Chemical Engineering (PhD)

Biochemical and biomedical engineering. Protein and nucleic acid engineering, metabolic engineering, synthetic biology, systems biology, bioinformatics, fermentations, genetic engineering technology, mammalian tissue culture, biomaterials, biosensors, biomolecular interactions, cell and tissue engineering, virus removal from blood, hemodialysis.

Chemical engineering fundamentals. Kinetics and catalysts, thermodynamics, transport phenomena.

Energy resources. Secondary and tertiary oil recovery, flow processes in porous media, acid gas treating, energy control and efficiency, photovoltaics, battery technology.

Environmental engineering and sustainability. Air pollution measurements, modeling and control, air pollutant and chemical exposures, atmospheric chemistry.

Materials and processes for microelectronics. Plasma processing, etching, chemical vapor deposition, selective laser sintering, supermolecular self-assembly and organization, colloidal systems, mesoscopic materials.

Meso- and molecular-scale modeling and simulation. Statistical and micromechanical modeling and Monte Carlo, Brownian, and molecular dynamics simulations of reactions, complex fluids, polymers, and biological molecules.

Polymer engineering. Synthesis; processing; reaction injection molding; properties, with specific emphasis on blends, transport, and thermodynamic behavior; membranes; microelectronics; thin film; composition.

Process engineering. Chemical reaction engineering and catalyst development; optimization; process simulation, dynamics, and control; fault detection, rheology and simulation of suspensions.

Separations. Membrane separations, distillation, absorption, supercritical extraction.

Other areas. Aerosol science, surface phenomena, crystal chemistry and physical properties, electrochemistry, electronic and optical materials, electrical impedance tomography.

Graduate Handbook

Graduate handbook information is updated and maintained by each program. Graduate handbooks are available within each program's office and online. Please contact the program with concerns or questions.

Admission

A student may choose to pursue the doctoral degree without first obtaining a master's degree.

Students with a Bachelor of Science degree in chemical engineering usually fulfill requirements for consideration for admission.

Students with a bachelor's degree in another discipline, such as chemistry, physics, other engineering sciences, and natural sciences, must have a background the department considers satisfactory for the study of advanced chemical engineering. A strong background will have included courses in math (including calculus and differential equations), vector physics, and ideally some courses that cover the topics of thermodynamics, heat and mass transfer, and chemical kinetics.

Apart from the requirements of the Office of Graduate and Postdoctoral Studies, the department has no set criteria for admission. Applications are viewed holistically based GPA, research experience, letters of recommendation, and personal statements. We view each of these categories as important and the admission committee ranks applications according to these metrics.

Total Hours Required: 60

Requirements

To be eligible for admission to candidacy, the student must pass the three core curriculum graduate courses in thermodynamics, transport phenomena, and kinetics, followed by a preliminary oral examination. Three additional courses in any field or major are required for the degree; organized graduate courses in Chemical Engineering or upper-level undergraduate and graduate courses outside Chemical Engineering will be counted towards this requirement. Only courses in which a student earns a C or higher will be counted. The doctoral candidate must also complete annual meetings with their committee and pass a final oral examination covering the research program.

For a student with a Bachelor of Science degree, at least three years are required to complete the Doctor of Philosophy degree program.

Code	Title	Hours
All students must also follow the requirements and policies below:		
Graduate Engineering Requirements		
Graduate University Requirements		

The graduate program in chemical engineering is designed to provide students with the opportunity to develop advanced competence in transport phenomena, thermodynamics, and reaction engineering for the application of chemistry to the advancement of society. Through formal coursework and mentoring, each student is expected to acquire the tools to develop and transmit new knowledge and processes in a focused area of chemical engineering. The focused research areas include advanced materials, polymers and nanotechnology, biotechnology, energy, environmental engineering and sustainability, modeling and simulation, and process engineering.

Program Educational Objectives

Upon graduation, those who earn advanced chemical engineering degrees are expected to

1. Become leading professionals who advance chemical engineering practice and knowledge in multiple fields, such as energy, materials, environmental and systems engineering, electronics, biotechnology, human health, and education;
2. Continue to educate themselves as their needs, interests, and circumstances dictate;
3. Become ethical and productive engineers, who recognize and acknowledge the local and global impacts of engineering technology on humans and the environment.