Rooted in STEM

Michigan Tech / GRAD SCHOOL
2015 ANNUAL REPORT
Record Enrollment Drives Growth

Fall semester 2015 brought Michigan Tech another record. For the seventh straight year, graduate enrollment has reached a record high. In addition, we continue to have the largest Peace Corps Master’s International program in the nation. We have more international graduate students on campus than ever before, and they bring a richness to our local community that benefits everyone in the area.

We are fortunate to have added a new person to the Graduate School this year; Dr. Pushpalatha “Pushpa” Murthy joined us as associate dean. In her new capacity she is providing leadership related to assessment of learning among graduate students. She is also undertaking a variety of other initiatives that will improve students’ experiences here at Michigan Tech. Dr. Murthy joined us after completing a three-year term as a program director in the Division of Graduate Education at the National Science Foundation (NSF) in Arlington, Virginia. We are very fortunate to be able to benefit from everything Pushpa learned from her work at NSF.

In parting, I want to thank all of the students, faculty, and staff who have made the last 10 years of my professional life the most rewarding I have ever experienced. We have done great things together and we should all be proud. Of course, the most credit for our successes must go to our students who continually impress all of us with their wonderful achievements.

Jacqueline E. Huntoon
Provost and Vice President for Academic Affairs
Acting Dean of the Graduate School
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Peace Corps Master’s International

Michigan Technological University is home to the largest Peace Corps Master’s International program in the country with 32 graduate students serving overseas. Through the program, students spend two semesters on campus studying to prepare for two years of service in the Peace Corps. Following their service, students return to Michigan Tech for one additional semester to complete their master’s degree. Students in the program are able to apply what they have learned in the classroom through creative problem solving in the communities they serve, working in agriculture and food security, environmental conservation, water and sanitation, public health, and education. We pair our students with a network of more than 150 alumni to help them become global leaders in their field.

PEACE CORPS MASTER’S INTERNATIONAL PROGRAMS
- Applied Natural Resource Economics
- Applied Science and Education
- Biological Sciences
- Civil and Environmental Engineering
- Computer Science
- Electrical and Computer Engineering
- Forestry and Natural Resources
- Mechanical Engineering
- Natural Hazards Mitigation (Geology)
- Rhetoric, Theory, and Culture

Michigan Tech offers many graduate degrees in STEM (science, technology, engineering, and mathematics) disciplines, and our international enrollment continues to grow as a result. Our Peace Corps Master’s International programs attract many domestic students to the Graduate School.
Leading Women in STEM

TAYLORIA ADAMS
PHD, CHEMICAL ENGINEERING
Seeking to make a difference using the power of math and the tools of engineering, Tayloria Adams came to Michigan Tech to further her understanding of biotechnology. Through her research, she was able to quantify the cellular response to electric fields, focusing on mesenchymal stem cells. The goal was to identify membrane capacitance for use as a biomarker in cell sorting therapeutic options for Type I diabetes.

Originally from Chesterfield, Virginia, Dr. Adams completed bachelor’s degrees in applied mathematics and chemical and life science engineering. She completed her PhD in December 2014, studying chemical engineering under the direction of Adrienne Minerick.

She was supported through a variety of internal and external fellowships, including the GEM Fellowship, the King-Chavez-Parks Fellowship, the Dean’s Fellowship, and the Finishing Fellowship. She values the support she received, including help from a team that always went the extra mile.

Dr. Adams is a postdoctoral researcher in the Neurology Department at the University of California Irvine exploring the membrane capacitance of mouse and human neural stem and progenitor cells using dielectrophoresis. Her goal is to develop an effective method to sort these cells to further study them as treatment options for neurodegenerative diseases.

JENNIE TYRRELL
PHD CANDIDATE, CIVIL ENGINEERING (SPRING 2018)

Jennie Tyrrell, of Fort Pierce, Florida, became aware of Michigan Tech through MindTrekkers, an outreach program that travels the US bringing STEM education to K-12 students. After working in design-build construction for 16 years, she decided to pursue a PhD in civil engineering to become a leader in education and outreach.

Tyrrell is focused on water resources under the direction of Brian Barkdoll. Her research explores the sensitivity of sediment concentrations and transport rate to water temperature fluctuations. As part of her research, Tyrrell is developing a quantitative tool to help decision-makers better plan for sediment management. Her primary goals are to provide river managers with a tool to forecast potential outcomes and plan budgets accordingly for projects such as dredging, erosion control, and flood mitigation. This will help managers identify river vulnerabilities, determine healthy sediment loads, and predict corresponding survival thresholds in aquatic habitats. She has also contributed to the Mi-STAR curriculum reform project.

After graduation, Tyrrell would like to weave her industry experience with her research background to serve either as a university faculty member or an outreach coordinator in STEM fields.

KENDRA WRIGHT
PHD CANDIDATE, PHYSICS (FALL 2016)

When Kendra Wright first hiked the landscape of the Azores (an island chain near Portugal) with research equipment strapped to her back, she looked out over the blue sea to the west and inhaled air that left North America eight days earlier. Her research explores the optical properties of aerosol particles in the atmosphere, analyzing the impact of aging on particle morphology.

Because its remote location is largely void of human impact, the Azores provide her team with the opportunity to analyze eight-day-old dust plumes from the US. This year she has been working to develop a new photoacoustic spectrometer that measures absorption due to atmospheric aerosol. She hopes to bring the device to the Azores for testing.

Hailing from Lake Leelanau, Michigan, Wright completed her undergraduate degree at Northern Michigan University with bachelors’ degrees in both physics and mathematics. She is currently working toward a PhD in physics under the direction of Claudio Mazzoleni.

Wright was awarded a NASA Fellowship, allowing her to pursue research on a full-time basis. In addition, the fellowship gives her access to post-doctoral positions. Following graduation, she would like to work in research and development.
Improving STEM Education

Students at Michigan Tech are committed to STEM—and are sharing their passion with pre-college students.

The Herbert H. and Grace A. Dow Foundation has funded a three-year, $5 million grant for Michigan Tech to implement the Michigan Science Teaching and Assessment Reform (Mi-STAR) project. Mi-STAR enhances STEM engagement for students across Michigan. Jacqueline Huntoon, acting dean of the Graduate School, serves as the principal investigator.

The grant was awarded based on Tech’s proposal to develop a new curriculum for grades 6-8 that integrates the science disciplines and engineering, and engages students in solving real-world problems. Mi-STAR will also develop a new model for teacher education and teacher professional development in integrated science. These will prepare middle school teachers to engage students in science and engineering practices, while emphasizing core ideas and cross-cutting concepts from multiple science disciplines and engineering.

Huntoon works in collaboration with fellow Michigan Tech faculty members Brad Baltensperger, Brenda Bergman, Amy Lark, and Chris Wojick. The grant will also engage Mi-STAR team members from Grand Valley State, Western Michigan, Saginaw Valley State, Central Michigan, Michigan State, and Eastern Michigan Universities. External advisory board members are drawn from the Michigan Department of Education, Michigan Science Teachers Association, American Geosciences Institute, American Chemical Society, American Institute of Biological Sciences, and the American Physical Society.

To test and research the new educational practices, the Mi-STAR team works with various Michigan school districts. If the proposed STEM education reform is successful, the process may become a model for integrated STEM education across the United States.

NEW GRAD SCHOOL POSITION

Last year, Alexandria Guth joined the staff of the Graduate School as the online and interdisciplinary graduate program coordinator. This position is the first of its kind in the School and was developed to provide support for online and interdisciplinary graduate degree programs.

She serves as a valuable resource for students and faculty by tracking progress of online degree programs and monitoring assessment and accreditation of the programs. Developing policies and procedures related to online learning is another part of her role ensuring each program adheres to applicable laws and regulations, while addressing issues of authorization of online programs across the United States as well as other countries.

Guth also assists with graduate school student recruiting, website management, and reviews of theses and dissertations. In her role, she is committed to learning new ways to improve online and interdisciplinary programs at Michigan Tech.

“I am excited to fill this new position in the Graduate School. Working on the administrative and compliance side of online education will allow us to offer our programs to new regions and populations,” said Guth. “Having previously taught online courses at the graduate and undergraduate level, I am keenly aware of how important online options can be in reaching non-traditional students. Expansion of our online presence will allow more people to take advantage of the expertise found at our University and it’s an interesting challenge to make that happen.”
It was at the Mayo Clinic in Rochester, Minnesota that Emily Shearier fell in love with research. Initially on track for a medical career, the New London, Wisconsin, native took advantage of the Summer Undergraduate Research Fellowship program in her third year studying biology at Michigan Tech. For Shearier, the program helped her realize that the thrill of discovery and problem solving she was experiencing through research could become a lifelong passion and a career.

Drawn to applied research, she set forth on a new path and enrolled in a doctoral program in biomedical engineering. Shearier was drawn to her advisor, Feng Zhao, based on her research in adult stem cells. There are numerous applications for stem cells within the body, particularly mesenchymal stem cells, and the opportunity was exciting to Shearier. Once mesenchymal stem cells are taken from a patient’s bone marrow or fatty tissue they can be used to construct new cells for various parts of the body.

The manipulation of these stem cells offers enormous potential in cancer research, heart disease mitigation, and neural regeneration. One specific application is with individuals who face circulation issues and a slower healing process due to diabetes. Through Shearier’s stem cell construct, a cluster of cells may be injected into diabetic wound sites to aid in the healing process.

The cells also have the potential to benefit patients with breast cancer who have had their lymph nodes removed. In many cases, removal can cause lymphedema, or swelling of the limbs due to the lack of lymph fluid released to the impacted limb. It may be possible in the future for these constructed cells to be inserted to re-establish the flow of the lymph fluid. She realizes that while her research is years away from possible treatment in humans, the potential for impact is real.

“I am amazed at the potential of stem cell research; that the stem cell applications I am exploring in my studies could help improve the lives of patients,” said Shearier.

She has been funded both as a graduate teaching assistant (GTA) and through various research projects. While she enjoys teaching benchtop experiments as part of her role as a GTA, she would like to obtain a finishing fellowship from the Graduate School to help fund her final semester as she focuses on her dissertation.

She participated in the December 2015 graduation ceremony and will complete her dissertation in the spring semester before pursuing a position in industry. Shearier’s long term goal is to lead a research laboratory—a job worthy of her love and dedication.

For the Love of Research
Giving Opportunities
To fund graduate students like Emily Shearier throughout the research process, the Michigan Tech Graduate School has set up a variety of giving opportunities.

DEAN’S FELLOWSHIP: Each year, the Graduate School provides partial support for 10 fellowship recipients in their first year of a PhD program to attract qualified PhD candidates and diversify the academic community.

DOCTORAL FINISHING FELLOWSHIP: Created to assist PhD candidates in completing their dissertation in their final semester of graduate school, the Doctoral Finishing Fellowship recognizes students who are contributing to the University and need support to complete their degrees.

GRADUATE SCHOOL GOAL PROGRAM FUND: The newly created Graduate School GOAL Program Fund was established to help new international graduate students succeed at the University through a six-week program introducing them to the local area and English-language instruction.

GRADUATE PEACE CORPS FELLOWSHIP: Students enrolled in Michigan Tech’s Peace Corps Master’s International Program are able to better serve in the sustainable development of third-world countries through the Graduate Peace Corps Fellowship.

GRADUATE TRAVEL FUND: The Graduate School Travel Fund helps students with travel expenses and conference fees, allowing them to present their research and grow their professional networks at academic conferences across the country.

GRADUATE SCHOOL ENHANCEMENT FUND: Students are acknowledged and rewarded for their hard work through celebratory events, cash awards, and distinctive gifts through the Graduate School Enhancement Fund.

SPONSOR A GRADUATE STUDENT: Full or partial financial support can be provided to domestic graduate students with financial need.

LEARN MORE: mtu.edu/gradschool/giving

Earl R. and Ellanette F. Lind Memorial Endowed Fellowship in Electrical Engineering
This fellowship was established to provide support for students on the path toward a graduate degree in electrical engineering. Earl Lind received his BS and MS degrees in engineering from Michigan Tech before continuing on to earn a PhD in electrical engineering from the University of Wisconsin. During his career at Raytheon, he earned several patents, including one for sonar technology. His dedication to the engineering profession will continue through the support of this graduate fellowship.
The number of self-supported students seeking master's and PhD degrees continues to rise. These students provide their own funding or receive support from an employer or organization. The course-work-only master's degree programs are designed to help self-supported graduate students meet their career development needs.

Internal support for graduate students comes from teaching and research assistantships provided by Michigan Tech. Funding from fellowships, grants, and contracts provide support to externally funded students in both the PhD and master's degree programs.

Of the 374 students enrolled as first-time master's degree-seeking students, 23 percent are female, while 30 percent of the 92 students enrolled as first-time PhD candidates are female (Fall 2015).
Students

From Fall 2005 to Fall 2015, the Graduate School has experienced a steady increase in the number of applications received. Applications submitted to our graduate programs this year reached nearly 5,400, which is a 355 percent increase since 2005.

Michigan Tech granted 358 master’s and 75 PhD degrees during the 2014-15 academic year. The Graduate School has once again surpassed the University’s goal of granting 65 PhD degrees and 225 master’s degrees per year, totaling 433 degrees granted. The 2014-15 academic year represents another record for the most graduate degrees in Michigan Tech’s history.
More than 50 percent of Michigan Tech PhD recipients began working in industry or business following graduation, while less than 25 percent of PhD recipients from other high-research universities move on to positions within industry or business.

More than 60 percent of students graduating from Michigan Tech with a graduate degree depart with no debt from their undergraduate and graduate level studies, compared to nearly 47 percent of students from other high-research universities.

The median time-to-degree for a PhD from Michigan Tech is 7.3 years after starting graduate school, compared to 8.3 years at all other high-research universities.

Less than 29 percent of PhD recipients at high-research institutions are involved in research and development following graduation, compared to more than 69 percent of Michigan Tech’s PhD recipients.
**Graduate Tuition**

FULL TIME TUITION FOR ACADEMIC YEAR 2015-16

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**Graduate Stipend**

NORMALIZED MINIMUM STIPENDS FOR EIGHT-MONTH ACADEMIC YEAR 2015-16

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**Notes:**
- Resident Engineers
- Nonresident Engineers
- Full time tuition for academic year 2015-16
- Graduate stipend normalized for eight-month academic year 2015-16
GSG GRADUATE RESEARCH COLLOQUIUM
2015

Each spring, Graduate Student Government (GSG) sponsors the Graduate Research Colloquium (GRC) Poster and Presentation Competition. Last spring's event featured 88 participants, with 33 posters, and 55 presentations. The GRC provided graduate students from a variety of programs the opportunity to share research and gain experience presenting to colleagues.

Awards are given to students based on their research, posters, and presentations. At this year's GRC banquet, 14 awards were presented by the GSG, and 53 were given by the Graduate School. The banquet keynote speaker was Max Seel, provost and vice president for academic affairs.