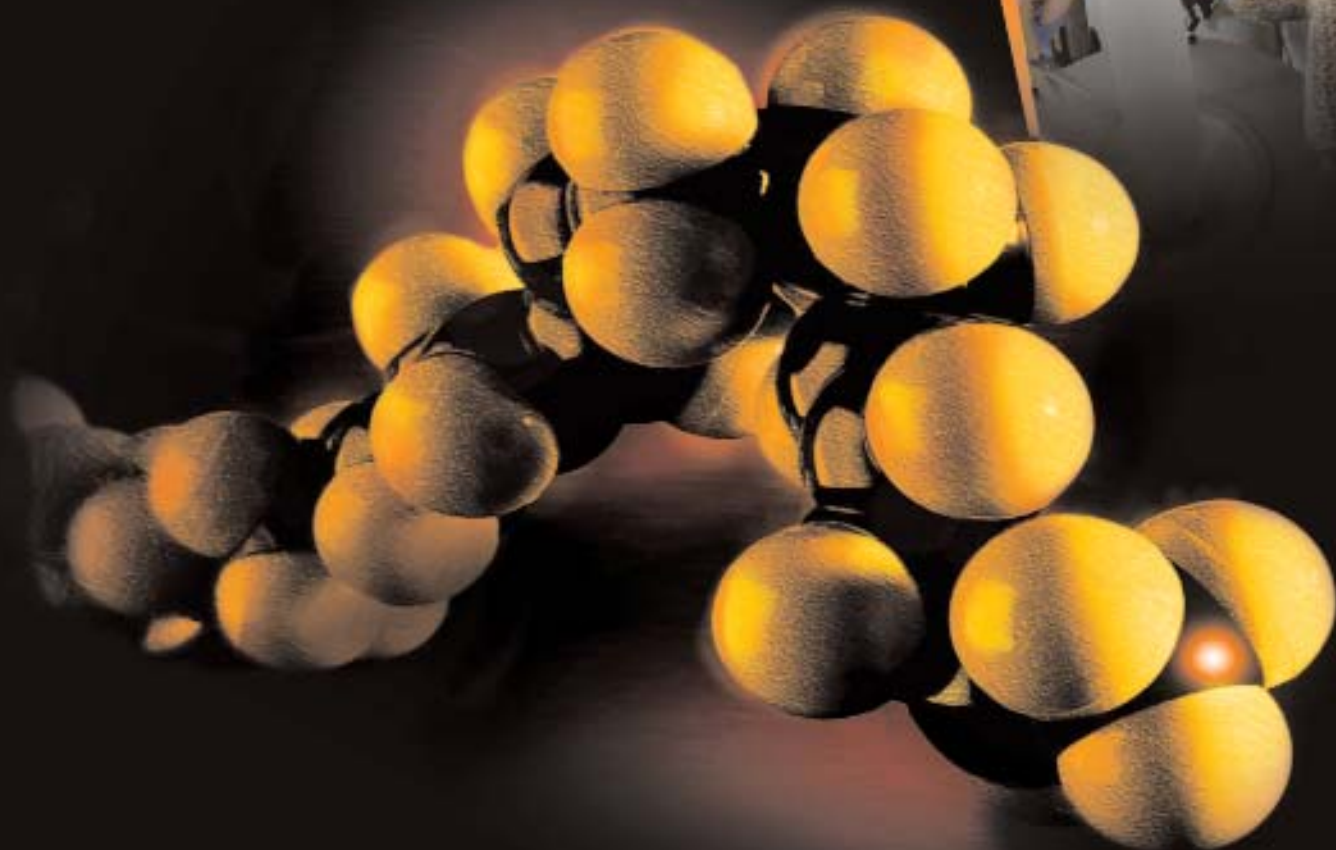




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GRADUATE STUDY IN  
**POLYMER  
ENGINEERING**

[www.poly-eng.uakron.edu](http://www.poly-eng.uakron.edu)



# WELCOME TO THE DEPARTMENT OF POLYMER ENGINEERING

The Department of Polymer Engineering at The University of Akron offers both master's and doctorate degrees in polymer engineering. The department currently has 12 faculty members with a wide range of specialties and fields of interest who bring a great deal of diversity, expertise and experience to our academic program.

Located in Akron, Ohio – a world-renowned center for polymer research and development – our facilities span two buildings on The University of Akron campus. The Polymer Engineering Academic Center (PEAC), which opened in June 2001, is a brick and glass four-story building that elegantly provides space for classrooms as well as faculty and student offices. The Sidney L. Olson Research Center, which is joined to PEAC by a second-story, enclosed walkway, houses all the department's laboratory and research facilities, including offices and workrooms for technical staff.

The Department of Polymer Engineering seeks to provide students with a high quality educational experience in the engineering and science of polymers, incorporating both classroom learning and a stimulating research environment. Since the department is involved primarily in graduate level education, students are taught the skills of research by regular full-time professors, occasionally assisted by visiting scientists, faculty and postdoctoral associates.

Graduates of the department have gone on to successful careers in private industry, government and academia. There are approximately 80-100 students in the department in any given semester who represent the United States and numerous foreign countries.

We invite you to look over our information and consider the benefits of studying at The University of Akron in the heart of the polymer industry.

Should you have any questions or need additional assistance, please do not hesitate to contact us. We look forward to serving your academic needs in the near future!

## ADMISSIONS

Requirements for admission into the Department of Polymer Engineering are as follows:

- **A cumulative Grade Point Average (GPA) of:**
  - 2.75 or higher overall on a 4.00 scale; or,
  - 3.00 or higher on a 4.00 scale for work completed in the last two years.

Students accepted for admission into M.S. and Ph.D. programs in Polymer Engineering at The University of Akron typically have GPAs well above 3.00 on a 4.00 scale.

Students coming from foreign universities not offering letter grades must receive a "First Class" grade or equivalent.

- **Submission of Graduate Record Examination (GRE) general test scores** is mandatory and no application will be processed without GRE scores. The institution code for The University of Akron is 1829.
- **Three letters of professional recommendation are required.** The letters must state that the applicant has a strong potential to excel in coursework and carry out independent scientific research. These may be sent through the "Apply Yourself" link on either the department's or UA Graduate School Web sites OR through regular mail directly by the referees with letters furnished on their official letterhead. Letters of recommendation without signatures or not on legible, official letterheads will be disregarded and the application will not be reviewed.
- **International students must submit official Test of English as a Foreign Language (TOEFL) scores** with a minimum total of 550 on the paper-based test, OR 213 on the computer-based test, OR 79 on the Internet-based test. International English Language Testing System scores of 6.5 or better will also be accepted.

## HOW TO APPLY

Please apply online by clicking the "Apply Online" icon at: [www.poly-eng.uakron.edu/grad\\_requirements.htm](http://www.poly-eng.uakron.edu/grad_requirements.htm)

Please note that ALL application materials, forms, reference letters and scores must be submitted to the Office of Graduate Admissions and not to the Department of Polymer Engineering.

Applications are processed throughout the year for fall semester admission; however, priority consideration is given to those students whose files are completed by Jan. 15 each year. Questions regarding admission or the application process may be directed to the Graduate School or to the Department of Polymer Engineering at:

**Office of Graduate Admissions**  
469 Polsky Building  
The University of Akron  
Akron, OH 44325-2101  
Phone 330-972-7663  
Fax 330-972-6475  
E-mail: [gradschool@uakron.edu](mailto:gradschool@uakron.edu)

**Department of Polymer Engineering**  
107 Polymer Engineering Academic Center  
The University of Akron  
Akron, OH 44325-0301  
Phone: 330-972-5281  
Fax: 330-258-2339



## MASTER OF SCIENCE IN POLYMER ENGINEERING

The master of science degree is awarded to a student after the completion of a prescribed program of course studies, basic engineering examination and a research project that leads to the preparation of a written thesis describing the research in a scholarly manner. A student and his/her adviser can plan any additional courses necessary to solve the thesis research project and/or that allow for the academic and professional growth of the student.

All requirements for the master's degree must be completed within six years after beginning graduate-level coursework at The University of Akron or elsewhere. A minimum of two-thirds of the total graduate credits required must be completed at The University of Akron.

Up to one-third of the total credits required for a master's degree may be transferred in from another accredited college or university or may come from a prior or concurrent degree at The University of Akron. All transfer credit must be at the "A" or "B" level (4.00 to 3.00) in graduate courses. The credits must be relevant to the polymer engineering program and must fall within the six-year time limit to complete degree requirements.

A student seeking to transfer credit must have full admission to and be in good standing at The University of Akron, as well as at the university where the transfer credits were originally earned. Transfer credit will not be recorded until a student has completed 12 semester credits at UA with a grade point average of 3.00 or better. While the credit hours for transfer courses will be added to student's total credit hours at The University of Akron, the grades received for transfer courses will not be counted in a student's UA grade point average.

## MASTER OF SCIENCE DEGREE REQUIREMENTS

Currently, to achieve the M.S. in Polymer Engineering, a student must successfully complete:

- **30 credits in polymer engineering, including:**
  - 12 credits of polymer engineering core courses
  - 6 credits of polymer engineering 600-level electives
  - 6 credits of technical electives
  - 6 or more credits of research
- **A Basic Engineering exam OR course 9841:650, Basic Engineering for Polymer Engineers**
- **A written thesis**
- **An oral defense of the thesis**

# DEPARTMENT OF



**Dr. Sadhan C. Jana** – Department Chair and Professor

1993 - Ph.D. in Chemical Engineering, Northwestern University  
phone: 330-972-8293 e-mail: janas@uakron.edu

Novel nanocomposite materials exhibiting shape memory behavior; bottom-up nanocomposite synthesis by molecular self-assembly in chaotic mixers; nanofiller orientation and optimum dispersion by chaotic mixing technology; polymer-reinforced aerogels for acoustic and thermal insulation; shape memory aerogel composites; expanded graphite-filled epoxy composite bipolar plates for fuel cells; chemical and engineering issues of nanocomposite product designs; processability-conductivity-composition relationships of conductive polymeric compounds of carbon nanofibers, and carbon nanotubes; structure development in low shear processing.



**Dr. Mukerrem Cakmak** – Director-University of Akron site, Center for Multifunctional Polymer Nanomaterials and Devices; Associate Director, Akron Global Polymer Academy; and Professor

1984 - Ph.D. in Polymer Engineering, University of Tennessee  
phone: 330-972-6928 e-mail: cakmak1@uakron.edu

Identification, modeling and simulation of complex structural mechanisms, particularly stress-induced crystallization that takes place during the course of polymer processing operations of a wide range of polymers (high temperature thermoplastics and their blends, as well as nano particle filled systems) subjected to melt as well as rubbery state deformation; the relationship between thermo-mechanical history applied by fiber spinning, film blowing, biaxial stretching and injection molding and evolved structure and properties; real time measurements of true mechano-optical and mechano-electrical properties of polymers undergoing uni and biaxial deformation for photonics applications. His latest interest is developing precision manufacturing platforms such as hybrid solution casting/electrospinning process used to produce functional polymers, including electrically conductive transparent films and flexible photovoltaics.



**Dr. Kevin Cavicchi** – Assistant Professor

2003 - Ph.D. in Materials Science and Engineering, University of Minnesota  
phone: 330-972-8368 e-mail: kac58@uakron.edu

Thermodynamics of multi-component polymer systems (block copolymers, graft copolymers, polymer blends); directed self-assembly of nano-structured and hierarchically ordered materials; synthesis of polymers with novel architectures and chemical modification of polymers; ion-conducting polymers.



**Dr. Chang Dae (Paul) Han** – Benjamin Franklin Goodrich Professor

1964 - Sc.D. in Chemical Engineering, Massachusetts Institute of Technology  
phone: 330-972-6468 e-mail: cdhan@uakron.edu

Polymer rheology; polymer physics; polymer processing; block copolymers; liquid-crystalline polymers; organoclay nanocomposites; computational polymer fluid dynamics.





# POLYMER ENGINEERING FACULTY

## Dr. Hendrik Heinz – Assistant Professor

2003 - Ph.D. in Materials Science and Engineering, Swiss Federal Institute of Technology (ETH) Zurich, Switzerland  
phone: 330-972-7467 e-mail: hh29@uakron.edu

Atomistic and coarse grain simulation of (bio)organic-inorganic interfaces in biomaterials, nanocomposites and organic-based semiconductors; adsorption of polyelectrolytes on mineral and nanoparticle surfaces; development of models and simulation parameters (e.g., force fields) for conjugated polymers, quantum dots and charge transport in photovoltaic devices; analysis of nanoscale pressure, thermodynamical properties and responses to stimuli (mechanical, optical, electrical).

## Dr. Avraam I. Isayev – Distinguished Professor

1970 - Ph.D. in Polymer Engineering, Institute of Petrochemical Synthesis, USSR Academy of Sciences, Moscow  
phone: 330-972-6673 e-mail: aisayev@uakron.edu

Polymer and composite processing, process modeling, rheo-optics, rheology and constitutive equations of polymers, oil products and disperse systems; the injection, co-injection, transfer, compression and gas-assisted injection molding; processing of self-reinforced or in-situ composites based on blends of flexible and thermotropic liquid crystalline polymers; decrosslinking of thermosets, devulcanization of rubbers and in-situ copolymerization in immiscible blends with the aid of ultrasonic waves; high temperature and high performance nanocomposites containing nanofibers and nanotubes.

## Dr. Thein Kyu – Distinguished Professor

1980 - Ph.D. in Polymer Chemistry, Kyoto University, Japan  
phone: 330-972-6672 e-mail: tkyu@uakron.edu

Phase diagrams of polymer blends and liquid crystalline polymers; phase separation dynamics; holographic polymer dispersed liquid crystals; reaction-induced crystallization and phase separation; phase field modeling on polymer crystallization; molecular composites; toughened plastics; ionic polymers; structural aspects of fabricated polymeric materials.

## Dr. Arkady I. Leonov – Professor

1962 - Ph.D. in Theoretical Mechanics, Institute of Problems in Mechanics, USSR Academy of Sciences, Moscow;  
1969 - Ph.D. (Doctor of Science, Habilitation) in Mathematical Physics, Karpov's Physico-Chemical Research Institute, Moscow  
phone: 330-972-5138 e-mail: leonov@uakron.edu

Thermodynamic modeling, mathematical analysis and basic experiments for polymer melts, filled polymers and disperse systems; theoretical/numerical analysis of complex viscoelastic flows; analysis of instabilities and melt fracture phenomena; chemorheology and chemoprocessing of polymers and their filled compositions; physics and mechanics of polymer solids - hybrid models, nonlinear viscoelasticity, necking and crazing; theoretical/experimental studies of nematic LC, LCP, LC elastomers, and clay-nanoparticle polymer suspensions; theory of Brownian motion of shaped particles in polymer fluids; variational analysis of nonlinear boundary problems for inelastic media.

## Dr. Kyonsuku Min – Associate Professor

1984 - Ph.D. in Polymer Engineering, University of Tennessee  
phone: 330-972-6675 e-mail: kmin@uakron.edu

Phase morphology, rheology and processing of polymer blends; mixing phenomena and process technology for elastomers; reactive blending process.

## Dr. Erol Sancaktar – Professor

1979 - Ph.D. in Engineering Mechanics, Virginia Polytechnic Institute and State University  
phone: 330-972-5508 e-mail: erol@uakron.edu

Mechanical behavior of adhesives, adhesive joints, polymers and composites; materials characterization; viscoelasticity; fracture mechanics; experimental and theoretical solid mechanics; design and manufacture with novel materials; development of analytical (mechanics) and experimental methods for the optimization of nano-to-macro aspects of adhesion and adhesive-substrate interphases; excimer laser applications; electrically conductive adhesives and polymers; adhesion and polymer welding; nanocomposites; nanopatterning, nanoprocessing and nanodevices.

## Dr. Mark D. Soucek – Associate Professor

1990 - Ph.D. in Inorganic Chemistry, University of Texas  
phone: 330-972-2583 e-mail: msoucek@uakron.edu

Powder coatings; coatings technology in high solids, waterborne, UV-curable and powder coatings; environmentally benign coatings; nanophase inorganic/organic coatings; study of crosslinking processes.

## Dr. James L. White – Harold A. Morton Professor

1965 - Ph.D. in Chemical Engineering, University of Delaware  
phone: 330-972-6643 e-mail: mj4@uakron.edu

Twin screw extrusion and batch and continuous mixing; rheology and processing particle-filled elastomers and plastics; structure development in processing (fiber formation, film extrusion, blow molding, injection molding, etc.); polymer blends.





## DOCTOR OF PHILOSOPHY IN POLYMER ENGINEERING

The doctorate in Polymer Engineering is awarded to a student after the completion of a prescribed program of course studies, preliminary examinations and a research project that leads to the preparation of a written dissertation describing the research in a scholarly manner. A student and his/her adviser can plan any additional courses necessary to aid in the dissertation research project and/or that allow for the academic and professional growth of the student. A master's degree is not a prerequisite for the doctorate; however, the first year of study will be substantially the same for both the master's and the doctoral student.

All doctoral requirements must be completed within 10 years of starting coursework at The University of Akron or elsewhere. This refers to graduate work after receipt of a master's degree or the completion of 30 semester credits.

A minimum of 50 percent of the total graduate credits required must be completed through The University of Akron with at least two consecutive semesters of full-time study and involvement in departmental activities conducted in residence at the University.

Up to 50 percent of the total credits required for a doctoral degree may be transferred from another accredited college or university, or may come from a prior or concurrent degree at The University of Akron. No more than 30 semester credits may be transferred from a single master's degree. All transfer credit must be at the "A" or "B" level (4.00 to 3.00) in graduate courses. The credits must be relevant to the polymer engineering program and must fall within the 10-year time limit to complete degree requirements.

A student seeking to transfer credit must have full admission to and be in good standing at The University of Akron, as well as at the university where the transfer credits were originally earned. Transfer credit will not be recorded until a student has completed 12 semester credits at UA with a grade point average of 3.00 or better. While the credit hours for transfer courses will be added to a student's total credit hours at The University of Akron, the grades received for transfer courses will not be counted in a student's UA grade point average.

## DOCTOR OF PHILOSOPHY DEGREE REQUIREMENTS

**Currently, to achieve the Ph.D. in Polymer Engineering, a student must complete:**

- **96 credits in polymer engineering, including:**
  - 12 credits of polymer engineering core courses
  - 9 credits of polymer engineering 600-level electives
  - 10 credits of polymer engineering 700-level electives
  - 3 credits of math
  - 2 credits of technical electives (credits may be taken from polymer engineering, polymer science, engineering, science, or math)
  - 60 credits of preliminary research and doctoral dissertation (12 credits or more must be of doctoral dissertation)
- **A Basic Engineering exam OR course 9841:650, Basic Engineering for Polymer Engineers**
- **Ph.D. qualifying examinations in six subject areas:**
  - Thermodynamics and Polymer Solution Properties
  - Polymer Characterization and Structure Development
  - Polymerization and Polymer Reactor Engineering
  - Rheology
  - Polymer Processing
  - Mechanical Properties of Polymers
- **A language requirement**
- **Presentation of a Graduate Research Seminar as part of 9841:601.** After beginning the fourth year of study, but before graduating, each doctoral student is required to present his/her research during one seminar offered in one semester as part of the 9841:601 seminar series.
- **An oral presentation of research proposal**
- **A written dissertation**
- **An oral defense of the dissertation**

## COURSES

### Core courses:

9841:611	Structural Characterization of Polymers with Electromagnetic Radiation	2 credits
9841:621	Rheology of Polymeric Fluids	3 credits
9841:622	Analysis and Design of Polymer Processing Operations I	3 credits
9841:631	Engineering Properties of Solid Polymers	2 credits
9841:641	Polymeric Materials Engineering Science	2 credits

### 600-level polymer engineering electives:

9841:601	Polymer Engineering Seminar	1 credit
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*Note - All M.S. students must register for 9841:601 two times while doctoral students must register four times. While the one credit earned in this course will count only one time toward degree requirements, all grades will be counted and calculated into a student's GPA.*

9841:623	Analysis and Design of Polymer Processing Operations II	3 credits
9841:650	Basic Engineering for Polymer Engineers	3 credits
9841:651	Polymer Engineering Laboratory	3 credits

*Note - All full-time students must take 9841: 651 one time.*

9841:661	Polymerization Reactor Engineering	3 credits
9841:675	Carbon-Polymer Nanotechnology	3 credits
9841:680	Polymer Coatings	3 credits

### 700-level polymer engineering electives:

*Note - Electives may also be taken from other departments such as polymer science, chemical engineering, mechanical engineering, physics, mathematics, computer science, or other engineering disciplines.*

9841:712	Rheo-Optics of Polymers	2 credits
9841:720	Molecular Aspects of Polymer Rheology	2 credits
9841:721	Rheology and Processing Two-Phase Polymer Systems	2 credits
9841:722	Advanced Modelling of Polymer Processing	2 credits
9841:723	Rheology and Processing of Elastomers	2 credits
9841:724	Advanced Extrusion and Compounding	2 credits
9841:725	Chemorheology and Processing of Thermosets	2 credits
9841:727	Advanced Polymer Rheology	2 credits
9841:731	Stress Analysis of Polymers and Composites	2 credits
9841:745	Liquid Crystals	2 credits
9841:761	Injection and Compression Molding Fundamentals	2 credits
9841:773	Advanced Polymer Coating Technology	2 credits
9841:778	Advanced Functional Polymers	2 credits
9841:797	Advanced Topics (announced) in Polymer Engineering	2 credits
9841:715	Advanced Characterization of Functional Polymers	3 credits
9841:728	Numerical Methods in Polymer Engineering	3 credits
9841:747	Polymer Colloids	3 credits
9841:749	Phase Transitions in Polymer Blends and Alloys	3 credits
9841:770	Polymer Nanocomposites	3 credits
9841:777	Modeling of Nanoscale Materials	3 credits
9841:797	Advanced Topics (announced) in Polymer Engineering	2-3 credits

### Research:

9841:898	Preliminary Research	1-15 credits
9841:899	Doctoral Dissertation	1-15 credits

*Note - Doctoral students will register for Preliminary Research hours until they successfully pass required sections of the Ph.D. qualifying exams. After that,*



## FUNDING YOUR EDUCATION

The Department of Polymer Engineering is currently able to provide financial assistance to a select number of qualified, full-time graduate students each year. Funds for student assistantship support are available from several principal sources, including:

- The Graduate School at The University of Akron;
- Externally-funded research activities such as research contracts or grants obtained by a professor in polymer engineering; and,
- Private companies, individual donors, and government and public foundations that give specific grants to the department or to individual students for fellowships, scholarships, or other awards.

Outside the Department of Polymer Engineering, there are funding options available to students from:

- Assistantships in other departments;
- Tuition scholarships/fellowships – generally awarded to full-time students in conjunction with an assistantship. The tuition scholarship provides for tuition remission while the assistantship provides a biweekly stipend. There are occasional instances where the Graduate School will allow a “stand alone” tuition scholarship to a qualified student in the first year of study.
- Student employment; and,
- Installment Payment Plan through the University.

## POLYMER ENGINEERING STUDENT ORGANIZATION (PESO)

All graduate students in polymer engineering are eligible for free membership in PESO. This popular student group was formally organized shortly after the founding of the department. The purpose of the group is to provide a professional and social forum for all graduate students interested in the discipline of polymer engineering. Some of the many activities of PESO include:

- Attendance at professional conferences such as ANTEC;
- Hosting seasonal or holiday parties or picnics;
- Coordinating various career workshops and seminars that address professional development;
- Organizing athletic teams for intramural sports as well as individual sporting events; and,
- Participation in University governance to represent current graduate student views on educational issues.



# AFTER GRADUATION

**Polymer engineering graduates go on to productive and successful careers in private industry, government and education. Here's a sampling of employers of UA polymer engineering alumni:**

3M Company  
A. Schulman, Inc.  
Abbott Labs  
Ahlstrom  
Akron Rubber Development Lab  
ALCOA  
Alltel  
Applied Nanotech  
Basell Polyolefins  
BASF Corporation  
Baxter Healthcare  
Boston Scientific  
ColorTech  
Cooper Tire  
Crompton Corporation  
Delphi Packard  
Dow Chemical  
DSM Thermoplastic  
DuPont  
Essilor of America  
ExxonMobil Chemical  
Freundenberg-Nok  
GE Plastics  
GLS Corporation  
The Goodyear Tire & Rubber Company  
Guidant  
Honeywell  
Hyundai / Kia

Johns Manville  
Johnson & Johnson  
Kumho Tire  
LG Chemical  
Lexmark  
MFG Research  
MRI Medical  
Mitsui Chemical  
NanoSelect Sensors  
NASA  
NIST  
National Composite Center  
Nova Chemicals  
Noveon  
Peace Corps  
Pirelli  
PolyOne  
Rensselaer Polytechnic  
St. Jude Medical  
Samsung Electronics  
Samyang Corporation  
Saudi Aramco  
Saudi Basic Industries  
Schlumberger  
Sealed Air / Cryovac  
Teknor Apex  
University of North Florida  
University of Georgia  
U.S. Naval Air Warfare Center

The University of Akron is the public research university for Northern Ohio. It is the only public university in Ohio with a science and engineering program ranked in the top five nationally by U.S. News & World Report. Serving 24,700 students, the University offers approximately 300 associate, bachelor's, master's, doctoral and law degree programs and 100 certificate programs at sites in Summit, Wayne, Medina and Holmes counties. For more information, visit [www.uakron.edu](http://www.uakron.edu).

### Directions to the Polymer Engineering Academic Center

**FROM THE NORTH: ROUTE 8** — Take Route 8 South to the Buchtel Avenue/Carroll Street exit. Turn right on Buchtel and follow it until it ends at Hill Street. Turn right onto Hill and drive about 50 meters to South Forge Street. The Polymer Engineering Academic Center is located at the junction of Hill and Forge streets. Visitor parking meters are available in Lot 45.

**FROM THE NORTH: I-77** — Take I-77 south to Route 8 North. Use the first exit from Route 8 North, Buchtel Avenue/Carroll Street. Go to the second traffic light and turn left onto Buchtel Avenue. Follow Buchtel until it ends at Hill Street. Turn right onto Hill and drive about 50 meters to South Forge Street. The Polymer Engineering Academic Center is located at the junction of Hill and Forge streets. Visitor parking meters are available in Lot 45.

**FROM THE SOUTH** — Take Interstate 77 North to Route 8 North. Use the first exit from Route 8 North, Buchtel Avenue/Carroll Street. Go to the second traffic light and turn left onto Buchtel Avenue. Follow Buchtel until it ends at Hill Street. Turn right onto Hill and drive about 50 meters to South Forge Street. The Polymer Engineering Academic Center is located at the junction of Hill and Forge streets. Visitor parking meters are available in Lot 45.

**FROM THE EAST** — Take Interstate 76 West to Route 8 North. Use the first exit from Route 8 North, Buchtel Avenue/Carroll Street. Go to the second traffic light and turn left onto Buchtel Avenue. Follow Buchtel until it ends at Hill Street. Turn right onto Hill and drive about 50 meters to South Forge Street. The Polymer Engineering Academic Center is located at the junction of Hill and Forge streets. Visitor parking meters are available in Lot 45.

**FROM THE WEST** — Take Interstate 76 East to Interstate 277/Route 224 East to 77 North. Use the first exit from Route 8 North, Buchtel Avenue/Carroll Street. Go to the second traffic light and turn left onto Buchtel Avenue. Follow Buchtel until it ends at Hill Street. Turn right onto Hill and drive about 50 meters to South Forge Street. The Polymer Engineering Academic Center is located at the junction of Hill and Forge streets. Visitor parking meters are available in Lot 45.

The University of Akron

