More than 60 faculty members in the University of Chicago’s Departments of Physics and Astronomy and Astrophysics teach undergraduates. Through rigorous classes, access to some of the world’s finest research facilities, and opportunities to do research with leaders in the field, UChicago students join a rich tradition of physics and astronomy that dates back to the University’s origins.

Sample Courses

**Experimental Physics**
In this yearlong laboratory course, students conduct experiments in atomic, molecular, solid-state, nuclear, and particle physics. Lectures cover additional material as needed. The course content varies from quarter to quarter.

**Spacetime and Black Holes**
Students explore general relativity, beginning with a review of special relativity and four-dimensional spacetime followed by the basic tools of physics in a curved spacetime. The Schwarzschild solution describing both black holes and the exteriors of stars and planets is presented. The course concludes with Einstein’s equations, the dynamical equations relating energy and momentum to spacetime curvature.

**Nuclei and Elementary Particles**
This course covers nuclear structure; processes of transformation; observables of the nucleus; photons, leptons, mesons, and baryons; hadronic interactions; and the weak interaction. Students also examine passage of nuclear radiation through matter and the functions of accelerators and detectors.

**Statistical and Thermal Physics**
This course develops a statistical description of physical systems. Students explore elements of probability theory, equilibrium and fluctuations, thermodynamics, canonical ensembles, the equipartition theorem, quantum statistics of ideal gases, and kinetic theory.

**Electronics**
In this hands-on experimental course, students develop confidence, understanding, and design ability in modern electronics. Lab sessions explore the properties of diodes, transistors, amplifiers, oscillators, logic gates, digital circuits, analog-to-digital and digital-to-analog converters, and more.

A strong emphasis on hands-on experiment—including this electronics lab—helps physics majors at the University of Chicago master the broad fundamentals of the discipline.

Twelve-nine Nobel Prize winners in physics have studied, researched, or taught at the University of Chicago. Recently, members of the faculty have received the Kyoto Prize for Lifetime Achievements in Basic Science, the Maxwell Prize and Polymer Physics Prize from the American Physical Society, the National Science Foundation Career Award, and the Oersted Medal (the highest recognition of the American Association of Physics Teachers).

Five physics faculty members have received the National Medal of Science, the nation’s highest scientific honor. All four of NASA’s Great Observatories—the Chandra X-ray Observatory, the Compton Gamma-ray Observatory, the Fermi Gamma-ray Space Telescope, and the Hubble Space Telescope—are named for University of Chicago scientists. In 1942, Enrico Fermi and his research team were responsible for the best-known achievement of
UChicago physicists: the first controlled, self-sustaining nuclear chain reaction.

More recently, University of Chicago scientists have made important contributions in such fields as particle physics, cosmic rays, cosmology, superconductivity, and the dynamics of liquids and granular solids. Students also have the opportunity to participate in historic discoveries. In 1995, undergraduates were part of the research team that discovered the top quark.

Curriculum
The undergraduate curriculum in the Department of Physics includes a strong emphasis on laboratory experiment and covers the broad fundamentals necessary for graduate study in theoretical physics, experimental physics, or astronomy and astrophysics, as well as some fields of engineering and many interdisciplinary specialties. The curriculum is designed for maximum flexibility, while still covering the fundamentals of physics, to allow students to pursue specific interests within the field. One of the most popular areas of study within the physics major is the specialization offered in astrophysics. The University also offers a physics minor.

Undergraduates benefit from enrolling in courses at the graduate level in many areas of experimental and theoretical physics. Many undergraduates continue their study in physics at UChicago at the master’s or doctoral level.

Student Research
University of Chicago physics students can participate in research groups or do independent research under the supervision of a faculty member at the University’s Enrico Fermi, Computation, and James Franck Institutes, as well as the Institute for Biophysical Dynamics. Extensive research opportunities are also available to UChicago undergraduates at several off-campus facilities, including Fermilab, Argonne National Laboratory, Apache Point Observatory in New Mexico, and Yerkes Observatory in Williams Bay, Wisconsin.

The Department of Physics offers summer research opportunities through many avenues, including the Selove Prize and Research Experiences for Undergraduates (REU) programs. In addition, students interested in specific research topics may approach professors engaged in that field and become involved in their summer research teams. Summer research often continues into the academic year and leads to further opportunities. For many students, work on a research project culminates in writing a bachelor’s thesis. The following are just a few examples:

- Simone Wanless, AB’09, worked with Thomas Rosenbaum, Professor in Physics and the University’s provost, studying the magnetic properties of condensed matter systems at temperatures approaching absolute zero. While an undergraduate, Simone also worked at the Advanced Photon Source at Argonne National Laboratory with Professor Dion Heinz (geophysical sciences) as well as with Professor Howard Halpern (medical physics).
- Adam Anderson, AB’10, worked with Ed Blacher, Professor and Chair of Physics, on an experiment in northern France to detect very elusive elementary particles called neutrinos and study particular neutrino properties that are very hard to measure. As an undergraduate, Adam also performed theoretical studies in condensed matter physics.
- Kate Kamdin, AB’10, worked with Scott Wakely, Associate Professor in Physics, on building the upgrade of the VERITAS observatory for high-energy gamma-ray astronomy. In addition to work on VERITAS, Kate also worked on cosmic-ray astronomy and plasma physics while an undergraduate at UChicago.

Student Achievements
University of Chicago physics students are nationally recognized as leaders in their field. They consistently earn the most competitive national awards, scholarships, and fellowships, including the National Science Foundation Graduate Fellowship, the Department of Defense Graduate Fellowship, the Physical Science Consortium for Women and Minorities Fellowship, and the Goldwater, Gates, Churchill, and Rhodes scholarships. A number of UChicago undergraduates have achieved distinction as recipients of the Apker Award of the American Physical Society, an award presented to young physicists who have demonstrated great potential for future scientific accomplishment.

Extracurricular Activities
In addition to the Wednesday Astronomy and Astrophysics Colloquium, the Thursday Physics Colloquium, and the Friday Lecture, there are numerous seminars each week focusing on the latest developments in research. Recent lectures have included:

- “What Is Inside a Black Hole?”
- “Faster Than Light?”
- “Using a Fermi Gas to Create Bose-Einstein Condensates”
- “Time and String Theory”
- “Why Is the Universe Accelerating?”
- “Quantum Circuits”

Student organizations for physics majors include the Society for Physics Students and the Society of Women in Physics. Additional organizations that may interest physics students are WOPAT, which provides an informal weekly talk series where students present their research in astrophysics and related topics; the Ryerson Astronomical Society; and Students for the Exploration and Development of Space.