286g A Multi-Year and Multidisciplinary Integration of Bioprocess Engineering into Chemical Engineering at Michigan Technological University

David R. Shonnard, Tomas B. Co, Faith A. Morrison, Susan T. Bagley, and James E. Hertel

Like many Chemical Engineering departments in the United States, we at MTU have responded to the emerging importance of biotechnology by altering the curriculum and offering additional courses. Due to the department's focus on hands-on process experiences for the undergraduates, we have integrated biotechnology into the curriculum in a way that is consistent with this teaching philosophy. We have developed a beer brewing lecture and problem solving experience in the common Freshman Engineering course (ENG1102) in order to introduce material and energy balance calculations and simple input / output flowsheets. A presentation featuring pictures of actual process equipment is also provided by an invited brewmaster from a local microbrewery. The department offers an elective course in the fundamentals of biochemical processes for Junior and Senior majors (CM4710). In addition to traditional topics such as an introduction to biochemistry and metabolism, modeling of bioreactors and bioseparation equipment, the course also introduces genetic engineering, industrial applications, and metabolic engineering. An experience in a required capstone laboratory course is offered featuring batch fermentation to produce L-lysine and purification using ion-exchange chromatography (CM4120). Finally, a multidisciplinary Minor in Bioprocess Engineering was created. One of the features of this minor is a semester-long laboratory course teaming Chemical Engineering and Biological Sciences students. The goals of the laboratory course are to produce and purify a commodity biochemical (L-lysine), apply QA/QC and GMP principles, gain in depth experiences on the operation of fermentation and bioseparation units, perform a metabolic flux analysis, and perform overall product yield calculations. This presentation will summarize the bioprocess engineering curriculum.