Mechanical Engineering & Materials Science

The Department of Mechanical Engineering & Materials Science offers a **PhD** in either **Mechanical Engineering** or **Aerospace Engineering**. The department's research strengths include biomechanics, materials, energy, fluid mechanics and rotary-wing aerodynamics. The doctoral student, with their adviser, designs the program of study and the research project. The dissertation is defended at the end of the research effort. A typical time to PhD after an undergraduate engineering degree is four to five years, but the length of the program may vary depending on the individual and the area of study.

Contact:	Prof. Jessica Wagenseil
Email:	jessica.wagenseil@wustl.edu
Website:	https://mems.wustl.edu/graduate/programs

Faculty

Chair

Philip V. Bayly (https://engineering.wustl.edu/faculty/Philip-Bayly.html)
The Lee Hunter Distinguished Professor of Mechanical Engineering
PhD, Duke University
Nonlinear dynamics, vibrations, biomechanics

Associate Chairs

Katharine M. Flores (Materials Science) (https://engineering.wustl.edu/faculty/Katharine-Flores.html)
PhD, Stanford University
Mechanical behavior of structural materials

David A. Peters (Mechanical Engineering) (https://engineering.wustl.edu/faculty/David-Peters.html)
McDonnell Douglas Professor of Engineering
PhD, Stanford University
Aeroelasticity, vibrations, helicopter dynamics and aerodynamics

Endowed Professors

Ramesh K. Agarwal (https://engineering.wustl.edu/faculty/Ramesh-Agarwal.html)
William Palm Professor of Engineering
PhD, Stanford University
Computational fluid dynamics and computational physics

Guy M. Genin (https://engineering.wustl.edu/faculty/Guy-Genin.html)
Harold & Kathleen Faught Professor of Mechanical Engineering
PhD, Harvard University
Solid mechanics, fracture mechanics

Mark J. Jakiela (https://engineering.wustl.edu/faculty/Mark-Jakiela.html)
Lee Hunter Professor of Mechanical Design
PhD, University of Michigan
Mechanical design, design for manufacturing, optimization, evolutionary computation

Shankar M.L. Sastry (https://engineering.wustl.edu/faculty/Shankar-Sastry.html)
Christopher I. Byrnes Professor of Engineering
PhD, University of Toronto
Materials science, physical metallurgy

Srikanth Singamaneni (https://engineering.wustl.edu/faculty/Srikanth-Singamaneni.html)
Lilyan and E. Lisle Hughes Professor of Mechanical Engineering
PhD, Georgia Institute of Technology
Microstructures of cross-linked polymers

Professor

Jianjun Guan (https://engineering.wustl.edu/faculty/Jianjun-Guan.html)
PhD, Zhejiang University
Biomimetic biomaterials synthesis and scaffold fabrication

Associate Professors

Spencer P. Lake (https://engineering.wustl.edu/faculty/Spencer-Lake.html)
PhD, University of Pennsylvania
Soft tissue biomechanics

Jessica E. Wagenseil (https://engineering.wustl.edu/faculty/Jessica-Wagenseil.html)
DSc, Washington University
Arterial biomechanics

Assistant Professors

Damena D. Agonafer (https://engineering.wustl.edu/faculty/Damena-Agonafer.html)
PhD, University of Illinois at Urbana-Champaign
Computational fluid dynamics and computational physics

Matthew R. Bersi (https://engineering.wustl.edu/faculty/Matthew-Bersi.html)
PhD, Yale University
Biomedical engineering

J. Mark Meacham (https://engineering.wustl.edu/faculty/Mark-Meacham.html)
PhD, Georgia Institute of Technology
Micro-/nanotechnologies for thermal systems and the life sciences

Rohan Mishra (https://engineering.wustl.edu/faculty/Rohan-Mishra.html)
PhD, Ohio State University
Computational materials science

Amit Pathak (https://engineering.wustl.edu/faculty/Amit-Pathak.html)
PhD, University of California, Santa Barbara
Cellular biomechanics

Patricia B. Weisensee (https://engineering.wustl.edu/faculty/Patricia-Weisensee.html)
PhD, University of Illinois at Urbana-Champaign
Thermal fluids

Professors of the Practice

Harold J. Brandon (https://engineering.wustl.edu/faculty/Harold-Brandon.html)
DSc, Washington University
Energetics, thermal systems

Swami Karunamoorthy (https://engineering.wustl.edu/faculty/Swami-Karunamoorthy.html)
DSc, Washington University
Helicopter dynamics, engineering education

Teaching Professor

Emily J. Boyd (https://engineering.wustl.edu/faculty/Emily-Boyd.html)
PhD, University of Texas at Austin
Thermofluids

Joint Faculty

Richard L. Axelbaum (Energy, Environmental & Chemical Engineering) (https://engineering.wustl.edu/faculty/Richard-Axelbaum.html)
Stifel & Quinette Jens Professor of Environmental Engineering Science
PhD, University of California, Davis
Combustion, nanomaterials

Elliot L. Elson (Biochemistry & Molecular Biophysics) (http://dbbs.wustl.edu/faculty/Pages/faculty_bio.aspx?SID=188)
Professor Emeritus of Biochemistry & Molecular Biophysics
PhD, Stanford University
Biochemistry and molecular biophysics

Michael D. Harris (Physical Therapy, Orthopaedic Surgery, and Mechanical Engineering & Materials Science) (https://pt.wustl.edu/people/michael-d-harris-phd/)
PhD, University of Utah
Whole body and joint-level orthopaedic biomechanics

Kenneth F. Kelton (Physics) (https://physics.wustl.edu/people/kenneth-f-kelton/)
Arthur Holly Compton Professor of Arts & Sciences
PhD, Harvard University
Study and production of titanium-based quasicrystals and related phases

Eric C. Leuthardt (Neurological Surgery and Biomedical Engineering) (http://www.neurosurgery.wustl.edu/patient-care/find-a-physician/clinical-faculty/eric-c-leuthardt-md-250/)
MD, University of Pennsylvania School of Medicine
Neurological surgery

Lori Setton (Biomedical Engineering) (https://engineering.wustl.edu/faculty/Lori-Setton.html)
Lucy and Stanley Lopata Distinguished Professor of Biomedical Engineering
PhD, Columbia University
Biomechanics for local drug delivery; tissue regeneration specific to the knee joints and spine

Matthew J. Silva (Orthopaedic Surgery) (http://www.orthoresearch.wustl.edu/content/Laboratories/2963/Matthew-Silva/Silva-Lab/Overview.aspx)
Julia and Walter R. Peterson Orthopaedic Research Professor
PhD, Massachusetts Institute of Technology
Biomechanics of age-related fractures and osteoporosis

Simon Tang (Orthopaedic Surgery and Biomedical Engineering) (http://www.orthoresearch.wustl.edu/content/Laboratories/3043/Simon-Tang/Tang-Lab/Overview.aspx)
PhD, Rensselaer Polytechnic Institute
Biological mechanisms

Senior Professors

Phillip L. Gould
PhD, Northwestern University
Structural analysis and design, shell analysis and design, biomechanical engineering

Kenneth L. Jerina (https://engineering.wustl.edu/faculty/Ken-Jerina.html)
DSc, Washington University
Materials, design, solid mechanics, fatigue and fracture

Salvatore P. Sutera
PhD, California Institute of Technology
Viscous flow, biorheology

Barna A. Szabo
PhD, State University of New York at Buffalo
Numerical simulation of mechanical systems, finite-element methods

Lecturers

Sharniece Holland (https://engineering.wustl.edu/faculty/Sharniece-Holland.html)
PhD, University of Alabama
Additive manufacturing and mathematics

Jeffery Krampf (https://engineering.wustl.edu/faculty/Jeff-Krampf.html)
MS, Washington University
Fluid mechanics, modeling, and design

J. Jackson Potter (https://engineering.wustl.edu/faculty/Jackson-Potter.html)
PhD, Georgia Institute of Technology
Senior design

H. Shaun Sellers (https://engineering.wustl.edu/faculty/Shaun-Sellers.html)
PhD, Johns Hopkins University
Mechanics and materials

Louis G. Woodhams (https://engineering.wustl.edu/faculty/Louis-Woodhams.html)
BS, University of Missouri-St. Louis
Computer-aided design

Senior Research Associate

Ruth J. Okamoto (https://engineering.wustl.edu/faculty/Ruth-Okamoto.html)
DSc, Washington University
Biomechanics, solid mechanics

Adjunct Instructors

Ricardo L. Actis
DSc, Washington University
Finite element analysis, numerical simulation, aircraft structures

Robert G. Becnel
MS, Washington University
FE review

John D. Biggs
MEng, Washington University
Thermal science

Andrew W. Cary
PhD, University of Michigan
Computational fluid dynamics

Dan E. Driemeyer
PhD, University of Illinois
Thermoscience

Richard S. Dyer
PhD, Washington University
Propulsion, thermodynamics, fluids

Timothy W. Jackson
PhD, University of Washington
Structural analysis and dynamics

Richard R. Janis
MS, Washington University
Building environmental systems

Dale M. Pitt
DSc, Washington University
Aeroelasticity

Gary D. Renieri
PhD, Virginia Polytechnic Institute and State University
Structural applications, composite materials

Krishnan K. Sankaran
PhD, Massachusetts Institute of Technology
Metallic materials

Michael C. Wendl
DSc, Washington University
Mathematical theory and computational methods in biology and engineering

Laboratory and Design Specialist

Chiamaka Asinugo (https://engineering.wustl.edu/faculty/Chiamaka-Asinugo.html)
MS, Washington University
Mechanical engineering design

Professor Emeritus

Wallace B. Diboll Jr.
MSME, Rensselaer Polytechnic Institute
Dynamics, vibrations, engineering design

Degree Requirements

PhD in Mechanical Engineering or Aerospace Engineering

Policies & Regulations

A key objective of the doctoral program is to promote cutting-edge multidisciplinary research and education in the areas of mechanical engineering and materials science. Students are selected for admission to the program by a competitive process, and they typically start in the fall semester. On arriving at Washington University in St. Louis, the student will be advised by the temporary adviser on all procedural issues. The student will choose a permanent adviser by the end of the first year of residency in the program.

Summary of Requirements for Doctoral Students

The following is a brief summary of the requirements for students in the Mechanical Engineering & Materials Science doctoral programs:

1. Pass the qualifying exams. Qualifying exams should be taken by the end of the first year.
2. Prepare and defend a research proposal. The research proposal should be defended by the end of the third year.
3. Write and successfully defend the doctoral dissertation.
4. Complete a minimum of **36** units of course credit and a minimum of **24** units of doctoral research; a total of **72** credit units is required to earn the PhD degree.
5. Satisfy the applicable teaching requirements of the Graduate School.

Degrees Offered

The Department of Mechanical Engineering & Materials Science (MEMS) offers the following doctoral degrees:

- PhD in Mechanical Engineering
- PhD in Aerospace Engineering
- DSc in Mechanical Engineering, Aerospace Engineering, or Materials Science

  The Doctor of Science (DSc) has similar requirements to the PhD but without the teaching requirement. For a list of differences, please refer to the DSc and PhD Comparison (PDF) (https://mems.wustl.edu/graduate/programs/Documents/DoctoralComparisonSection.pdf).
- Students may also pursue a PhD in Materials Science — through the Institute of Materials Science & Engineering (IMSE) — while working with professors from the Department of Mechanical Engineering & Materials Science. For details about this program, visit the IMSE Graduate Program (http://imse.wustl.edu/graduate-program/) webpage.

For more information about MEMS PhD degrees, visit the MEMS Graduate Degree Programs (https://mems.wustl.edu/graduate/programs/Pages/default.aspx) webpage.