



GRADUATE PROGRAMS

**MECHANICAL AND
AEROSPACE ENGINEERING**



UB MECHANICAL AND AEROSPACE ENGINEERING



•• GREAT LOCATION

•• EXCELLENT FACILITIES

•• COMFORTABLE SIZE

•• EXCITING RESEARCH

•• SUCCESSFUL GRADUATES

•• ACCESSIBLE, FIRST-RATE FACULTY

•• TOP-QUALITY UNIVERSITY



FIRST-RATE FACULTY

The UB Department of Mechanical and Aerospace Engineering faculty—working closely with our advanced graduate students—conducts leading-edge research, funded by government agencies and industry, in a number of disciplines.

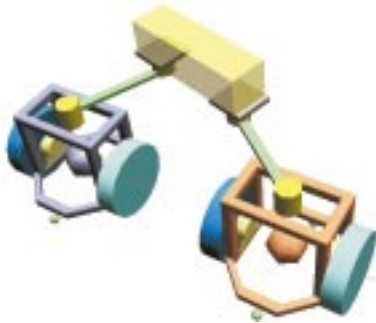
In recent years, our faculty have earned:

2 NSF PRESIDENTIAL FACULTY FELLOWS AWARDS

4 NSF CAREER AWARDS

1 NSF ACCOMPLISHMENT-BASED CREATIVITY AWARD

1 NSF PRESIDENTIAL YOUNG INVESTIGATOR AWARD



❖ NATIONAL RANKING

The National Research Council (NRC) Effectiveness Ratings for Research-Doctorate Programs in Mechanical Engineering place UB's MAE department just below the first quartile (31 percent) in program effectiveness.

The NRC ranks us alongside the University of California at Santa Barbara and Virginia, and ahead of Duke, Michigan State, Iowa State, Johns Hopkins, Colorado, and Florida.

UB has the top-rated public mechanical and aerospace program in New York State.



AREAS OF STUDY INCLUDE:

**BIOMATERIALS, MEDICAL DEVICES,
AND IMPLANTS**

**BIOMEDICAL SIMULATION AND
VISUALIZATION**

COMBUSTION

COMPOSITE MATERIALS

COMPUTATIONAL FLUID DYNAMICS

COMPUTATIONAL MECHANICS

DESIGN THEORY

ELECTRONIC PACKAGING MATERIALS

EXPERIMENTAL MECHANICS

GUIDANCE, NAVIGATION, AND CONTROL

**HEMODYNAMICS AND VASCULAR
MECHANICS**

MAGNETIC DATA-STORAGE MATERIALS

MECHATRONICS

MUSCULOSKELETAL BIOMECHANICS

OPTIMIZATION IN DESIGN

PARTICULATE LIGHT SCATTERING

ROBOTICS/MECHATRONICS

SCIENTIFIC VISUALIZATION

**SMART AND MULTIFUNCTIONAL
MATERIALS**

THEORETICAL FLUID DYNAMICS

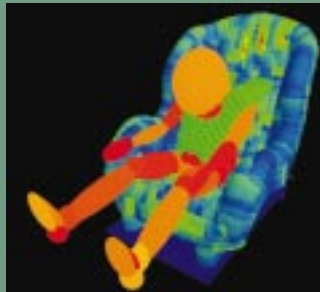
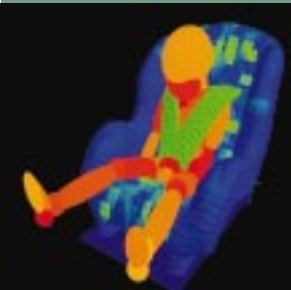
**THERMAL/CHEMICAL/MECHANICAL
SYSTEMS MODELING**

**THERMODYNAMIC AND TRANSPORT
BEHAVIOR OF NOVEL MATERIALS AND
ANOMALOUS PHENOMENA**

TRANSPORTATION

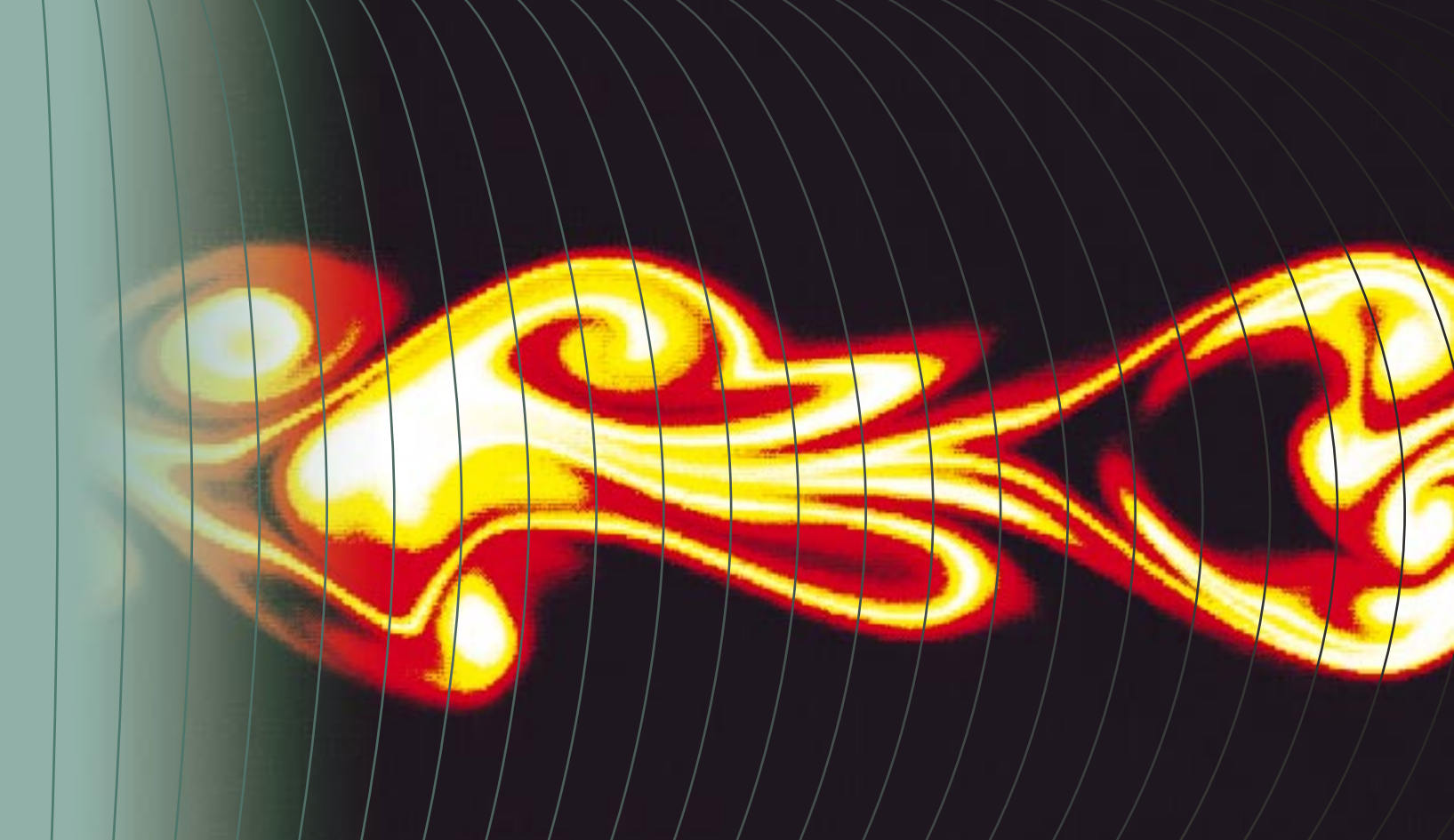
TRIBOLOGY AND CONTACT MECHANICS

VIRTUAL REALITY/HAPTICS



•• Dirk Tenne
Germany
Ph.D. program





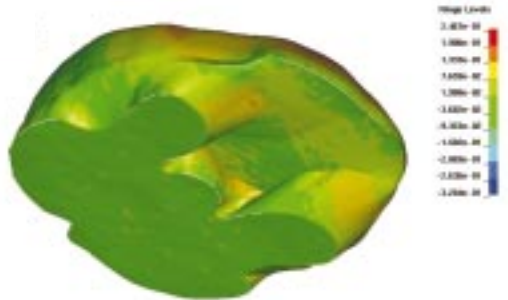
RESEARCH AREA: CONTROL SYSTEMS (ESTIMATION AND TARGET TRACKING)

"The information technology at UB is very well developed, and that's the most important thing right now."

EXPLORE UB MECHANICAL AND AEROSPACE ENGINEERING



www.mae.buffalo.edu



RESEARCH AT UB MAE

Our research is focused in four basic areas and one interdisciplinary area:

- Dynamics, control, and mechatronics
- Design and optimization
- Fluid and thermal sciences
- Materials and mechanics
- Bioengineering (interdisciplinary)

ABOUT THE DEPARTMENT

The roots of the MAE department date back to the 1920s, when the first engineering courses were offered at the University of Buffalo—then a private university. A four-year baccalaureate program in mechanical engineering established in 1944 served as the foundation for the establishment of UB's School of Engineering and Applied Sciences in 1946. The UB Department of Mechanical and Aerospace Engineering was officially created in 1980 when the aerospace engineering faculty joined with the existing mechanical engineering department. Jarvis Hall, one of the two buildings the department occupies on UB's North Campus, is named for Gregory Jarvis (UB engineering '67), who was a crew member on the ill-fated Challenger space shuttle.

• SCOTT FERGUSON

U.S.

M.S. with intention to go through Ph.D.



❖ DYNAMICS, CONTROL, AND MECHATRONICS

The focus of this group is on modeling, identification, and control development and validation of a variety of electromechanical, biomedical, and other systems applications. Research areas include advanced control, estimation, distributed cooperating systems, robust vibration control, virtual reality-based simulation and testing, and hardware-in-the-loop testing. These activities can be broadly categorized into:

ROBOTICS/MECHATRONICS | **TRANSPORTATION** | **TRIBOLOGY AND CONTACT MECHANICS** |
GUIDANCE, NAVIGATION, AND CONTROL | **VIRTUAL REALITY/HAPTICS**



❖ DESIGN AND OPTIMIZATION

Our design research focuses on the design of components, mechanisms, products, and systems, and on the issues inherent in designing, prototyping, and manufacturing them. These issues range from component and assembly modeling in the design of machines and robotic manipulators and biomedical systems, to developing Internet-based decision support tools in collaborative product design. The work of this group can be broadly categorized into:

SCIENTIFIC VISUALIZATION | **OPTIMIZATION IN DESIGN** | **VIRTUAL REALITY/HAPTICS** | **DESIGN THEORY** | **MECHATRONICS**

RESEARCH AREA: DESIGN AND OPTIMIZATION

"The faculty here is really focused on teaching you as well as on their research. That's important."





❖ FLUID AND THERMAL SCIENCES

This area includes fluid mechanics, combustion, heat and mass transfer, special environments, propulsion, bioengineering, aerosol mechanics, instrumentation, electrodynamics of fluids, and computational fluid dynamics. Fundamental research efforts in this area address turbulent flows, combustion, aerosol mechanics, particulate light scattering, flame-vortex interaction, hemodynamics, thermodynamic and transport properties of novel materials and anomalous phenomena, computational methods, flow diagnostics, and microscale fluid mechanics. Applied research here deals with energy conversion, thermal/chemical/mechanical modeling of complex systems, pollution control, biomedical devices, inhalation toxicology, drug therapy, direct numerical simulation (DNS) and large eddy simulation (LES) of complex combustion systems, multi-recompression heater, design of a total body thermal protection garment, and pathophysiology of blood flow that leads to heart attacks and strokes.

COMBUSTION | **COMPUTATIONAL FLUID DYNAMICS** | **THERMAL/CHEMICAL/MECHANICAL SYSTEMS MODELING** |

PARTICULATE LIGHT SCATTERING | **THEORETICAL FLUID DYNAMICS** |

THERMODYNAMIC AND TRANSPORT BEHAVIOR OF NOVEL MATERIALS AND ANOMALOUS PHENOMENA

❖ MATERIALS AND MECHANICS

Research in materials is grounded in understanding why a material displays a given electronic, physical, mechanical, or chemical property or behavior, thus permitting “structure-property” relationships and predictions. Materials research involves fabrication of new materials as well as improvement of existing materials; it includes electronic materials, biomaterials, metals, ceramics, polymers, and composites. Mechanics research at UB emphasizes the use of numerical methods to solve problems of solids, structures, and biomechanics; this includes composite materials as well as viscoelastic and biomaterials. Research focuses on proposing and validating constitutive models as well as on finding efficient computational schemes to complete the solution. We emphasize experimental mechanics to study the mechanics of materials. This effort is aided by advances in experimental techniques and emphasizes the scientific importance of experimental observations.



Materials

COMPOSITE MATERIALS | **SMART AND MULTIFUNCTIONAL MATERIALS** | **MAGNETIC DATA-STORAGE MATERIALS** | **ELECTRONIC PACKAGING MATERIALS**

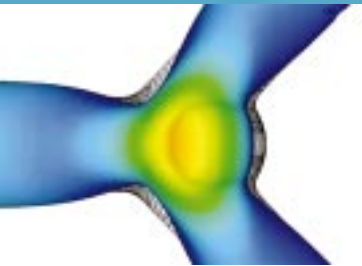
Mechanics

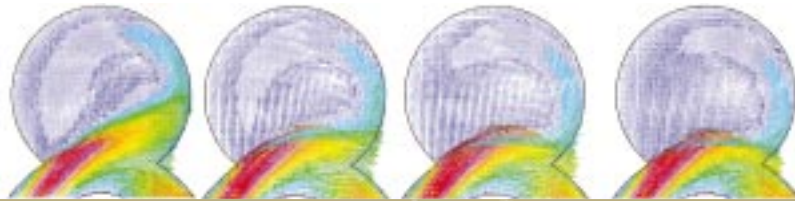
COMPUTATIONAL MECHANICS | **EXPERIMENTAL MECHANICS**

❖ BIOENGINEERING

In an overall sense, bioengineering is the use of engineering principles to solve problems in medicine and biology. Bioengineering as found in mechanical and aerospace engineering has research and teaching programs that focus primarily on musculoskeletal and orthopedic biomechanics, cardiovascular biomechanics, biomaterials, simulation and computation of biological processes, and medical imaging. There are collaborative efforts with the Departments of Biomaterials, Orthopaedic Surgery, and Emergency Medicine.

BIOMATERIALS, MEDICAL DEVICES, AND IMPLANTS | **MUSCULOSKELETAL BIOMECHANICS** |
BIOMEDICAL SIMULATION AND VISUALIZATION | **HEMODYNAMICS AND VASCULAR MECHANICS**





Adhesive

SOURCES OF RECENT RESEARCH FUNDING

AMERICAN PRECISION INDUSTRIES

ARMY RESEARCH OFFICE

BOSTON SCIENTIFIC CORPORATION

BUD INC./EVERFAB

CUBRC/VERIDIAN

DELPHI-HARRISON THERMAL
SYSTEMS

DIVERSIFIED MANUFACTURING

GRAHAM MANUFACTURING CORP.

IAT

LOCKHEED-MARTIN

MILLIKEN RESEARCH
ASSOCIATES, INC.

MOKON

MOOG, INC.

NASA

NASA LANGLEY RESEARCH CENTER

NATIONAL CENTER FOR ADVANCED
TECHNOLOGIES

NATIONAL INSTITUTES OF HEALTH

NATIONAL SCIENCE FOUNDATION

PRAXAIR

RODGARD

ROLLS-ROYCE ALLISON

SHERWOOD

SUN MICROSYSTEMS

TOSHIBA AMERICA MEDICAL
SYSTEMS

WHITAKER FOUNDATION

XEROX

VITAL STATISTICS

Degrees

M.Eng., M.S., Ph.D.

Faculty

23 full time, 8 part time

Graduate students

186 full time, 15 part time

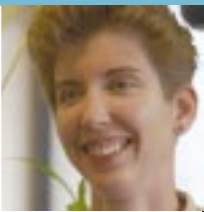
Teaching, research,
and graduate
assistant positions

80

RENEE BAGWELL

U.S.

Ph.D. program



• LOW COST

Because the University at Buffalo is a public institution, UB graduate tuition is an exceptional value. If you look at the top three rated mechanical and aerospace engineering programs

in New York State, only UB's has low tuition. The department supports all its full-time Ph.D. students—and some students in its master's program—with stipends and tuition scholarships.



TOP GRADUATES

In the past few years, our Ph.D. graduates have received:

4 NSF CAREER AWARDS

1 NSF PRESIDENTIAL YOUNG INVESTIGATOR AWARD

2 OFFICE OF NAVAL RESEARCH YOUNG INVESTIGATOR AWARDS

1 PRESIDENTIAL FACULTY FELLOW AWARD

1 NSF PRESIDENTIAL EARLY CAREER AWARD FOR SCIENTISTS AND ENGINEERS

RESEARCH AREA: COMPOSITE MATERIALS

"I like Buffalo because I'm an outdoors person and I've got fishing in Canada to the north and great wilderness camping in a huge state park south of the city."

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www.mae.buffalo.edu

•• BOTTOM LINE: WHERE OUR GRADS GO

The following is a selection of the labs and companies where recent UB MAE graduate degree recipients are working:



**ALCATEL SPACE
INDUSTRIES**

BOEING

BOSCH

COOPER INDUSTRIES

DRESSER RAND

EVERCELL

FLUENT

FORD

**HONEYWELL SATELLITE
SYSTEMS OPERATION**

HUNDAI

**JET PROPULSION
LABORATORY**

**KNOLLS ATOMIC
POWER PLANT**

KODAK

**LOCKHEED-MARTIN
TACTICAL AIRCRAFT
SYSTEMS**

**LOS ALAMOS NATIONAL
LABORATORY**

**MOOG AIRCRAFT
GROUP**

**NATIONAL
TRANSPORTATION
SAFETY BOARD**

NIAGARA MOHAWK

PORSCHE

PRAXAIR

**RAYTHEON MISSILE
SYSTEMS**

**ROLLS-ROYCE
ALLISON**

SEAGATE

SIEMENS

**SILICON GRAPHICS
INC.**

SPRINT

SUN MICROSYSTEMS

UNITED AIRLINES

VOLVO

XEROX



OUR PH.D. GRADUATES HAVE JOINED THE FACULTIES OF:

CLARKSON

CLEMSON

CORNELL

KANSAS STATE

LOUISIANA STATE

MICHIGAN STATE

PURDUE

**ROCHESTER INSTITUTE
OF TECHNOLOGY**

RPI

TEXAS A&M

UC-BERKELEY

**UNIVERSITY OF
FLORIDA**

UNIVERSITY OF HAWAII

**UNIVERSITY OF
HOUSTON**

**UNIVERSITY OF
ILLINOIS-URBANA/
CHAMPAIGN**

**UNIVERSITY OF
MINNESOTA**

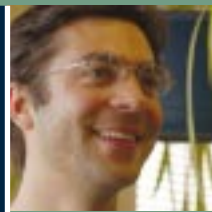
**UNIVERSITY OF
SOUTH FLORIDA**

VANDERBILT

VIRGINIA TECH

•• **MARKUS TREMMEL**

Germany
Ph.D. program



A woman with glasses is seated in a wind tunnel, looking out at a large, white, aerodynamic model of a car. The background shows a clear blue sky and some greenery. The image is partially obscured by a dark blue overlay on the left side where the text is located.

DEPARTMENT SUPPORT

Teaching assistantships and university fellowships—assigned on the basis of academic merit—provide support ranging between \$12,000 and \$15,000 for an initial ten-month academic-year period. Beyond that period, continuing support usually comes from research assistantships funded by research grants and contracts. Students receiving such departmental support are usually awarded tuition scholarships in addition to the basic stipend.

RESEARCH AREA: AERODYNAMICS

"The classes are small. The professors are very friendly. The facilities are great. The computing facilities are fantastic. And the multicultural aspect is wonderful."

EXPLORE UB MECHANICAL AND AEROSPACE ENGINEERING



www.mae.buffalo.edu

FAQs

Prospective graduate students frequently ask us these questions:

• Q. HOW CAN I GET AN APPLICATION AND REQUIRED FORMS?

A. The MAE online application and all required forms are available online at the department Web site.

If you do not have Web access, you can request a complete application package via e-mail to maegrad@eng.buffalo.edu.

PLEASE NOTE: If you are interested in study in our department, the best thing you can do is to submit an application. E-mails and letters to faculty asking them to admit you to the graduate program cannot, and will not, be evaluated.

• Q. WHAT CRITERIA DO YOU USE TO EVALUATE APPLICATIONS?

A. We take the following elements into consideration when we evaluate applications, for both admission and financial aid:

- GRE scores (verbal, quantitative, analytic); the mechanical engineering subject test is recommended but not required
- TOEFL scores, if applicable

- Grades in relevant coursework at the undergraduate and, if applicable, graduate levels (you will be required to provide official transcripts from all colleges and universities previously attended)
- Your personal statement explaining why you are interested in graduate study in mechanical and aerospace engineering at the University at Buffalo
- The three letters of recommendation, preferably from faculty members at your college who know you well, that you will submit with your application (under certain circumstances, letters from employers can be used)

It is our policy not to make an evaluation, or to offer advice, without a completed application with full supporting documents in hand.

• Q. HOW CAN I APPLY FOR FINANCIAL AID?

A. When you submit your application, you can indicate on the application if you need financial aid. We will then consider you for a teaching assistantship (TA). Most faculty will not offer an RA until they have seen your performance in the department. This may take a semester.

•• **Q. DO INDIVIDUAL FACULTY MEMBERS OFFER FINANCIAL AID?**

A. This is possible, but it happens rarely for M.S. applicants. Most faculty will not offer an RA until they have seen your performance in the department. **Special Note for Ph.D. applicants (who already possess a master's degree):** After submitting your application, you should get in touch with faculty members who are potential advisors in your area. If they request a personal letter, you would submit it at that time.

•• **Q. WHERE CAN I LEARN MORE ABOUT YOUR FACULTY AND THEIR RESEARCH INTERESTS?**

A. In the faculty section of our Web site.

•• **Q. DO YOU ADMIT APPLICANTS WITHOUT A MASTER'S DEGREE DIRECTLY INTO YOUR PH.D. PROGRAM?**

A. No, not under ordinary circumstances. Students who have not yet earned a master's degree are admitted into our graduate program as M.S. candidates. Upon passing the qualifying examination for Ph.D.-level study (normally no later than the student's second year in the graduate program), students apply to the Graduate Committee for admission into the Ph.D. program.

•• **Q. IF I DO INTEND TO EARN A PH.D., SHOULD I SAY SO IN MY APPLICATION?**

A. Yes, we need to know. Our admission decisions are based on how well your qualifications match your ultimate graduate

program plans. On the paper application, please check off "Master's only," "Ph.D. only," or "Both Master's and Ph.D." On the on-line application, please indicate this in the first line of the "Applicant's Personal Statement."

•• **Q. WHAT UNDERGRADUATE MAJORS CAN BE CONSIDERED FOR ADMISSION INTO THE GRADUATE PROGRAM?**

A. At a minimum, an undergraduate degree (bachelor's or other four-year equivalent) is required for admission. Graduates from accredited mechanical or aerospace engineering departments make up the bulk of our applicants. However, students from chemical engineering, civil engineering, materials science and engineering, and similar programs have successfully completed our program. Students from other, related engineering and science disciplines may have some additional undergraduate coursework to make up.

•• **Q. DO YOU ADMIT STUDENTS FOR THE SPRING SEMESTER?**

A. Yes, but this is a comparatively small group. There may be problems getting the right course sequence for your area of interest, and you may need an additional semester. In general, there are comparatively few TA and RA positions available to students entering in the spring.

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ADMISSION REQUIREMENTS

A B.S. in mechanical engineering or aerospace engineering—or the equivalent—and a grade point average of at least 3.0 on a 4.0 scale are usually required for admission for all master's programs.*

Prospective Ph.D. students may apply for either the M.S. or the Ph.D. program, but those without an M.S. degree will initially be accepted as M.S. candidates.

Full-time students admitted to the M.S. program who show research ability and who are in good academic standing may apply for admission to the Ph.D. qualifying examination after two semesters. The procedure for applying after two semesters is the same as for students who first complete the M.S.

program. Students who complete the M.S. program and wish to continue must apply for admission to the Ph.D. program and take the Ph.D. qualifying examination.

* Students applying for admission with a quality point average below 3.0 or without a B.S. in mechanical engineering or aerospace engineering may occasionally be admitted on a provisional basis, depending on the circumstances of their case and their letters of recommendation. Students from chemical engineering, civil engineering, materials science and engineering, and similar programs have successfully completed our program. Students from other, related engineering and science disciplines may have some additional undergraduate coursework to make up. Admission on a provisional basis requires that the student obtain a grade of "B" or higher in each of the first three graduate courses taken.

SCHOOL AND UNIVERSITY

UB's School of Engineering and Applied Sciences offers graduate degrees in chemical engineering; civil, structural, and environmental engineering; computer science and engineering; electrical engineering; and industrial engineering in addition to mechanical and aerospace engineering.

The school either houses or has strong research affiliations with such nationally known UB research centers as the New York State Center for Engineering Design and Industrial Innovation; the Center for Computational Research (currently running one of the world's fastest supercomputing clusters); the Institute for Lasers, Photonics, and Biophotonics; the National Center for Geographic Information Analysis; the Center for Multisource Information Infusion; the Multidisciplinary Center for Earthquake Engineering Research; and a great many others.

As a research-intensive university, UB supports and houses a wide array of research institutes, centers, and laboratories. These organized units, and the research projects of individual faculty members, accounted for more than \$300 million in grants from federal and state agencies, foundations, and industrial research partners in 2002.

With particular strengths in such areas as high-performance computing, earthquake damage mitigation engineering, medicine, materials science, drug development, and bioinformatics, among others, UB ranks 32nd in the nation among public universities in total annual research spending.



WHERE TO LOOK, WRITE, E-MAIL

Graduate Program

Department of Mechanical and Aerospace Engineering

University at Buffalo

318 Jarvis Hall

Buffalo, NY 14260-4400

USA

E-mail: maegrad@eng.buffalo.edu

WWW.MAE.BUFFALO.EDU

