

Astronomy

Astronomy is the study of planets, stars, galaxies, and the universe as a whole, including how these originate and how they evolve in time. The principal pursuits of the astronomer are to extend our understanding of the physical nature of the universe and to convey this understanding to students and the general public.

Astronomy is an observational, not an experimental, science. With only a few exceptions (e.g., meteorites, moon rocks), astronomers cannot actually handle celestial objects and are totally dependent upon incoming radiation from space. Observations over the entire electromagnetic spectrum (gamma rays, x-rays, ultraviolet, visible light, infrared, microwave, and radio waves) are collected with both earth-based and space telescopes. These observations are then analyzed and interpreted using the tools of modern theoretical physics. The heart of the prospective astronomer's education therefore consists of a firm grounding in physics and the advanced mathematics at the core of physics.

Pursuing Astronomy at Ohio State

Students who major in astronomy should be ready to start their calculus and science courses as soon as they begin college. This means that their high school mathematics should go up to and include analytical geometry and trigonometry, and their high school science courses should include physics and chemistry. Experience with computers is also very helpful.

Students may declare astronomy as their major and register as students in the College of the Arts and Sciences at the arts and sciences office in Denney Hall. For additional information, students are encouraged to visit the Department of Astronomy on the fourth floor of McPherson Lab.

Program Educational Objectives

- Provide students with the opportunity to master the fundamental physics at the heart of modern astrophysics: classical mechanics, electromagnetism, quantum mechanics, and thermodynamics.
- Help students to develop problem-solving skills and the ability to analyze physical systems within the framework of theoretical physics.

- Provide students with an overview of research topics in contemporary astronomy.
- Provide students with a basic mastery of data analysis and statistics.
- Teach students to communicate effectively both orally and in writing.
- Provide students with the opportunity to develop a basic knowledge of and facility with computing.

Astronomy Requirements

Modern astronomy is essentially physics applied to the study of celestial objects. Therefore, the astronomy major curriculum looks very much like the physics major curriculum, although certain advanced physics courses and laboratories are not included for an astronomy degree. In addition, students who major in astronomy are required to take an introductory sequence in astronomy plus an advanced course and an observational techniques and data handling course.

Co-Curricular Opportunities

The astronomy department encourages all of its majors to pursue research with one of its faculty members in one of many active research programs. This is an excellent opportunity to learn about and become involved in the cutting edge of astronomy discoveries. Areas of research include galactic dynamics, quasars, cosmology, dark matter, stellar structure, and interstellar matter.

Honors & Scholars Opportunities

Ohio State offers the Honors & Scholars programs to create an environment of intellectual support and stimulation within a close-knit community of high-ability undergraduate students. Through these programs, students have access to smaller classes, undergraduate research opportunities, close working relationships with faculty, priority scheduling, and unique housing options.

Honors & Scholars programs represent great opportunities to be part of a smaller community within a large university. Good candidates for these programs will receive additional information after admission to the university. Learn more about the Honors & Scholars program at honors-scholars.osu.edu.

For more information, check these web sites:

Astronomy: www.astronomy.ohio-state.edu

Mathematical & Physical Sciences: mps.osu.edu

Ohio State: osu.edu

Admissions: undergrad.osu.edu

First Year Experience Programs: undergrad.osu.edu

Multicultural Center: multiculturalcenter.osu.edu

Curriculum Sample

This is a sample list of classes a student will take to pursue a degree in Astronomy. Since university students need more than specific education in a narrow field, they also will take classes to complete the General Education Curriculum (GEC). The GEC will allow students to develop the fundamental skills essential to collegiate success across major programs. Course work options satisfying the GEC often come from a variety of academic areas of study allowing students to tailor their GEC toward their interests. Note: This sample represents one of several possible paths to a degree in Astronomy, and not all of the courses listed below are required. Consult the departmental web site, www.astronomy.ohio-state.edu, for details on each specific track.

Freshman Year:

| | |
|--------------------------------|-----------|
| Astronomy Seminar | 2 |
| MPS Survey | 1 |
| Calculus and Analytic Geometry | 15 |
| Particles and Motion | 5 |
| Electricity and Magnetism I | 5 |
| Thermal and Quantum Physics | 5 |
| Programming | 4 |
| GEC (English composition) | 5 |
| GEC (foreign language) | 10 |
| Total hours | 52 |

Sophomore Year:

| | |
|--------------------------------|-----------|
| Calculus and Analytic Geometry | 5 |
| Differential Equations | 4 |
| Particles and Waves I | 4 |
| Particles and Waves II | 4 |
| Particles and Waves III | 4 |
| Solar System Astronomy | 5 |
| Stellar and Galactic Astronomy | 5 |
| Experimental Physics | 4 |
| Vector Analysis | 3 |
| Linear Algebra | 3 |
| GEC (foreign language) | 10 |
| Total hours | 51 |

Junior Year:

| | |
|--------------------------------|-----------|
| Astronomical Observations | 5 |
| Fields and Waves I | 4 |
| Fields and Waves II | 4 |
| Stellar Evolution or Cosmology | 5 |
| Quantum Physics I | 4 |
| Quantum Physics II | 4 |
| Theoretical Mechanics | 4 |
| GEC (second writing course) | 5 |
| GEC (arts and humanities) | 5 |
| GEC (social sciences) | 5 |
| GEC (historical study) | 5 |
| Total hours | 50 |

Senior Year:

| | |
|--------------------------------|-----------|
| Stellar Evolution or Cosmology | 5 |
| Statistical Physics I | 4 |
| Statistical Physics II | 4 |
| GEC (arts and humanities) | 5 |
| GEC (historical study) | 5 |
| GEC (social sciences) | 5 |
| GEC (senior writing course) | 3 |
| GEC (biological science) | 5 |
| GEC (diversity experience) | 5 |
| Senior Thesis or Electives | 8 |
| Total hours | 49 |

Career Prospects in Astronomy

Most professional astronomers have faculty positions at universities and colleges or are affiliated with universities and colleges through observatories and laboratories. For these astronomers, teaching and research are the major areas of activity. A PhD is generally required for faculty positions. Some professional astronomers are employed by the federal government directly (e.g., NASA) or by federally supported national observatories and laboratories (e.g., the National Optical Astronomy Observatories and the National Radio Astronomy Observatory). Others find employment in the aerospace industry or with companies involved in computation or image processing. A PhD in astronomy or physics is also generally required for these positions.

Individuals with an MS and/or a BS in astronomy may find opportunities to teach at the high school level. They may also find employment at observatories, planetariums, science museums, and in industry where they may assist in computational and observational research programs or participate in public education programs.

A BS in astronomy is excellent preparation for graduate study in astronomy and in some other physical sciences.

Beginning salaries for faculty positions at colleges and universities range from \$40,000 to \$70,000, depending upon the candidate's skills, previous experience (generally gained in postdoctoral research positions), and the size, quality, and competitiveness of the school.

Career Counseling and Job Placement

Ohio State's professional counseling staff specializes in personal development and academic growth. In addition, Ohio State's career and job placement offices around campus offer help in career planning and, as students move closer to graduation, resume writing, writing application letters, and job placement. These offices can help students match interests and strengths with a promising career. Ohio State recognizes that students' needs for career support services vary and offers special services for disabled students, veterans, minority students, and international students.

Revised July 2009. For the most up-to-date information on the astronomy program, please visit www.astronomy.ohio-state.edu.

Contact information:

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