



*Department of Mechanical Engineering  
and Mechanics*

Good Day,

Welcome to Drexel University and the Department of Mechanical Engineering and Mechanics (MEM). We are here to discuss the opportunities of mechanical engineering with you. Hopefully this visit will give you the sense of enthusiasm and commitment our community has to the engineering profession, to the development of the next generation of practitioners, to discovery and innovation, and to the creation of systems that improve the state of mankind.

Creativity is a term I want to emphasize. People have long asked where human activity ends and machine activity begins. Engineers utilize the knowledge and tools of mathematics, physics, chemistry, biology, and the sciences of sociology and psychology to create tools that expand the frontiers of the human-machine interface for the benefit of humankind. They work with energy systems, structures and mechanics, manufacturing, and robotics from scales as large as a skyscraper to as small as a single molecule.

Our highly networked, collaborative environment is a second home for a distinctive kind of engineer: one who is eager to work across STEM fields, collaborate with classmates and colleagues in the humanities and social sciences, and partner on breakthrough ideas with organizations ranging from Boeing and the American Heart Association to the U.S. Office of Naval Research, the Department of Energy, and PeaceTech Lab. In Drexel MEM, we're taking on the real problems of real people using the values of modern design thinking—making life more equitable and meaningful, whether in our local Philadelphia neighborhoods or communities around the world. Increasingly our students and graduates will be called upon to lead: developing complex systems, teaching and mentoring new generations of engineers, playing roles in securing peace through improving the lives of those in need.

When you choose Drexel MEM, you join a vast alumni network with members spread across the country and over the world with opportunities to find mentorship, build connections, and collaborate that can be personally and professionally transformative. One in one hundred American engineers holds an engineering degree from Drexel University. Finding a college that fits you is a time of great opportunity and excitement – we hope you'll choose Drexel MEM as the next step in your adventure.

A handwritten signature in blue ink, appearing to read "J. Spanier".

Jonathan E. Spanier, Professor  
Department Head  
Mechanical Engineering and Mechanics

*Mechanical engineers use the principles of energy, materials, and mechanics to design and manufacture machines and devices of all types. At Drexel, our mechanical engineering programs explore how matter behaves at extremes and poke at the boundary between human activity and what machines can do. Traditional career pathways have broadened into new opportunities in biomechanics, high-performance computing, infrastructure systems, materials, and frontiers of human-machine interfaces for the benefit of humankind.*

## OUR MISSION

The Department of Mechanical Engineering and Mechanics seeks to be a vibrant and inclusive academic community of choice for diverse students and scholars—one that welcomes and supports those underrepresented in our field into programs distinctive for integrated and collaborative education, inquiry fueled by curiosity-inspired modeling, design, and manufacturing; and the successful application of MEM discoveries and innovations to address humanity's most pressing challenges.

Drexel University has been named one of 10 Innovative Engineering Institutes by the American Society of Mechanical Engineers (ASME).

Read More at <https://www.asme.org/topics-resources/content/10-innovative-engineering-institutes>

# INDUSTRY PARTNERSHIPS

Our partnerships with industry leaders, e.g. Eastern Controls Inc. and Endress+Hauser USA create a pipeline of engineers ready to succeed in careers within data-driven manufacturing automation.



*Endress + Hauser CEO Matthias Altendorf visits Drexel MEM*

## SENIOR DESIGN

The Senior Design three-course sequence is intended to simulate a professional work environment, providing students with the experience of working in a group on an open-ended problem.



In the 2022 Celebration of Engineering Design Competition, MEM-01 design group won first place for developing a refreshable braille learning device, addressing recent declines in braille literacy through a human-centric design.

*MEM-01 Group Members: Daniella Jose, David Hanna, Lauren Lugones, Stephen Abbate, Rostam Kojouri, Angelo Meissler*

# STUDENT LIFE

## EXAMPLE STUDENT ORGS

**Formula SAE** is an international collegiate competition where students design, build and complete an open-wheel race car. In the Drexel Formula EV club, students design and construct a high-performance, all-electric vehicle for use in the annual Formula SAE electric competition.

**I Am ME** is a professional organization at Drexel focused on promoting equal partnership, equal opportunities, and increased visibility for female engineers in mechanical engineering.

**Theme Park Engineering and Design Group** is an organization that provides Drexel undergraduate students with resources and knowledge pertaining to the themed entertainment industry.

Read more about Drexel MEM orgs at  
<https://drexel.edu/engineering/student-experience/student-organizations/>



# Mechanical Engineering and Mechanics

## SPECIALIZATIONS

### What Can You Do with a Degree in Mechanical Engineering?

Students may customize their degrees in mechanical engineering by selecting electives in one of the following specialty areas offered by the department. While these subspecialties are NOT offered as academic concentrations (with the exception of aerospace), students nonetheless have the flexibility to tailor their coursework to prepare them for courses in each of these subfields.



**Biomechanics:** Orthopedics, cardiovascular engineering, biomimetics, bio-inspired robotics and control, rehabilitations, forensic engineering, injury protection; artificial organs, tissues, and biological sensors; lab-on-a-chip, cell and protein mechanics.  
*Potential careers at:* Exponent, Synthes, Children's Hospital of Philadelphia, Johnson & Johnson, Glaxo Smith Klein, Nike...



**Autonomous Systems, Control, and Robotics:** Systems modeling, simulation, and control system design; networked robotic systems, autonomous air, land, and sea vehicles; adaptive and intelligent controls, swarms, multi robot systems.  
*Potential careers at:* NAVSEA, Ocean Power Technologies, Pratt & Whitney...



**Design and Manufacturing.** 3D-printing, bio-fabrication, laser etching; CAD, CNC machining; wrought metal alloys production, macrofabrication of devices; bio-inspired designs and design methodologies.

*Potential careers at:* Volvo, Boehringer, Synthes, Merck, Black & Decker, Air Products...



**Thermal Fluids and Energy Sciences:** Fluid Dynamics, heat transfer, combustion, applied thermodynamics; Alternative/green-energy systems, fuel cell technology, battery, hydrogen energy, plasma energy, propulsion, chemical processing, power generation.

*Potential careers at:* Volvo, Exelon Nuclear, Sunoco, Johnson Matthey, Siemens, DuPont, AirProduct...



**Mechanics and Structures:** Mechanical behavior of structures and machine parts, failure mechanisms, advanced materials, finite element methods for stress analysis; design of electronic parts, biomechanical systems, buildings, aircraft, machine components.

*Potential careers at:* Airbus, GM, Black & Decker, DuPont, NASA, DoD, DoE, NIST...



**Aerospace:** Air and space systems design, atmospheric flight mechanics, orbital mechanics, guidance and control, structural design, propulsion systems, computational fluid mechanics.

*Potential careers at:* NASA, Boeing, Augusta Aerospace, Lockheed Martin...

*Create your own* We will work with students to customize a specialization targeted to emphasize their individual interest.

## CO-OP PROGRAM CO-OP PROGRAM

### Drexel Co-Op for Mechanical Engineers

A key part of the major is Drexel's prestigious co-operative education program, in which students alternate periods of classroom study with periods of engineering work experience. Mechanical Engineering students can choose from the following:

- Three Co-op Option (Five Years): includes three six-month periods of full-time employment.
- One Co-op Option (Four Years): includes one six-month period of full-time employment.

Some of the companies that have worked with MEM students include: Exelon Corp.; Lockheed Martin; NASA; NAVSEA; CDI Corp.; Southco, Inc.; Johnson & Johnson; and Dorman Products, to name a few. Our co-op students are generally paid, with an average six-month pay of \$18,500, which may be augmented with a housing/moving allowance.



# ACCELERATED DEGREE PROGRAM

Accelerated degree programs, such as the BS/MS in Engineering, as well as the BS/JD, BS/MD, and BS/MBA, enable qualified students to earn both degrees sooner than they would in traditional programs. Eligible students can be admitted to these degree programs in two ways: apply as an incoming freshman for provisional admission through Undergraduate Admissions or apply to the Graduate Studies Office after completion of a minimum 90 credits. To learn about accelerated degree option, visit [www.drexel.edu/em/ug/accelerated](http://www.drexel.edu/em/ug/accelerated).

## Degree Requirements

### Freshman Year

#### **Fall:**

CALCULUS I  
CHEMISTRY I  
INTRO TO ENGINEERING  
EXPOSITORY WRITING  
UNIVERSITY 101

#### **Winter:**

CALCULUS II  
PHYSICS I  
CHEMISTRY II  
INTRO TO PROGRAMMING  
PERSUASIVE WRITING  
CO-OP 001 (1 credit)

#### **Spring:**

MULTI VARIABLE CALC  
PHYSICS II  
ESSENTIAL BIOLOGY  
FRESHMAN DESIGN  
ANALYTICAL WRITING

### Sophomore Year

#### **Fall or Spring:**

LINEAR ALGEBRA  
PHYSICS III  
MATERIALS I  
STATICS  
CIVIC ENGAGEMENT

#### **Winter or Summer:**

DIFFERENTIAL  
EQUATIONS  
INTRO THERMODYNAMICS  
DYNAMICS  
FOUNDATIONS OF CAD  
MATH/SCIENCE ELECTIVE

#### **Fall and Winter/ Spring and Summer:**

CO-OP

## Pre-Junior Year

### Fall or Spring:

MECH OF MATERIALS  
THERMO ANALYSIS  
TECHNOLOGY IN HISTORY  
ENG ECONOMICS  
FREE ELECTIVE

### Winter or Summer:

INTRO TO CONTROLS  
MECH BEHAV OF MAT'L  
FLUID MECHANICS  
ENGINEERING ETHICS  
EXPERIMENTAL MECH LAB

### Fall and Winter/ Spring and Summer:

CO-OP

## Junior Year

### Fall or Spring:

DYNAMIC SYSTEMS  
CAD/CAM  
THERMAL FLUID LAB  
HEAT TRANSFER  
FUNDAMENTAL ELECTIVE  
INTRO TO DESIGN

### Winter or Summer:

ENGINEERING RELIABILITY  
DYNAMIC SYSTEMS LAB  
GEN ED ELECTIVE  
FUNDAMENTAL ELECTIVE  
FUNDAMENTAL ELECTIVE

## Senior Year

### Fall:

SENIOR DESIGN I  
MATH/SCIENCE ELECTIVE  
GEN ED ELECTIVE  
FUNDAMENTAL ELECTIVE  
MEM/COE ELECTIVE

### Winter:

SENIOR DESIGN II  
MATH/SCIENCE ELECTIVE  
GEN ED ELECTIVE  
MEM ELECTIVE  
MEM/COE ELECTIVE

### Spring:

SENIOR DESIGN III  
FREE ELECTIVE  
GEN ED ELECTIVE  
MEM ELECTIVE

## **Example MEM Electives**

Machine Design  
Manufacturing Process I  
Manufacturing Process II  
Robotics I  
Robotics II  
Micro-Based Control Systems  
Aircraft Design & Performance  
Aerospace Structures  
Aircraft Flight Dynamics & Control  
Aerodynamics  
Applied Machine Learning for Mechanical Engineers  
Finite Element Methods  
Numerical Methods in Design



The Department of  
Mechanical Engineering  
and Mechanics  
welcomes

# New Faculty



**Dr. Joshua Agar** joins us from Lehigh University, where he has been an assistant professor. Dr Agar earned his PhD from the Univ of Illinois at Urbana-Champaign, and he completed a postdoctoral fellowship at the Univ of California, Berkeley. His research interests center around codesign of automation and controls for experimental synthesis, manufacturing, and nanoscale spectroscopy, machine learning, and heterogeneous computing. He joined us July 1, 2022.

**Dr. Ania-Ariadna Baetica** is currently a Postdoctoral Scholar in Biochemistry and Biophysics at the Univ of California, San Francisco. She earned the BA in Mathematics from Princeton and the PhD in Engineering Control Theory from Caltech, under the supervision of Thomas E. and Doris Everhart Professor of Control & Dynamical Systems and Bioengineering Richard Murray. Her research interests and expertise span biological control and systems biology. She will be joining us in Spring 2023.



**Dr. Yue Zheng** is currently a Postdoctoral Researcher at UMass Amherst and recently completed a postdoctoral fellowship at the Univ of Southern California. She received the BS in Theoretical and Applied Mechanics from Fudan Univ and the PhD in Mechanical Engineering from the Univ of California, San Diego. Her research interests lie in the mechanics of soft materials, mechanical metamaterials, and biomechanics, including both modeling and simulation, and experiment, with applications in soft robotics. She will join the department in Fall 2023.

**Dr. Wesley Chang** is a Beckman Postdoctoral Fellow at Caltech, researching electrochemical methods to decarbonize the industrial sector, following completion of a postdoctoral appointment at Columbia. He received the BS and MS from Stanford, and the PhD in Mechanical Engineering from Princeton. His research has explored a variety of battery technologies, including next-generation lithium metal batteries for electric vehicles. Dr. Chang's lab will focus on electrochemical energy storage and conversion technologies. He will be joining us in Fall 2023.

