

# ASTRONOMY- PHYSICS, BS

## ADVISING AND CAREERS

### ADVISING AND CAREERS DECLARE OR CANCEL THE MAJOR

Follow the process described in the Department of Astronomy website. (<https://www.astro.wisc.edu/undergraduate-program/prospective/>)

We encourage students to meet major advisors as early as possible. The undergraduate advisor, Evan Heintz (via Starfish (<https://wisc.starfishsolutions.com/starfish-ops/dl/instructor/serviceCatalog.html?bookmark=connection/38989/schedule>)), can assist students with curriculum and course scheduling, career planning, academic concerns, and overall performance and strategies.

Astronomy-Physics Majors should begin an Introductory Physics sequences as early as possible. See the major's Requirements section for the options. The sequence of PHYSICS 247 + PHYSICS 248 + PHYSICS 249 is recommended. However, students who transfer in courses from one of the other sequences (most commonly the PHYSICS 207 sequence), may usually continue with other major requirements rather than restarting with PHYSICS 247. Please contact Evan Heintz, the academic advisor, to confirm which courses are best for you.

### ADVISING FOR ADMITTED STUDENTS

Assistance choosing courses is available for students enrolling during Student Orientation, Advising, and Registration (SOAR (<https://soar.wisc.edu>)): contact Evan Heintz, [ehaintz@wisc.edu](mailto:ehaintz@wisc.edu).

### UNDERGRADUATE RESEARCH

If you are declared in the Astronomy-Physics major and are interested in pursuing a research position with a faculty member or scientist, please schedule an appointment (via Starfish (<https://wisc.starfishsolutions.com/starfish-ops/dl/instructor/serviceCatalog.html?bookmark=connection/38989/schedule>)) with the undergraduate advisor, Evan Heintz, who will discuss your interests and aid you in finding a position within the department.

### CAREER EXPLORATION

A good starting point for exploring careers is PHYSICS 301 Physics Today. This course, offered in Spring semesters, includes a weekly talk where a research topic is discussed by one of the Physics or Astronomy faculty.

SuccessWorks has also created the extremely helpful "What Can You Do with Your Major" Skills & Outcomes Sheet (<https://successworks.wisc.edu/what-you-can-do-with-your-major/>). Check out the specific Astronomy-Physics sheet to explore the major's transferable skills, alumni job titles, frequent employers of the major and words of advice from alumni who have found success following their passions.

### RECOMMENDED ADDITIONAL COURSES

#### Astronomy

Students are required to take ASTRON 200 The Physical Universe for the major. This course serves as a good introduction for all areas of astronomy. Due to this requirement, ASTRON 103 The Evolving Universe:

Stars, Galaxies, and Cosmology and ASTRON 104 Our Exploration of the Solar System are not recommended for students planning to major in Astronomy-Physics.

#### Mathematics

Please consult with the Astronomy academic advisor before choosing your Mathematics courses.

Specific math courses are requisites for the major's Physics and Astronomy courses. We also recommend additional math courses to best prepare you for upper-level coursework.

A typical math sequence is: MATH 221 Calculus and Analytic Geometry 1, MATH 222 Calculus and Analytic Geometry 2, MATH 234 Calculus--Functions of Several Variables, MATH 340 Elementary Matrix and Linear Algebra, MATH 319 Techniques in Ordinary Differential Equations, MATH 321 Applied Mathematical Analysis 1: Vector and Complex Calculus, MATH 322 Applied Mathematical Analysis 2: Partial Differential Equations.

- MATH 221 Calculus and Analytic Geometry 1: A requisite for PHYSICS 247 A Modern Introduction to Physics, PHYSICS 207 General Physics, and PHYSICS 201 General Physics.
- MATH 222 Calculus and Analytic Geometry 2: A requisite for ASTRON 200 The Physical Universe. Also, a requisite for PHYSICS 247 A Modern Introduction to Physics but can be taken concurrently.
- MATH 234 Calculus--Functions of Several Variables: A requisite for PHYSICS 248 A Modern Introduction to Physics but can be taken concurrently. If you are not taking the PHYSICS 247 A Modern Introduction to Physics + PHYSICS 248 A Modern Introduction to Physics + PHYSICS 249 A Modern Introduction to Physics introductory sequence, you will still need this course for PHYSICS 311 Mechanics and PHYSICS 322 Electromagnetic Fields.
- MATH 319 Techniques in Ordinary Differential Equations and MATH 340 Elementary Matrix and Linear Algebra: You are strongly advised to take these courses before PHYSICS 311 Mechanics and PHYSICS 322 Electromagnetic Fields.
- MATH 320 Linear Algebra and Differential Equations: This course combines topics from MATH 319 Techniques in Ordinary Differential Equations and MATH 340 Elementary Matrix and Linear Algebra. It is adequate for the undergraduate major's curriculum but is not recommended for students planning for graduate school. There is an accelerated honors section that thoroughly covers all of the material in MATH 319 and MATH 340. It is more challenging but is a good way to fit in both topics if you are unable to take MATH 319 + MATH 340 before you take PHYSICS 311 Mechanics or PHYSICS 322 Electromagnetic Fields.
- MATH 321 Applied Mathematical Analysis 1: Vector and Complex Calculus: For students interested in more abstract math, taking MATH 521 Analysis I would be equivalent. It is recommended that MATH 321 be taken before PHYSICS 322 Electromagnetic Fields but especially before you take either PHYSICS 448 Atomic and Quantum Physics or PHYSICS 531 Introduction to Quantum Mechanics. Students may want to check with the academic advisor before enrolling in this course to confirm they have enough time and attention in a specific term.

- MATH 322 Applied Mathematical Analysis 2: Partial Differential Equations : MATH 321 Applied Mathematical Analysis 1: Vector and Complex Calculus and MATH 322 are recommended for those planning for graduate school in Astronomy or Physics.

### Computer and Data Science

Computers are fundamental to astronomical research. The most useful language is Python, followed by C or C++. COMP SCI 220 Data Science Programming I is a good starting point for learning Python.

Students interested in data science and machine learning are also recommended to take PHYSICS 361 Machine Learning in Physics.

### Chemistry

A college course in physical or organic chemistry is useful for Astronomy students. Physical chemistry is particularly valuable for those interested in the interstellar medium, comets, and planets.

### Statistics

A background in statistics is valuable, particularly for students interested in observational astronomy. STAT/MATH 309 Introduction to Probability and Mathematical Statistics I/STAT/MATH 310 Introduction to Probability and Mathematical Statistics II are suggested.

## WHAT YOU LEARN IN THIS MAJOR WILL:

- prepare you for graduate studies for master’s or doctoral degrees in experimental or theoretical astronomy, astrophysics, or physics;
- prepare you for employment in industrial or governmental laboratories;
- provide a broad background for further work in other sciences, such as materials sciences, aerospace, computer science, geophysics, meteorology, radiology, medicine, biophysics, engineering, and environmental studies;
- provide a science-oriented education, useful in some areas of business administration, public policy, law, or other fields where a basic knowledge of science is useful; and
- provide part of the preparation you need to teach astronomy or physics. To teach these subjects in high school, you will also take education courses to become certified. You will need a doctoral degree to become a college or university professor.

Students who intend to continue astronomy in a graduate program are strongly encouraged to get involved in research early. Please consider applying for Research Experiences for Undergraduates (REUs) and if interested in department research, visit our website (<https://www.astro.wisc.edu/undergraduate-program/current-students/>) and reach out to individual faculty. On our webpage you will find our Undergraduate Student Handbook as well as some of the current research projects.

## SUCCESSWORKS

SuccessWorks (<https://successworks.wisc.edu/>) at the College of Letters & Science helps you turn the academic skills learned in your classes into a fulfilling life, guiding you every step of the way to securing jobs, internships, or admission to graduate school.

Through one-on-one career advising, events, and resources, you can explore career options, build valuable internship and research experience, and connect with supportive alumni and employers who open doors of opportunity.

- What you can do with your major (<https://successworks.wisc.edu/what-you-can-do-with-your-major/>) (Major Skills & Outcomes Sheets)
- Make a career advising appointment (<https://successworks.wisc.edu/make-an-appointment/>)
- Learn about internships and internship funding (<https://successworks.wisc.edu/finding-a-job-or-internship/>)
- Try “Jobs, Internships, & How to Get Them,” (<https://successworks.wisc.edu/canvas/>) an interactive guide in Canvas for enrolled UW–Madison students