THE UNIVERSITY OF TOLEDO

MASTER OF SCIENCE PHYSICS (Materials Science)

The University of Toledo graduate programs in the Department of Physics and Astronomy aim to develop exceptional personal and professional scientific skills, and engage students in cutting edge research with a world-class faculty, all within a supportive and creative learning environment.

UToledo graduate programs in Physics and Astronomy develop a strong and broad foundation in fundamental physics, while simultaneously teaching the mathematical and problem-solving skills necessary to advance knowledge of our physical world. Coursework is tailored to your specific area of research concentration, with flexibility, so you acquire the skills necessary to complete an innovative, important and original thesis research project.

UToledo boasts nationally and internationally recognized faculty members in physics and astronomy. Our M.S. in physics/materials science program is designed for students with a strong interest in learning about how important properties of materials depend upon the materials' structure and composition.

The study of materials is based on the relationship between the properties of a material (which determine its functionality), its structure and the way that the material is assembled. Materials science is inherently multidisciplinary and includes subjects from both basic sciences and engineering, and from physics and chemistry.

Physics Graduate Degree Highlights:

- **Financial support.** Graduate physics students are supported through teaching and research assistantships. We also offer incentive and stipend enhancements for exceptionally qualified applicants.
- **International reputation in photovoltaics.** Toledo and the State of Ohio have a long history of success in the photovoltaics industry. That history, along with The University of Toledo's expertise in photovoltaics science and technology, led to the creation of the Wright Center for Photovoltaics Innovation and Commercialization.
- **High-tech labs and research facilities.** UToledo physics graduate students have access to: state-of-the-art equipment in the Wright Center for Photovoltaics Innovation and Commercialization; on-campus, several parallel computing clusters, as well as the Ohio Supercomputer Cluster; and the Toledo Heavy Ion Accelerator (THIA).
- **Research opportunities.** Faculty and students in UToledo's Department of Physics and Astronomy work closely to conduct world-class research. Students in the M.S. degree program with the materials science option may conduct research involving: the theoretical study of equilibrium and non-equilibrium surface physics and materials science; strongly correlated electron systems including lanthanide organometallics and actinide intermetallic superconductors using X-ray absorption spectroscopy techniques, including XANES, EXAFS and RIXS; film growth mechanisms and structure to identify nucleation and growth behavior as well as phase changes in thin films; and much more.

PROGRAM OVERVIEW

Master of Science in Physics/Materials Science

The M.S. degree in physics with a materials science option is available. For this degree, a student must complete 30 hours of graduate credit including:

- PHYS 6140 (Fundamentals of Modern Physics), 6/8540 (Structure, Defects, and Diffusion), 6/8550 (Thermodynamics and Phase Transformation in Condensed Systems), and an additional 12 hours of graduate course credit in Physics with six of the 12 hours numbered above 6000 (no degree credit for PHYS 5900, 6010 or 6020).
- The student must present a satisfactory thesis based on directed research for no more than eight hours of degree credit.
- The remainder of the 30 required credit hours may be chosen from any courses approved for graduate credit not previously elected, with the approval of the student's committee.

In some cases, students working toward the Ph.D. may earn the M.S. without formal presentation of the M.S. thesis if they have: (1) passed the Ph.D. Qualifying Examination; (2) satisfied the course requirements for the M.S.; and (3) completed a research project under the supervision of a research advisor, resulting in acceptance for publication of a peer-reviewed research paper with the student as its first author. A substantial paper mainly written by the student is an acceptable substitution for a thesis and the peer review process substitutes for a thesis defense. Students meeting the above requirements may petition the department to grant the M.S. without formal presentation of a thesis.

We encourage you to contact individual faculty members directly to discuss research interests and opportunities.

Faculty contact information is available at: *utoledo.edu/nsm/physast/research*

Faculty Member	Area(s) of Research
Amar, Jacques	Theoretical condensed matter physics, materials science and surface physics
Anderson-Huang, Lawrence	Astrophysics, theory of stellar atmosphere
Bjorkman, Jon	Astrophysics, theory of stellar winds and disks, radiation transfer and simulations
Bjorkman, Karen	Circumstellar disks, polarimetry and stellar winds
Chandar, Rupali	Stellar populations, star and galaxy formation and evolution
Cheng, Song	Ion-atom and molecule collusions
Collins, Robert	Condensed matter physics, optical properties of solids and thin solid films
Cushing, Michael	Astrophysics, low-mass stars and brown dwarfs
Deng, Xunming	Materials science, thin films and photovoltaics
Ellingson, Randall	Ultrafast laser spectroscopy, photophysics of semiconductor nanocrystals and nanocrystalline films
Federman, Steven	Interstellar matter
Gao, Bo	Light-atom interactions, Bose-Einstein condensation and multibody interactions
Heben, Michael	Nanoscience, materials for energy conversion and storage
Irving, Richard	Atomic physics
Karpov, Victor	Theoretical condensed matter physics and photovoltaics
Khare, Sanjay	Theoretical condensed matter physics and materials science
Lee, Scott	Biophysics and high-pressure physics
Medling, Anne	Black hole growth and feedback
Medling, Scott	X-ray absorption spectroscopy
Megeath, S. Thomas	Plant and star formation
Ray, Aniruddha	Utilizing nanotechnology and optical imaging for biophysical and medical applications
Podraza, Nikolas	Condensed matter and photovoltaics
Smith, J.D.	Infrared and extragalactic astronomy
Visbal, Elijah	Cosmology simulations
Yan,Yanfa	Materials science, condensed matter and photovoltaics

What to expect when you graduate ...

Graduates of UToledo's master's program in physics typically advance to Ph.D. programs or take jobs in the industry.

Alumni of UToledo's graduate programs in physics have landed positions at institutions such as: University of Chicago, Baker College, Rensselaer Polytechnic Institute, Ohio State University, Pacific Northwest National Laboratory, NASA, Intel Corporation, Boeing Company, Chicago and the Raytheon Company.

Admission requirements, guidelines and application information can be found at: *utoledo.edu/graduate/apply*.

If you have questions about the application process, contact 419.530.4723 or *graduateonlineapplication@utoledo.edu*.

COLLEGE OF NATURAL SCIENCES AND MATHEMATICS
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Department of Physics and Astronomy
utoledo.edu/nsm/physast

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