

NYU Polytechnic School of Engineering
Chemical and Biological Sciences Department
Biocatalysis in Industry - BTE6043
Spring 2014
Instructor: Prof Evgeny Vulfson
Thursday 14.00 - 16.30

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Course Pre-requisites: advisor's approval

Course Description: The course focuses on the commercial use of biological catalysts across various industry segments, including pharmaceuticals, health care, fine chemicals and food. It offers a broad overview of the underlying technologies combined with insights into the economics of biocatalysis and bio-processing. The course also covers emerging trends in biomaterials. Case studies are presented to facilitate the analysis and underline major challenges.

This is a required course for Biotechnology & Entrepreneurship curriculum and this year for Biotechnology MS students, for whom it replaces Enzyme Catalysis in Organic Synthesis.

Course Objectives:

- To provide students with basic understanding of enzyme catalysis and general mechanism involved
- To review biocatalysts' applications across various industry sectors
- To develop an appreciation of the role of biotechnology in economic and environmental sustainability.

Course Structure: Lectures and in class discussions.

Readings: There is no textbook for the course. Handouts and supporting/supplementary materials in the form of original papers and reviews will be posted on the NYU-Poly Blackboard after every lecture.

Course requirements: Students are required to review handouts from the previous lecture and read the supporting papers. Any questions will be answered in a short review session at the beginning of the following lecture.

Grading and Exams:

No mid-term, but there will be a regular ~15 min quiz comprising 4 short questions, based on the material covered in all previous lectures. Feedback on every quiz will be provided in class. Each quiz will be scored separately and average scores will be posted on the Blackboard around mid-term and at the end of the course. Quiz score will count for 40% of the final grade.

Final exam will be based on materials covered in all lectures (60% of the final grade).

The exam papers will contain up to 20 questions that will require a short and to the point answer. Students must demonstrate good understanding of the material; no multiple choice questions.

Assignments: Students may be offered to do an optional assignment for extra credits.

Grading: A 95-100; A- 90-94; B+ 85-89; B 80-84; B- 75-79; C+ 70-74; C 65-69; F <65

Class schedule and topics covered:

Lecture 1: Introduction to biocatalysis
Lecture 2: General principle of catalysis
Lecture 3: How do enzymes work?
Lecture 4: Molecular basis of specificity and catalytic mechanisms
Lecture 5: Industrial biocatalysis: overview
Lecture 6: Bioreactors and bioprocessing
Lecture 7: Enzyme catalysis in non-aqueous media
Lecture 8: Bioremediation
Lecture 9: Enzyme stability, protein engineering and directed evolution
Lecture 10: Enzymes in food and consumer products
Lecture 11: Enzymes as processing aids
Lecture 12: Enzymes in the pharmaceutical and fine chemical industry
Lecture 13: Enzymes as therapeutics
Lecture 14: Review and conclusions
Lecture 15: **Final exam**

For all the lectures copies of the slides and supporting/supplementary papers will be provided

All students must familiarize themselves with the University policy on plagiarism