TO: The Faculty of the College of Engineering
FROM: The Davidson School of Chemical Engineering
RE: New Graduate Course, CHE 52300 Engineering Applications of Biological Molecules

The faculty of the Davidson School of Chemical Engineering have approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

Course: CHE 52300 Engineering Applications of Biological Molecules

Fall/Spring, Lecture, Cr. 3
Restrictions: May not be enrolled as the following Classifications:
Freshman: 0 - 14 hours
Freshman: 15 - 29 hours
Sophomore: 30 - 44 hours
Sophomore: 45 - 59 hours
Junior: 60 - 74 hours
Junior: 75 - 89 hours
Pre-requisite: Undergraduate level BIOL 23000 Minimum Grade of D-

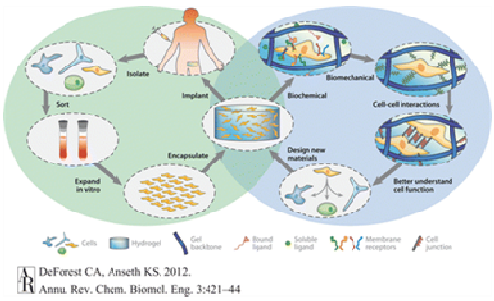
Description:

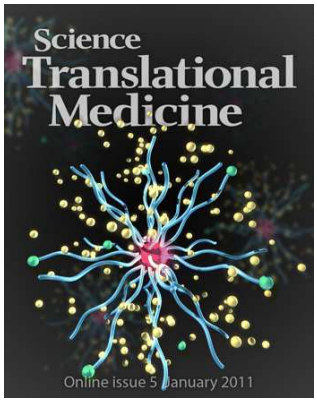
This course introduces the applications of biological molecules in different engineering fields. The first part of the course will provide a general overview of fundamental molecular and cell biology, biophysics and biomechanics. The second part of the course will focus on three specific areas, namely 1) biopolymer, 2) nanobiotechnology and 3) genetic engineering. For each focus area, a general overview will be provided followed by in-class discussions of seminal papers of the field and team-based case studies. The goal of the course is to introduce the recent advances in the interface of biology and engineering to our students and prepare them for research and development work in interdisciplinary environments.

Reason: This course has been taught as Engineering Applications of Biological Molecules CHE 59700, in the spring of 2011semester with 10 students, in the fall of 2012 semester with 11 students, during the spring 2015 semester with 10 students, and fall 2018 semester with 12 students.

Sangtae Kim
Jay and Cynthia Ihlenfeld Head of Chemical Engineering

CHE 597: Engineering Application of Biological Molecules





Course Description: This course provides an introduction to the applications of biological molecules in different engineering fields. The first part of the course will provide a general overview of fundamental molecular and cell biology, biophysics and biomechanics. The second part of the course will focus on three specific areas, namely 1) biopolymer, 2) nanobiotechnology and 3) genetic engineering. For each focus area, a general overview will be provided followed by in-class discussions of seminal papers of the field and team-based case studies. The goal of the course is to introduce the recent advances in the interface of biology and engineering to our students and prepare them for research and development work in interdisciplinary environments.

Course Objectives: Develop a fundamental understanding of biological molecules and its various applications in different scientific and engineering disciplines.

Course Instructor: Chongli Yuan (cyuan@purdue.edu)

Course Structure: Lecture MWF

Course Syllabus

Week 1-2: Overview of common molecular and cell biology techniques.

General biology techniques including recombinant DNA technology, cell culture, PCR, gel electrophoresis, protein liquid chromatography and fluorescence spectroscopy will be covered.

Week 3-6: Topic 1: Biopolymer.

The structure, function and application of natural (DNA, RNA and protein) and synthetic polymer (biocompatible polymer and hydrogel) will be discussed.

Case study topic: (1) hydrogel to direct stem-cell differentiation, (2) DNA origami and (3) gene delivery using polymeric vehicles.

Week 7-10: Topic 2: Nanobiotechnology

This topic will cover the basics to construct a nano-structured material and platform for different applications.

Case study topic: (1) nanoparticle-based sensor for cancer biomarkers, (2) the next generation sequencing technique and (3) advanced lithium-ion battery based on a viral template.

Week 11-13: Topic 3: Genetic Engineering

The current biological techniques to engineer prokaryotic and eukaryotic cells will be discussed.

Case study topic: (1) Insulin production using bacterial cultures and (2) engineer bacterial strain for biofuel production.

Week 14-15: Final project report