

# Introduction to Biochemical Engineering

## Introduction

Joumana Zeid

- B.S. & M.S. Chemical Engineering (SJSU)
- Industry experience
  - Membrane Technology and Research
  - Genentech, Inc

Late Stage Purification, Process Development

**ChE192F07@yahoo.com**

**Office Hours: Tue. Thur. 1915 – 2000**

## Introduction

### What is Biochemical Engineering?

- Design and construction of unit processes that involve biological organisms or molecules
- Apply engineering principles to biological materials, processes, and systems
- Engineering and translation of discoveries in Biochemistry and Medicine into commercial processes for new biological entities

## Introduction

### What do biochemical engineers do?

- Typical employers come from all sectors of the biotechnology industries, including those with interests in pharmaceuticals, food, environment, waste treatment, and consulting
- Specialties include
  - Fermentations and reactors
  - Purification processes
  - Enzymes and kinetics

## Introduction

- Fields combined and applied in chemical engineering
  - Chemical Engineering
  - Biochemistry
  - Biology
  - Genetics

## Introduction

- Diverse Applications
  - Culture development
  - Optimizing cell fermentations
  - Bioreactor design
  - Bioseparations
  - Process design, optimization and intergration
  - Process transfer to manufacturing scale
  - Manufacturing and controls

# Introduction

- **Biotechnology**

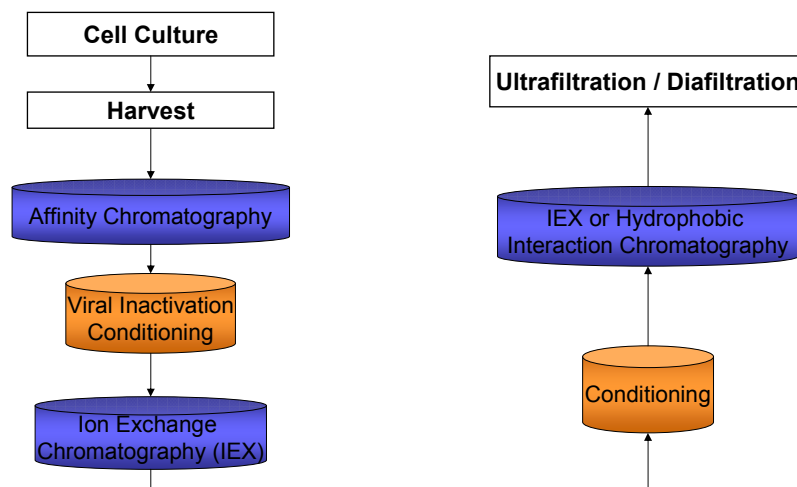
Acquiring biological knowledge to develop new processes and products

- **Industry sectors:**

- Agriculture
- Resource management
- Health: Biopharmaceuticals

## Introduction: Biotechnology application

- **Applications: Process Design**



## Introduction

- Essential Knowledge/ Topics
  - Cells
  - How cells work
  - Metabolism Pathways
  - Enzymes and Kinetics
  - Reactors: Design and Data Analysis
  - Bioseparations
  - Application and Industrial considerations

## Introduction

- Essential Skills
  - **COMMUNICATION**
  - Design of experiments
  - Data Analysis
  - Problem Solving and Troubleshooting

## Class Information

### Honesty Policy

- Students are expected to do their own work on homework and exams and acknowledge the contributions of their sources in the paper presentation. **Cases of academic dishonesty will result in an F on the exam, and a note to appropriate personnel on campus, including your advisor for addition to your file, and may result in an F in this course.**
- **Please review the SJSU Dishonesty policy as that is followed in this course:**  
[http://www.cob.sjsu.edu/bus911/91L\\_univ\\_policy.htm](http://www.cob.sjsu.edu/bus911/91L_univ_policy.htm)

## Class Information

Meeting: TuTh 6:00 – 7:15

Office hours: TuTh 7:15 – 8:00

### Book

- Bioprocess Engineering 2nd Edition, Michael L. Shuler and Fikret Kargi, Prentice-Hall

### Prerequisites

- Bio 80 and Chem 112A, OR Chem 130AB, OR Chem 135 OR ChE 158 (may be concurrent)

## Class Information

### Grade breakdown

- HW and Class Problems 20%
  - **Random questions can be graded**
- 2 Midterms 30%
  - Timing TBD
  - Any quizzes will be included here
- Class Project
  - Paper 15%
  - Presentation 10%
- Final 25%
  - Thursday December 13, 1715-1930

## Class Project

- A review paper will be due in this class. The topic must have applications in or involve engineering, and should not be primarily biological science oriented.
- The paper is an individual assignment.
- The content of the paper is to be a historical development of a particular technology, followed by a thorough description of the current status of research in the area including the future direction(s).

## Class Project: Timelines

- Topic selections September 20
  - Chosen by individuals
- Literature Reviews October 18
  - Paragraph description with 4-5 page literature review
- Paper November 15
  - Maximum 15 pages double spaced
- Presentations
  - At the end of the semester
  - Potentially 15 minutes each

## Class Project

- To be completed in groups of 2
- You are responsible for finding a partner
- Team assignments by August 30
  - Individuals without partners, **let me know**

## Lecture Notes

- Most lecture notes will be in PowerPoint slide-format
- E-mailed prior to lecture?
  - Will need COMPLETE class e-mail list
- Course Website?
  - <http://www.engr.sjsu.edu/ChE192/>

## Genentech Tour

- Interest?
- Timing
  - At beginning of bioseparations?
- Logistics?
  - Transportation

No Guarantees!