

367f Pharmaceutical Engineering Courses as Electives for Chemical Engineering Students

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Pharmaceutical engineering is a relatively new engineering field, at least in academia, which can be defined as the branch of engineering devoted to the application of engineering concepts, scientific principles, and codes of practice to (1) develop processes and scale-up criteria for drug synthesis, drug manufacturing, and pharmaceutical operations; (2) design and construct pharmaceutical plants; and (3) operate industrial facilities for pharmaceutical production. New Jersey is geographically at the heart of the nation's pharmaceutical industry, and New Jersey Institute of Technology (NJIT) is located at the national epicenter of industrial pharmaceutical research and development. Because of its proximity to many pharmaceutical companies, and to better address the industry need for qualified engineers, in December 2001 NJIT established the first official Master of Science (MS) Degree Program in Pharmaceutical Engineering (PhEn) in the State of New Jersey. The program has grown substantially in a very short period of time, rapidly attracting a much larger number of students than initially anticipated, including a large number of students currently working at local pharmaceutical companies. In addition to the MS PhEn degree, two graduate-level "Certificates", each requiring taking four prescribed PhEn courses, have also been established. The Certificate program yields a stand-alone credential, which is a milestone in its own right, and it is also a springboard to the PhEn Master's degree.

Students in the MS PhEn program are required to take seven PhEn core courses, five of which are common core courses, and two are track-specific core courses. Increasingly, these PhEn courses attract a number of graduate chemical engineering students who take them either as electives or to pursue a Certificate. After taking some of the PhEn courses, some students even decide to pursue a double ChE/PhEn MS degree.

In general, PhEn courses are eminently suited as graduate-level ChE elective courses, as it can be evinced from their course names: Principles of Pharmaceutical Engineering (PhEn601), Pharmaceutical Facility Design (PhEn 602), Pharmaceutical Unit Operations: Processing of Liquid and Dispersed-Phase Systems (PhEn603), Validation and Regulatory Issues in the Pharmaceutical Industry (PhEn604), Pharmaceutical Packaging Technology (PhEn 605), Pharmaceutical Unit Operations: Solids Processing (PhEn606), Pharmaceutical Reaction Engineering (PhEn 612), Pharmaceutical Separation Processes (PhEn 614), and Principles of Pharmacokinetics and Drug Delivery (PhEn618).

PhEn courses offer an excellent opportunity to cover ChE concepts applied to the pharmaceutical industry, as well as expose ChE students to novel concepts from other disciplines not typically covered in traditional ChE courses. This paper examines the possible ways in which ChE students can expand their knowledge in the growing area of pharmaceutical engineering and benefit from it.