

A man with grey hair and a beard, wearing red safety glasses and a blue sweater, is looking down at a piece of equipment. A woman with dark hair, also wearing red safety glasses and a red cardigan over a striped shirt, is looking at the same equipment. They are in a laboratory setting with various wires and equipment visible in the background.

Earn your **advanced degree** from Materials Science and Engineering at the University of Illinois Urbana-Champaign and **change our world**.  
Study and conduct research with top scientists in the field and graduate with a degree from one of the most prestigious Materials Science departments in the nation.

# MatSE AT ILLINOIS

A close-up view of laboratory equipment, showing various wires, connectors, and mechanical components.

**I ILLINOIS**  
Materials Science & Engineering  
GRAINGER COLLEGE OF ENGINEERING



# RESEARCH AREAS IN MATERIALS SCIENCE

**#3**

rank

(US News & World Report, 2019)

**26**

faculty members

**50%+**

faculty who are Fellows in  
national and international  
societies

**>90%**

recent faculty hires have  
received a federal  
“young investigator grant”;  
more than 55% have received  
2 of such grants

**125**

new innovations  
2014-2018

**82**

U.S. Patents  
2014-2018



## MATERIALS FOR ENERGY AND THE ENVIRONMENT

This research area focuses on fundamentally understanding materials used for energy generation and storage technologies from heat engines to solar cells, as well as on materials for water purification. Studies include developing novel materials with advanced heat transport or heat resistance, understanding how these materials work at the atomic scale, and improving them.



Creation of new materials systems, bioinspired design, novel manufacture, and multiscale characterization, intersection of chemistry, materials science, and mechanics.

Developing polymers and composites capable of self-healing and regeneration, self-reporting, and self-protection to improve reliability and extend material lifetime.

## MATERIALS FOR MEDICINE

This concentration designs, synthesizes, and fabricates novel functional materials and explores their biomedical and biological applications. Research crosses many disciplines including chemistry, physics, chemical, biological, mechanical and electronic engineering, pharmaceutical and life sciences, and computational sciences.



Intersection of materials chemistry, polymers, biomaterials, organic and inorganic self-assembly, electronic materials and photonics.

Developing a stamp-sized sensor that can detect trace amounts of certain chemical warfare agents, such as sarin, within minutes.



# RESEARCH AREAS

## MECHANICAL PROPERTIES AND MATERIALS FOR EXTREME CONDITIONS

Structural applications, from airplane fuselage to car chassis to computer and cell phone cases, often call for materials that are stronger and lighter, and can maintain high performance in harsh environments. Research in this area combines experiments, numerical simulations, and modeling to improve existing materials and to develop new materials that will meet the requirements of these demanding applications.

## NANOSCALE SCIENCE AND TECHNOLOGY

Nanoscale science and technology is a cross-cutting area of research that seeks advances in basic understanding of the synthesis, processing, and properties of nanoscale materials and the development of new nanoscale materials for energy, medicine, information technology, transportation, and the environment. Research utilizes multiple areas of expertise: electron microscopy and diffraction, synthesis of low-dimensional semiconductors, assembly of nanostructures into hierarchical structures, excited-state electronic structure, and transport of electronic, magnetic, and vibrational excitations at the nanoscale.



NICOLA PERRY

Advanced functional oxides for energy, sensing, and electronic applications.

Developing design principles for fast oxygen surface exchange kinetics, tailored ionic/electronic transport, and minimized chemical expansion in ceramics that “breathe.” Current applications are fuel cells, electrolyzers, and batteries.



PINSHANE HUANG

Intersections of physics, chemistry, and materials research. Seeking to understand the structure and properties of materials, one atom at a time.

Developing new methods to image the structure and chemistry of materials, with single atom precision, that are used in new generations of solar cells, batteries, and catalysts.

# PROGRAM OF STUDY

Both MS and PhD degree programs in MatSE feature an open/flexible curriculum that can be easily tailored to individual student's needs and goals. Examples of courses relevant for emphasis in various sub-disciplines or concentrations are given here: [matse.illinois.edu/academics/graduate-programs/graduate-courses](http://matse.illinois.edu/academics/graduate-programs/graduate-courses).

## MASTER OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING REQUIREMENTS

<b>Course Work (non thesis)</b>	<b>36 hours</b>
MSE 595 (0 or 1 hour)	
<ul style="list-style-type: none"> <li>Must be taken every semester in the first two years of residence.</li> <li>Maximum of 2 hours may be applied toward the degree</li> </ul>	0-2 hours
Area seminars (MSE 529, MSE 559) and Advisor group meetings (MSE 590)	
<ul style="list-style-type: none"> <li>MSE 529 or 559 (0 or 1 hour) must be taken every semester.</li> <li>Maximum of 4 hours may be applied toward the degree.</li> </ul>	0-4 hours
<b>Total degree credit</b>	<b>36 hours</b>
<b>Other</b>	
<ul style="list-style-type: none"> <li>Minimum of 10 hours of MSE course work</li> <li>MSE 492 Lab Safety Fundamentals (1 hour); credit does not apply toward the degree</li> <li>Minimum of 14 500-level credit hours overall applied toward the degree (excluding 599)</li> <li>Maximum of 4 hours of independent study may be applied toward degree requirements</li> <li>Minimum program GPA is 3.0.</li> </ul>	

## DOCTOR OF PHILOSOPHY IN MATERIALS SCIENCE AND ENGINEERING REQUIREMENTS

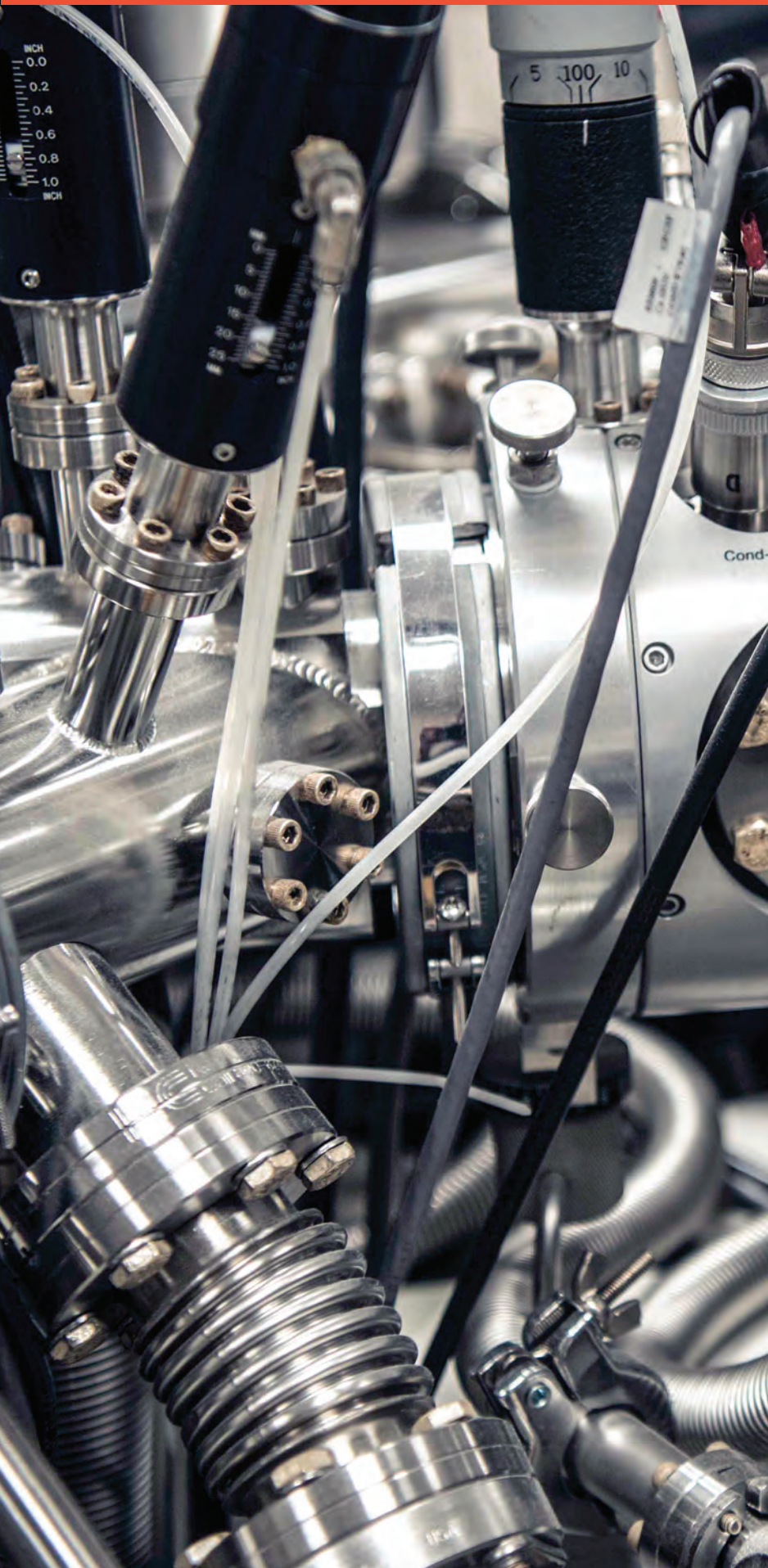
	<b>Entering with approved M.S. degree</b>	<b>Entering with approved B.S. degree</b>
Thesis Research-MSE 599	44 hours	52 hours
Course Work	20 hours	44 hours
One of CHEM 544, MSE 500, PHS 504 with a grade of B or higher	4 hours	4 hours
MSE 595 (0 or 1 hour)		
<ul style="list-style-type: none"> <li>Must be taken every semester in the first two years of residence.</li> <li>Maximum of 2 hours (with MS) or 4 hours (with BS) may be applied toward the degree</li> </ul>	0-2 hours	0-4 hours
Area seminars (MSE 529, MSE 559) and Advisor group meetings (MSE 590)		
<ul style="list-style-type: none"> <li>MSE 529 or 559 (0 or 1 hour) must be taken every semester.</li> <li>Maximum of 4 hours (with MS) or 8 hours (with BS) may be applied toward the degree</li> </ul>	0-4 hours	0-8 hours
MSE Coursework	10 hours	20 hours
500 level credit hours applied towards degree (excluding 599)	10 hours	24 hours
<b>Total degree credit</b>	<b>64 hours</b>	<b>96 hours</b>
<b>Other</b>		
<ul style="list-style-type: none"> <li>Ph.D. exam and dissertation requirements: Qualifying exam, Preliminary exam, Final exam or dissertation defense, and Dissertation deposit (Completed thesis must be approved by the advisor and department head)</li> <li>MSE 492 Lab Safety Fundamentals (1 hour); credit does not apply toward the degree</li> <li>Minimum program GPA is 3.0</li> </ul>		

## QUICK FACTS: WHICH DEGREE PROGRAM IS THE ONE FOR YOU?

	<b>M.S. in Materials Science</b>	<b>Ph.D. in Materials Science</b>
<b>Milestones</b>	Non thesis, coursework-based	Thesis/research requirement
<b>Length</b>	Full time enrollment required; 1.5 – 2 years typical time-to-degree	Full time enrollment: 5 years typical time-to-degree
<b>Department Support</b>	No	Yes
<b>Cost</b>	Graduate Engineering rate set by the Office of the Registrar at Illinois <a href="http://cost.illinois.edu">cost.illinois.edu</a>	



# FACILITIES



## RESEARCH FACILITIES

At Illinois, you will use some of the finest research facilities in the world.

**Beckman Institute for Advanced Science and Technology:** Integrative Imaging; Intelligent Systems; Molecular Science and Engineering.

**Materials Research Laboratory:** Electron Microscopy; Laser and Spectroscopy; Micro/Nano Fabrication Cleanroom; Scanning Probe Microscopy; Surface Analysis; Thermal Analysis & Soft Materials Characterization; X-Ray Analysis; Bio Services; Mask Fabrication Services.

**Coordinated Science Laboratory:** Health IT, Internet of Things, Cybersecurity, Robotics.

**National Center for Supercomputing Applications:** Digital Agriculture, Bio and Health Sciences, Earth and Environment, Astronomy, plus many more.

## YOUR FUTURE

As a MatSE graduate, you will be in demand with industry-leading companies, start-ups, and government agencies that rely on current and improved materials technology. Our alumni are also working as postdoctoral researchers in national labs and as faculty in academia. Some examples:

National Science Foundation • Argonne National Laboratory • U.S. Naval Research Laboratory • Aramco • Apple • Amazon • The Clorox Company • Harvard University • University of Michigan Ann Arbor • Stanford University

## FINANCIAL AID

All applicants to the Ph.D. program are automatically considered for financial support in the form of a research assistantship. Research assistantships in materials science are typically paid out over 12 months and include a full tuition and partial fee waiver. Proof of funding is not required for Ph.D. applicants.

Many of our doctoral students are funded by prestigious fellowships and awards. There are also many opportunities for fellowships and awards administered through the department and other campus units. Examples include the following:

Racheff-Intel Award  
3M Fellowship  
TechnipFMC Educational Fund Fellowship  
Mavis Future Faculty Fellows (MF3) Program  
Schmidt Science Fellows Program  
Lam Research Corporation -  
    Outstanding Graduate Student Award  
Global Young Scientists Summit  
    Travel Award  
Ross J. Martin Award  
HHMI Gilliam Fellowships  
Innovation Award - Durgam & Subha  
    Chakrapani Family Trust Award  
Lindau-Nobel Meeting Germany  
Yee Fellowship Award  
Dissertation Completion Fellowship  
Conference Travel Awards



## LIVING IN URBANA-CHAMPAIGN

Living local is the culture in Urbana-Champaign, with 2 distinct downtowns that will enhance your campus experience.

Discover live music, festivals, boutiques, and over 50 locally owned restaurants that can be enjoyed throughout the year.

The cost of living in Urbana-Champaign is 14% lower than the national average and is the least expensive place to live among the top 5 ranked materials science departments.

# #2

Best college town in America  
(AIER)

# #1

Midwest food town  
(Midwest Living)



Keep in touch: **MATSE.ILLINOIS.EDU**



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