Chemical Engineering
Doctor of Philosophy

The Department of Chemical Engineering offers a Doctor of Philosophy degree in Chemical Engineering. The department also sponsors the Energy, Environmental, and Interdisciplinary Engineering tracks within the School of Engineering and Mines Ph.D. Engineering program. The department also administers the Sustainable Energy Engineering masters program and participates in the multidisciplinary Environmental Engineering masters program. The M.S. and Ph.D. degrees are the most common options and financial aid is provided to the vast majority of students working towards these degrees.

Research interests in the department include: coal and bio-based fuels and chemicals; energy technologies, processes, and policies; heterogeneous catalysis; photocatalytic oxidation; polymer reaction engineering, synthesis, and rheology; organic aerosol formation and partitioning; mathematical modeling of multicomponent aerosols; polymeric membranes and composite materials; biocomposite, nanocomposite, and nanobiocomposite materials; organic photovoltaic materials; environmental impact of heavy metals and particulate matter; and development of carbon from waste material sources. Projects are often conducted through our interdisciplinary Sustainable Energy Research, Infrastructure and Supporting Education (ND SUNRISE) research program or in collaboration with the Energy and Environmental Research Center (EERC).

Admission Requirements
1. B.S. degree in Chemical Engineering from an ABET accredited program with a GPA of at least 3.3 or a M.S. degree in Chemical Engineering with a GPA of at least 3.0. Students holding a B.S. degree in a science or engineering field may be admitted to Qualified Status with an obligation to acquire background undergraduate engineering knowledge. The exact requirements will be determined on a case-by-case basis.
2. Graduate Record Examination General Test only if prerequisite degree is not accredited by ABET.
3. A minimum TOEFL score of 550 on the paper-based test or 213 on the computer-based test, or for the internet-based TOEFL, a composite score of 79, with minimum scores of 21/30 (Speaking*); 19/30 (Listening); 19/30 (Reading); and 17/30 (Writing) for applicants whose native language is not English. Applicants may also meet language requirements by presenting IELTS scores of 6.5. *Applicants being considered for Graduate Teaching Assistantships must achieve these minimum TOEFL scores, but have a minimum score of 26/30 on the Speaking subtest. Students who have received a bachelor’s degree or higher from the United States or English-speaking Canada are not required to submit the TOEFL.

Degree Requirements
Students seeking the Ph.D. degree at the University of North Dakota must satisfy all general requirements set forth by the Graduate School, as well as particular requirements set forth by the Chemical Engineering Department.
1. A minimum of 90 semester credits including acceptable master’s degree work and credits granted for the dissertation and the research leading to the dissertation.
2. Required Courses:
   - Advanced Transport Phenomena
   - Advanced Chemical Engineering Thermodynamics
   - Advanced Chemical Engineering Kinetics
   - Design of Engineering Experiments
   - Seminar in Chemical Engineering
   - Research
   - Dissertation
   - At least 9 credits of graduate coursework from outside chemical engineering, which may contribute to a minor or cognate
   - Additional graduate coursework

3. Successful completion of the four core chemical engineering courses with a GPA of at least 3.3.

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4. Successful completion of an oral comprehensive exam when at least 45 post-baccalaureate credits have been completed. This exam will be based on the four core chemical engineering courses and their application to the student’s research. The exam will be administered by at least three faculty members from the Department of Chemical Engineering. Candidates who fail the exam will be allowed one opportunity to repeat the exam. The reexamination must take place no later than 13 months after the initial exam attempt.

5. Students must present to their advisory committee an annual oral progress report describing research progress.

6. Preparation and defense of a dissertation documenting original and independent research on a topic related to chemical engineering.

Faculty and Areas of Expertise

Steve Benson (Professor). Research interests: Efficient and clean utilization of renewable and fossil fuels in gasification and combustion systems, ash formation and fireside ash deposition, carbon products, carbon dioxide separation and capture.

Frank Bowman (Assistant Professor and Graduate Program Director). Research interests: Atmospheric aerosols, organic aerosol partitioning, mathematical modeling of multicomponent aerosols, air quality modeling, educational technology, assessment of student learning, educational air pollution models.

Yun Ji (Assistant Professor). Research interests: Renewable and sustainable energy, chemicals, and fuels; biomass pretreatment, enzymatic hydrolysis, integrated energy and environmental projects, process simulation, forestry biorefinery, pulp and paper technology.

Edward Kolodka (Associate Professor). Research interests: Polymer reaction engineering, synthesis, rheological and mechanical properties of polymers, development of polymers from agricultural products, synthesis and characterization of conducting polymers.

Gautham Krishnamoorthy (Assistant Professor). Research interests: Computational fluid dynamics, simulations of combustion reacting flows, carbon capture technologies, radiative heat transfer.

Michael Mann (Professor and Chair). Research interests: Advanced energy systems firing coal and biomass, emission control, renewable and sustainable energy systems, coupling thermodynamics with political, social, and economic factors.

Wayne Seames (Professor). Research interests: Mitigating the impact of heavy inorganic elements upon the environment, combustion technology, alternative fuels development, biochemical unit operations, environmental impacts from wood and concrete contamination.

Brian Tande (Assistant Professor). Research interests: Polymer science and engineering with applications in sustainable energy, rheology of complex fluids, block copolymer morphology, neutron scattering, effect of polymer branching on membrane transport, polymers and composites from renewable sources.

Bob Wills (Professor). Research interests: Non-thermal drying of solids by chemical dehydration, vegetative oil extraction, product enhancement and process efficiencies in the fermentation industry.

Program Contact Information

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