Energy, Environmental & Chemical Engineering

The Department of Energy, Environmental & Chemical Engineering (EECE) provides integrated and multidisciplinary programs of scientific education in cutting-edge areas, including the PhD in Energy, Environmental & Chemical Engineering. The research and educational activities of the department are organized into four clusters: aerosol science and engineering; engineered aquatic processes; multiscale and electrochemical engineering; and synthetic biology and bioproduct engineering. These overlapping clusters address education and research in four thematic areas: energy; environmental engineering science; advanced materials; and sustainable technology for public health and international development. In addition to the core faculty in the department, faculty in the schools of Medicine, Arts & Sciences, Business, Law, and Social Work collaborate to provide students with a holistic education and to address topical problems of interest.

The department is a key participant in the university's Energy, Environment & Sustainability (http://sustainability.wustl.edu/) initiative, and it supports both the International Center for Energy, Environment and Sustainability (InCEES) (http://incees.wustl.edu/) and the McDonnell Academy Global Energy and Environment Partnership (MAGEEP) (http://mageep.wustl.edu/). Major externally funded research centers in the department include the Consortium for Clean Coal Utilization (http://cleancoal.wustl.edu/), the Nano Research Facility (NRF) and Jens Environmental Molecular and Nanoscale Analysis Laboratory (Jens Lab) (https://nano.wustl.edu/), and the Center for Aerosol Science and Engineering (CASE) (https://aerosols.wustl.edu/).

Contact: Monique Spears
Email: moniquespears@wustl.edu
Website: https://eece.wustl.edu/graduate/programs

Endowed Professors
Stifel and Quinette Jens Professor
PhD, University of California, Davis
Combustion, advanced energy systems, clean coal, aerosols, nanoparticle synthesis, rechargeable battery materials, thermal science

Walter E. Browne Professor of Environmental Engineering
PhD, California Institute of Technology
Aquatic chemistry, environmental engineering, water quality, water treatment

Randall Martin (https://engineering.wustl.edu/faculty/Randall-Martin.html)
Raymond R. Tucker Distinguished Professor
PhD, Harvard University
Characterizing atmospheric composition to inform effective policies surrounding major environmental and public health challenges ranging from air quality to climate change

Vijay Ramani (https://engineering.wustl.edu/faculty/Vijay-Ramani.html)
Director of Graduate Studies
Roma B. and Raymond H. Witcoff Distinguished University Professor
PhD, University of Connecticut
Electrochemical engineering, energy conversion

Professors
Zhen (Jason) He (https://engineering.wustl.edu/faculty/Zhen-Jason-He.html)
PhD, Washington University
Environmental biotechnology, bioenergy production, biological wastewater treatment, resource recovery, bioelectrochemical systems, sustainable desalination technology, anaerobic digestion, forward osmosis, membrane bioreactors

PhD, Harvard University
Aquatic processes, molecular issues in chemical kinetics, environmental chemistry, surface/physical chemistry, environmental engineering, biogeochemistry, nanotechnology

Faculty

Interim Chair and Professor
Katharine Flores (https://engineering.wustl.edu/faculty/Katharine-Flores.html)
Professor, Mechanical Engineering and Materials Science
PhD, Stanford University
Mechanical behavior of structural materials
**Assistant Professors**

**Peng Bai**
- PhD, Tsinghua University, China
- Develop next-generation batteries, probe the in situ electrochemical dynamics of miniature electrodes down to nanoscales, capture the heterogeneous and stochastic nature of advanced electrodes, and identify the theoretical pathways and boundaries for the rational design of materials, electrodes and batteries through physics-based mathematical modeling and simulation

**Fangqiong Ling**
- PhD, University of Illinois at Urbana-Champaign
- Microbial ecosystem analysis and modelling, process modelling, machine learning, NextGen sequencing bioinformatics, environmental microbiology, and bioreactor design

**Kimberly M. Parker**
- PhD, Stanford University
- Investigation of environmental organic chemistry in natural and engineered systems

**Elijah Thimsen**
- PhD, Washington University
- Gas-phase synthesis of inorganic nanomaterials for energy applications, and novel plasma synthesis approaches

**Research Assistant Professor**

**Benjamin Kumfer**
- DSc, Washington University
- Advanced coal technologies, biomass combustion, aerosol processes and health effects of combustion-generated particles

**Senior Lecturers**

**Janie Brennan**
- Director of Undergraduate Studies
- PhD, Purdue University
- Biomaterials, chemical engineering, engineering education

**Raymond Ehrhard**
- BS, Missouri University of Science and Technology
- Water and wastewater treatment technologies, process energy management
Lecturers
Trent Silbaugh (https://engineering.wustl.edu/faculty/Trent-Silbaugh.html)
PhD, University of Washington
Chemical engineering education, catalysis, carbon capture and conversion
Avni Solanki (https://engineering.wustl.edu/faculty/Avni-Solanki.html)
PhD, University of Florida
Wastewater, sustainable development, environmental engineering, and engineering education

Affiliated Faculty
Gary Moore
Senior Lecturer for the Joint Engineering Program
MS, Missouri University of Science and Technology
Environmental management

Adjunct Faculty
Keith Tomazi
PhD, University of Missouri-Rolla
Process development engineering
Grigoriy Yablonsky
PhD, Boreskov Institute of Catalysis
Chemical reaction engineering and heterogeneous catalysis

Joint Faculty
Doug Allen
PhD, Purdue University
USDA Research Scientist, Danforth Plant Sciences Center
Metabolic networks of oilseed plants
Nathan Ravi
PhD, Virginia Polytechnic Institute
Cataract, ocular biomaterials

Senior Professor
Milorad P. Dudukovic
Laura and William Jens Emeritus Professor
PhD, Illinois Institute of Technology
Chemical reaction engineering, multiphase reactors, visualization of multiphase flows, tracer methods, environmentally benign processing

Degree Requirements
Doctor of Philosophy (PhD) in Energy, Environmental & Chemical Engineering (EECE)

The doctoral degree requires a total of 72 credits beyond the bachelor's degree. Of these, a minimum of 36 credits must be graduate course work, and a minimum of 30 credits must be doctoral thesis research units. To be admitted to candidacy, students must have completed at least 18 credits at Washington University, have an overall grade-point average of at least 3.25, and pass the qualifying examination. Note that, to be eligible to take the qualifying exam, students must maintain a 3.25 GPA as described in the EECE PhD handbook. All students are required to enroll in the department seminar every semester to receive passing grades. The first-year students must complete the core curriculum, perform two research rotations, and find a permanent research adviser. Then, within 18 months after the qualifying exam (generally in their third year), students should defend their thesis proposal.

After successful proposal defense, students should provide their research updates through annual meetings or reports with their thesis committee until their graduation. While conducting doctoral research, students should perform in a professional manner in their research lab and/or office setting and be in compliance with all safety and regulatory requirements for their research projects. During the doctoral program, students must satisfy their fundamental and advanced teaching requirements by participating in mentored teaching experiences in the department for two or three semesters, by attending professional development workshops from the Teaching Center, and by presenting at least two formal presentations at the local level or at national or international conferences. Upon completion of their dissertation, students must present their dissertation research in a public forum and successfully defend the dissertation before their thesis committee.

For more detailed guidelines, please refer to the EECE doctoral studies handbook available on the EECE Graduate Degree Programs webpage (https://eece.wustl.edu/graduate/programs/Pages/PhD-Energy-Environmental-Chemical-Eng.aspx).