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. Research and educational activities of the department are organized into four clusters: aerosol science & engineering; engineered aquatic processes; multiscale engineering; metabolic engineering & systems biology. 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 initiative and supports both the International Center for Energy, Environment and Sustainability (InCEES) and the McDonnell Academy Global Energy and Environment Partnership (MAGEEP). Major externally funded research centers in the department include the Consortium for Clean Coal Utilization, the Nano Research Facility (NRF) and Jens Environmental Molecular and Nanoscale Analysis Laboratory (Jens Lab), the Solar Energy Research Institute for India and the United States (SERIUS).

Contact:
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https://eece.wustl.edu/graduate/programs

Faculty
Chair and Endowed Professor
Pratim Biswas (https://engineering.wustl.edu/Profiles/Pages/Pratim-Biswas.aspx)
Lucy and Stanley Lopata Professor
PhD, California Institute of Technology
Aerosol science and engineering, air quality and pollution control, nanotechnology, environmentally benign energy production

Endowed Professors
Richard L. Axelbaum (https://engineering.wustl.edu/Profiles/Pages/Richard-Axelbaum.aspx)
Stifel and Quinette Jens Professor
PhD, University of California, Davis
Combustion, advanced energy systems, clean coal, aerosols, nanoparticle synthesis, rechargeable battery materials, thermal science

Milorad P. Dudukovic (https://engineering.wustl.edu/Profiles/Pages/Milorad-Dudukovic.aspx)
Laura and William Jens Professor
PhD, Illinois Institute of Technology
Chemical reaction engineering, multiphase reactors, visualization of multiphase flows, tracer methods, environmentally benign processing

Daniel E. Giammar (https://engineering.wustl.edu/Profiles/Pages/Daniel-Giammar.aspx)
Walter E. Browne Professor of Environmental Engineering
PhD, California Institute of Technology
Aquatic chemistry, environmental engineering, water quality, water treatment

Vijay Ramani (https://eece.wustl.edu/faculty/Pages/faculty.aspx?bio=108)
Roma B. and Raymond H. Witcoff Distinguished University Professor of Environment Engineering
PhD, University of Connecticut, Storrs
Electrochemical engineering, energy conversion

Professors
Young-Shin Jun (https://engineering.wustl.edu/Profiles/Pages/Young-Shin-Jun.aspx)
Director of Graduate Studies
PhD, Harvard University
Aquatic processes, molecular issues in chemical kinetics, environmental chemistry, surface/physical chemistry, environmental engineering, biogeochemistry, nanotechnology

Palghat A. Ramachandran (https://engineering.wustl.edu/Profiles/Pages/Palghat-Ramachandran.aspx)
PhD, University of Bombay
Chemical reaction engineering, applied mathematics, process modeling, waste minimization, environmentally benign processing

Yinjie Tang (https://engineering.wustl.edu/Profiles/Pages/Yinjie-Tang.aspx)
Director of Undergraduate Studies
PhD, University of Washington, Seattle
Metabolic engineering, bioremediation
Jay R. Turner (https://engineering.wustl.edu/Profiles/Pages/Jay-Turner.aspx)
Vice Dean for Education
DSc, Washington University
Air quality planning and management; aerosol science and engineering, green engineering

Jian Wang (https://eece.wustl.edu/faculty/Pages/faculty.aspx?bio=126)
PhD, California Institute of Technology
Aerosol properties and processes, nucleation and new particle formation, aerosols in the marine environment, effects of aerosols on cloud microphysical properties and macrophysical structure, and development of advanced aerosol instruments

**Assistant Professors**

**Peng Bai** (https://engineering.wustl.edu/Profiles/Pages/Peng-Bai.aspx)
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

**Rajan Chakrabarty** (https://engineering.wustl.edu/Profiles/Pages/Rajan-Chakrabarty.aspx)
PhD, University of Nevada, Reno
Characterizing the radiative properties of carbonaceous aerosols in the atmosphere; and researching gas phase aggregation of aerosols in cluster-dense conditions

**Marcus Foston** (https://engineering.wustl.edu/Profiles/Pages/Marcus-Foston.aspx)
PhD, Georgia Institute of Technology
Utilization of biomass resources for fuel and chemical production, renewable synthetic polymers

**Fangqiong Ling** (https://eece.wustl.edu/faculty/Pages/faculty.aspx?bio=178)
PhD, University of Illinois at Urbana-Champaign
Microbial ecosystem analysis and modelling, process modelling, NextGen sequencing bioinformatics, environmental microbiology, and bioreactor design

**Kimberly M. Parker** (https://engineering.wustl.edu/Profiles/Pages/Kimberly-Parker.aspx)
PhD, Stanford University
Investigation of environmental organic chemistry in natural and engineered systems

**Elijah Thimsen** (https://engineering.wustl.edu/Profiles/Pages/Elijah-Thimsen.aspx)
PhD, Washington University
Gas-phase synthesis of inorganic nanomaterials for energy applications, and novel plasma synthesis approaches

**Research Associate Professor**

**Tianxiang Li**
PhD, University of Kentucky
Combustion and applications in energy, pollutant control, biofuel synthesis, flame synthesis of nanomaterials

**Research Assistant Professor**

**Benjamin Kumfer**
DSc, Washington University
Advanced coal technologies, biomass combustion, aerosol processes and health effects of combustion-generated particles
Lecturers
Janie Brennan
PhD, Purdue University
Biomaterials, synthetic biology, engineering education

Trent Silbaugh
PhD, University of Washington
Chemical engineering

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

Adjunct Faculty
Robert Heider
MME, Washington University
Process control and process design

Timothy Michels
MA, Washington University
Energy economics, building construction and equipment sciences

Gary Moore
MS, Missouri University of Science and Technology
Environmental management

Nicholas J. Nissing
BS, Washington University
Product development and process design

Research Associate
Raymond Ehrhard
BS, Missouri University of Science and Technology
Water and wastewater treatment technologies, process energy management

Senior Professor
Rudolf B. Husar
PhD, University of Minnesota
Environmental informatics, aerosol science and engineering

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 must be graduate courses and a minimum of 30 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 GPA equal to or greater than 3.25, and pass the qualifying examination. 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 the successful proposal defense, students should provide the research updates through annual meetings or reports with their thesis committee until their graduation. While conducting doctoral research, students should perform professionally in a research lab including compliance with 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 a national or international conference. Upon completion of the thesis, students must present the thesis in a public forum and successfully defend the thesis before their thesis committee.

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