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
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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, 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, 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

Christopher I. Byrnes Professor of Engineering
PhD, University of Toronto
Materials science, physical metallurgy

Srikant 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, scaffold fabrication

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

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

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

Assistant Professors
PhD, University of Illinois at Urbana-Champaign
Computational fluid dynamics, computational physics

Matthew R. Bersi (https://engineering.wustl.edu/faculty/Matthew-Bersi.html)
PhD, Yale University
Biomedical engineering
Sang-Hoon Bae  
PhD, University of California Los Angeles  
Materials growth, optoelectronics, renewable energy

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

PhD, Ohio State University  
Computational materials science

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

**Professor of the Practice**

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

**Teaching Professors**

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

DSc, Washington University  
Biomechanics, solid mechanics

**Joint Faculty**

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, 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, fracture

Salvatore P. Sutera  
PhD, California Institute of Technology  
Viscous flow, biorheology
Richard R. Janis
MS, Washington University
Building environmental systems

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, 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) (http://bulletin.wustl.edu/grad/gsas/mems/Doctoral-Comparison-Section.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.