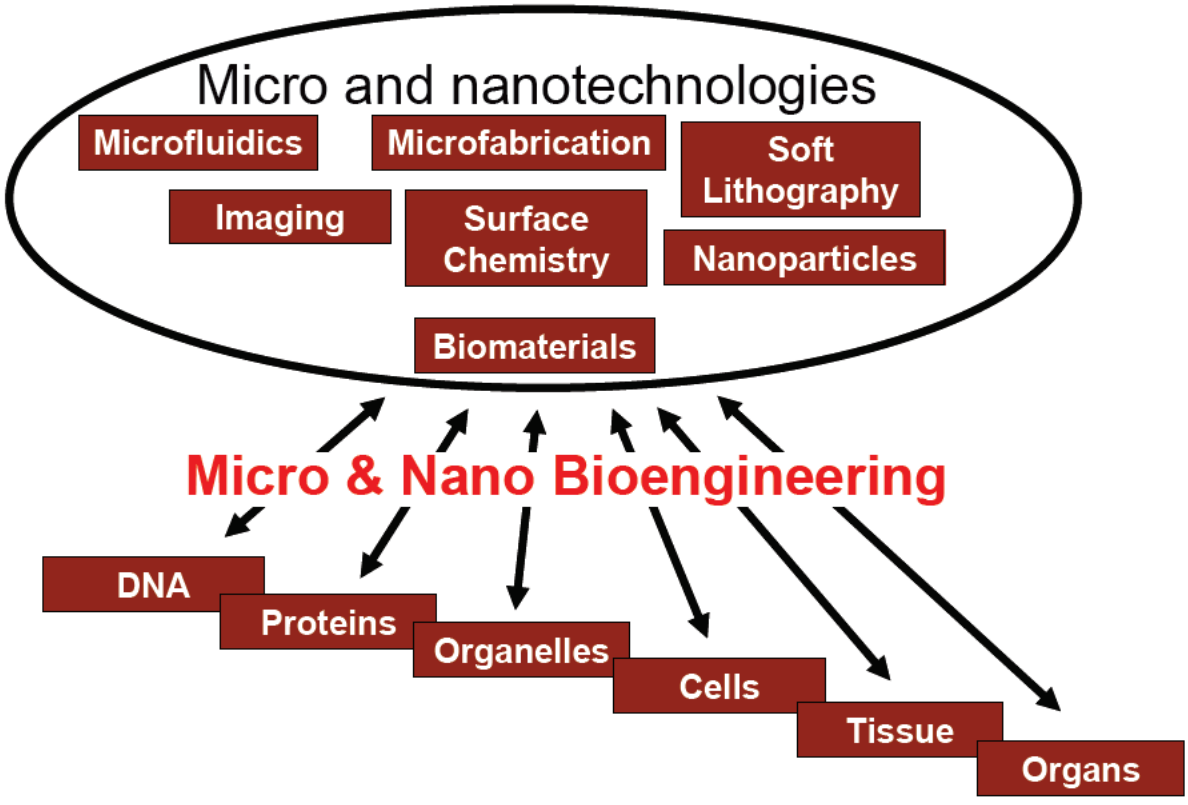
Course location: Lyman Duff 321; 3775, University St
Time : Tuesday 9-12 am
Credits : 3

Course Description :

This interdisciplinary course is intended for graduate students having either a biological/medical background or an engineering, physical sciences background. The students will learn a variety of micro- and nanotechnologies that are useful for bioengineering, and simultaneously learn how these technologies can be used in biology and medicine and how they can help advance nanobiomedicine. An important aspect of this course is to open channels of communication and understanding between the different communities and cultures. The course will comprise lectures and weekly presentations of topical publications by the students, and time permitting, a lab demonstration.



Detailed topics:



2. Learning Outcomes

1. Know the vocabulary and approach of the complementary field (biology & medicine vs physical sciences & engineering).
2. Be capable of communicating with colleagues in the complementary field
3. Give examples of micro- and nanotechnologies in biology and medicine
4. Develop skills to critically evaluate and appraise research papers in the field
5. Evaluate advantages and limitations of micro- and nanoscale bioengineering in specific fields of biology and medicine today.
6. Identify the "pull" for new technologies in biology and medicine, and/or identify the "push" of technology in science and engineering, and how to align these two concepts.
7. Gain an appreciation of the work and challenges of the complementary field
8. Be able to develop further as an interdisciplinary scientists/engineer/medical researcher and invent 'disruptive' new technologies that will transform the field.

3. Assessment:

Method/Questions:	**weight**
Presentation 1	15 %
Presentation 2	20 %
write a mini-proposal for a grant application (~5 pages text) (or (undergraduates only write a literature review on an interdisciplinary research area and retrace its development ~ 20 pages). 5% of the mark if the 1 page summary is better graded.	45 % (5%)
Grant review	5 %
Write a self-reflective essay 1-2 p summarizing your experience and outlining what has been learned	1 %
Presence	5 %
Participation	9 %

The in-class presentations will be graded on a scale of 100 as follows:

- Understanding of the material and answering to online and in class questions: **30**
- Quality and clarity of slides and of presentation , engagement of the audience: **30**
- Synthesis complex data, providing context for the topic, quality of appraisal and discussion (requires extra reading): **30**
- Improvements/adjustments based on feedback by the instructor during preparatory meeting and (if applicable) online questions: **10**

4. Tentative schedule:

Date	**Topic**	***Lecturer***	***Presentations***
Sept 02	Introduction & Molecular biology of the cell	David Juncker & Andy Ng	
Sept 09	Lab demonstration – Microfludics and soft lithography	Ayo Olanrewanju Donald MacNearney	
Sept 16	Microtechnology, microfabrication	*Lino Eugene* –	Alex, Raissa
Sept 23	Soft lithography Surface chemistry & Biopatterning- protein chips	David Juncker	3
Sept 30	Bottom-up Nanotechnology (starts at 9:15)	Amy Blum –	3
Oct 07	Tissue engineering – soft litho 2	David Juncker	3
Oct 14	Microfluidics 1 & Mass transport	Thomas Gervais	3
Oct 21	Microfluidics 2 –LOC devices	David Juncker 3	3
Oct 28*	Gene chips & Genomics	*Rob Sladek*	3
Nov 04	Nanomedicine	Dusica Maysinger	3
Nov 11	Neuroengineering	David Juncker	3
Nov 18	*Grant review class*	David Juncker	3
Nov 25	Human on a chip	David Juncker	3
Dec 02	Personalized medicine - Self assessment	Karen Gambaro	3