The Department of Electrical & Systems Engineering offers PhD degrees in Electrical Engineering and in Systems Science & Mathematics. Research activity in the department is focused in the following three areas:

- Applied mathematics, systems & control
- Electronics & optics
- Signal processing, imaging & communications

Students working in any of these areas will enjoy the benefits of programs that balance fundamental theoretical concepts with modern applications. In our department, students find ample opportunities for close interactions with faculty members working on cutting-edge research and technology development.

Prospective PhD students with previous degrees in engineering who are interested in PhD studies and research in mathematics or statistics are encouraged to apply for PhD studies in Mathematics and Statistics. For more details, visit the Graduate Programs in Mathematics and Statistics webpage.

**Faculty**

**Chair**

Bruno Sinopoli
Professor PhD, University of California, Berkley
Cyberphysical systems, analysis and design of networked embedded control systems, with applications to sensor actuators networks

**Endowed Professors**

Arye Nehorai
Eugene and Martha Lohman Professor of Electrical Engineering PhD, Stanford University
Statistical signal processing, machine learning, imaging, biomedicine

Joseph A. O'Sullivan
Samuel C. Sachs Professor of Electrical Engineering Dean, UMSL/WashU Joint Undergraduate Engineering Program PhD, Notre Dame University
Information theory, statistical signal processing, imaging science with applications in medicine and security, and recognition theory and systems

Lan Yang
Edward H. & Florence G. Skinner Professor of Engineering PhD, California Institute of Technology
Nano/micro photonics, ultra high-quality optical microcavities, ultra-low-threshold microlasers, nano/micro fabrication, optical sensing, single nanoparticle detection, photonic molecules, photonic materials

**Professors**

Shantanu Chakrabarty
PhD, Johns Hopkins University
New frontiers in unconventional analog computing techniques using silicon and hybrid substrates, fundamental limits of energy efficiency, sensing and resolution by exploiting computational and adaptation primitives inherent in the physics of devices

Jr-Shin Li
Das Family Distinguished Career Development Professor PhD, Harvard University
Mathematical control theory, optimization, quantum control, biomedical applications

Hiro Mukai
Professor PhD, University of California, Berkeley
Theory and computational methods for optimization, optimal control, systems theory, electric power system operations, differential games

Neal Patwari
Professor PhD, University of Michigan
Intersection of statistical signal processing and wireless networking for improving wireless sensor networking and radiofrequency sensing

Heinz Schaeftler
PhD, Rutgers University
Optimal control, nonlinear systems, mathematical models in biomedicine

**Associate Professors**

ShiNung Ching
Das Family Distinguished Career Development Assistant Professor PhD, University of Michigan
Systems and control in neural medicine, nonlinear and constrained control, physiologic network dynamics, stochastic control
Jung-Tsung Shen (https://engineering.wustl.edu/Profiles/Pages/Jung-Tsung-Shen.aspx)
Das Family Distinguished Career Development Assistant Professor  
PhD, Massachusetts Institute of Technology  
Theoretical and numerical investigations on nanophotonics, optoelectronics, plasmonics, metamaterials

Assistant Professors

Ulugbek Kamilov (https://ese.wustl.edu/faculty/Pages/default.aspx?bio=120)
PhD, Ecole Polytechnique Fédérale de Lausanne, Switzerland  
Computational imaging, signal processing, biomedical imaging

Matthew D. Lew (https://engineering.wustl.edu/Profiles/Pages/Matthew-Lew.aspx)
PhD, Stanford University  
Microscopy, biophotonics, computational imaging, nano-optics

Chuan Wang (https://ese.wustl.edu/faculty/Pages/default.aspx?bio=123)
PhD, University of Southern California  
Flexible electronics, stretchable electronics, printed electronics, nanomaterials, nanoelectronics, optoelectronics

Shen Zeng (https://ese.wustl.edu/faculty/Pages/default.aspx?bio=121)
PhD, University of Stuttgart  
Systems and control theory, data-based analysis and control of complex dynamical systems, inverse problems, biomedical applications

Xuan "Silvia" Zhang (https://engineering.wustl.edu/Profiles/Pages/Xuan-%28Silvia%29-Zhang.aspx)
PhD, Cornell University  
Robotics, cyber-physical systems, hardware security, ubiquitous computing, embedded systems, computer architecture, VLSI, electronic design automation, control optimization, and biomedical devices and instrumentation

Senior Professors

Paul S. Min (https://ese.wustl.edu/faculty/Pages/Paul-Min.aspx)
PhD, University of Michigan  
Routing and control of telecommunication networks, fault tolerance and reliability, software systems, network management

DSc, Washington University in St. Louis  
Computer engineering, lower-power VLSI design, computer architecture, signal processing, microprocessors systems design

William F. Pickard (https://ese.wustl.edu/faculty/Pages/William-Pickard.aspx)
PhD, Harvard University  
Biological transport, electrobiology, energy engineering

Daniel L. Rode (https://ese.wustl.edu/faculty/Pages/Daniel-Rode.aspx)
PhD, Case Western Reserve University  
Optoelectronics and fiber optics, semiconductor materials, light-emitting diodes and lasers, semiconductor processing, electronics

Ervin Y. Rodin (https://ese.wustl.edu/faculty/Pages/Ervin-Rodin.aspx)
PhD, University of Texas at Austin  
Optimization, differential games, artificial intelligence, mathematical modeling

Barbara A. Shrauner (https://ese.wustl.edu/faculty/Pages/Barbara-Shrauner.aspx)
PhD, Harvard University (Radcliffe)  
Plasma processing, semiconductor transport, symmetries of nonlinear differential equations

Donald L. Snyder (https://ese.wustl.edu/faculty/Pages/Donald-Snyder.aspx)
PhD, Massachusetts Institute of Technology  
Communication theory, random process theory, signal processing, biomedical engineering, image processing, radar

Barry E. Spielman (https://ese.wustl.edu/faculty/Pages/Barry-Spielman.aspx)
PhD, Syracuse University  
High-frequency/high-speed devices, radiofrequency and microwave integrated circuits, computational electromagnetics

Tzyh Jong Tarn (https://ese.wustl.edu/faculty/Pages/TJ-Tarn.aspx)
DSc, Washington University  
Quantum mechanical systems, bilinear and nonlinear systems, robotics and automation, life science automation

Professors of Practice

Dedric Carter (https://ese.wustl.edu/faculty/Pages/faculty.aspx?bio=149)
PhD, Nova Southeastern University  
MBA, MIT Sloan School of Management

Dennis Mell (https://ese.wustl.edu/faculty/Pages/faculty.aspx?bio=150)
MS, University of Missouri-Rolla  
Industrial automation, robotics and mechatronics, product design and development with design-for-manufacturability emphasis, prototyping, manufacturing

Ed Richter (https://ese.wustl.edu/faculty/Pages/faculty.aspx?bio=151)
MS, Washington University  
Signal processing applications implemented on a variety of platforms, including ASIC, FPGA, DSP, microcontroller and desktop computers
Degree Requirements
PhD in Electrical Engineering or Systems Science & Mathematics

The Department of Electrical & Systems Engineering at Washington University in St. Louis offers two PhD programs. Both the PhD in Electrical Engineering and the PhD in Systems Science & Mathematics are academic doctoral degrees designed mainly for full-time students interested in an academic, laboratory and/or industrial research and development career in a specialization within electrical engineering, systems, control or applied mathematics.

Students pursuing the Doctor of Philosophy degrees in Electrical Engineering or Systems Science & Mathematics must complete a minimum of 72 credit hours of post-baccalaureate study consistent with the residency and other applicable requirements of Washington University and the Graduate School. These 72 units must consist of at least 36 course units and at least 24 units of research and may include work done to satisfy the requirements of a master's degree in a related discipline. Up to 24 units may be transferred to Washington University from another institution.

Each candidate for the PhD degree in Electrical Engineering and the PhD degree in Systems Science & Mathematics must do the following:

- Complete at least 36 credit hours of post-baccalaureate courses.
- Pass a written qualifying examination, to be taken before the second academic year of the program.
- Pass an oral preliminary research examination, to be completed within two years of passing the written qualifying examination and at least one year prior to completing the dissertation.
- Satisfy the general residency requirement for PhD degrees offered by the Graduate School.
- Satisfy the general teaching requirement for PhD degrees offered by the Graduate School.
- Write a doctoral dissertation that describes the results of original and creative research in a specialization within electrical engineering or systems science and mathematics.
- Pass a final oral examination in defense of the dissertation research.
- Take ESE 590 Electrical & Systems Engineering Graduate Seminar each semester.