EARTH AND SPACE SCIENCE (BS) - ASTROPHYSICS AND PLANETARY GEOLOGY TRACK

Program Overview

Earth and Space Science is an interdisciplinary field which works to advance humanity's understanding of the Earth and the wider universe.

Students are provided with a solid foundation in earth systems and processes (geosphere, hydrosphere, atmosphere, and biosphere) and the impacts humans have on these systems, both past and present. Additionally, students will learn about the origins of the planets and the exploration of the solar system. All four tracks in ESS combine classroom, laboratory, and field experiences, as well as provide opportunities for mentored research projects and hands-on learning experiences.

Astrophysics is the study of planets, stars, galaxies and the universe itself. Planetary Geology is the study of planets beyond Earth, and to an extent the study of Earth as a planet. This concentration offers students a set of foundational courses in astronomy, physics, mathematics, and geology, as well as principles of astronomical observation and experimental analyses. These principles are then applied to a student's particular interests within the field of astronomy and space science. These programs provide students with the background and tools to be successful in academia, public and private research organizations, and space-related private industry.

Career Opportunities

Majoring in a physical science, such as our Astrophysics and Planetary Geology degree, sets you up for a wealth of possible careers because you will become an excellent problem solver. Working for or with NASA as they move into the 2010s and beyond is only one of the many possibilities. People with similar degrees also work as writers, doctors, lawyers, and engineers.

- Physics degree holders are in the top 2 scoring groups of majors on the MCAT (2003 statistics)
- NASA expects not to have enough people to replace those who will be retiring in the next 20 years. NASA funds missions to study the Earth as well as astronomical objects.
- News outlets need science journalists, and movies often employ scientists as consultants.
- Staff for Members of Congress and patent lawyers need technical and scientific backgrounds.

Becoming an Astrophysics and Planetary Geology major will open up a world (or even a universe!) of possibilities for you after you leave Columbus.

Program of Study

Code	Title	Credit Hours
Core IMPACTS Area : Institutional Priorities [1]		**4-5**
Choose one of the following communication options		3
COMM 1110	Public Speaking	
Foreign Language Course Options		
AMSL, ARAB, CHIN, FREN, GERM, GREK, ITAL, JAPN, KREN, LATIN, PORT, SPAN - 1001, 1002, 2001, 2002; SWAH - 1001, 1002.		
Take one of the following courses		1-2
ITDS 1779	Scholarship Across the Disciplines	
LEAD 1705	Introduction to Servant Leadership	
PERS 1506	Perspectives 1-hour	
PERS 1507	Perspectives 2-hour	
Core IMPACTS Area : Mathematics & Quantitative Skills [1]		**3-7**
DATA 1501	Introduction to Data Science	3
MATH 1001	Quantitative Skills and Reasoning	3
MATH 1101	Introduction to Mathematical Modeling	3
MATH 1111	College Algebra	3
MATH 1113	Pre-Calculus	4
MATH 1125	Applied Calculus	3
MATH 1131	Calculus with Analytic Geometry I	4
MATH 1132	Calculus with Analytic Geometry II	4
MATH 1165	Computer-Assisted Problem Solving	3
MATH 1401	Introduction to Statistics	3
MATH 1501	Calculus I	4
MATH 2125	Introduction to Discrete Mathematics	3
STAT 1401	Elementary Statistics	3
Core IMPACTS Area : Political Science and U.S. History		**6**
HIST 2111	U. S. History to 1865	3
or HIST 2112	U. S. History since 1865	
POLS 1101	American Government	3
Core IMPACTS Area : Arts, Humanities, and Ethics		**6**
Select one Fine Arts course		3
ARTH 1100	Art Appreciation	
ARTH 2125	Introduction to the History of Art I– Prehistoric through Gothic	
ARTH 2126	Introduction to the History of Art II– Renaissance through Modern	
MUSC 1100	Music Appreciation	
THEA 1100	Theatre Appreciation	
ITDS 1145	Comparative Arts [2]	
Select one Humanities course		3
ENGL 2111	World Literature I	
ENGL 2112	World Literature II	
ITDS 1155	The Western Intellectual Tradition	
ITDS 1774	Introduction to Digital Humanities	
PHIL 2010	Introduction to Philosophy	
ITDS 1145	Comparative Arts [2]	
Core IMPACTS Area : Communicating in Writing		**6**
ENGL 1101	English Composition I	3
ENGL 1102	English Composition II	3
Core IMPACTS Area : Technology, Mathematics, and Sciences [1,3]		**7-11**
ANTH 1145	Human Origins	3
ASTR 1105	Descriptive Astronomy: The Solar System	3
ASTR 1106	Descriptive Astronomy: Stars and Galaxies	3
ASTR 1305	Descriptive Astronomy Lab	1
ATSC 1112	Understanding the Weather	3
ATSC 1112L	Understanding the Weather Lab	1
BIOL 1125	Contemporary Issues in Biology Non-Lab	3

BIOL 1215K	Introductory Biology	4
BIOL 1225K	Contemporary Issues in Biology with Lab	4
CHEM 1151 & 1151L	Survey of Chemistry I and Survey of Chemistry I Lab	4
CHEM 1152 & 1152L	Survey of Chemistry II and Survey of Chemistry II Lab	4
CHEM 1211 & 1211L	Principles of Chemistry I and Principles of Chemistry I Lab	4
CHEM 1212 & 1212L	Principles of Chemistry II and Principles of Chemistry II Lab	4
CPSC 1105	Introduction to Computing Principles and Technology	3
CPSC 1301K	Computer Science I	4
ENVS 1105	Environmental Studies	3
ENVS 1105L	Environmental Studies Laboratory	1
ENVS 1205K	Sustainability and the Environment	4
GEOG 2215	Introduction to the Geographic Information Systems	3
GEOL 1110	Natural Disasters: Our Hazardous Environment	3
GEOL 1121	Introductory Geoscience I: Physical Geology	3
GEOL 1121L	Introductory Geoscience I: Physical Geology Lab	1
GEOL 1122	Introductory Geo-sciences II: Historical Geology	3
GEOL 1322	Introductory Geo-sciences II: Historical Geology Lab	1
GEOL 2225	The Fossil Record	4
PHYS 1111 & PHYS 1311	Introductory Physics I and Introductory Physics I Lab	4
PHYS 1112 & PHYS 1312	Introductory Physics II and Introductory Physics II Lab	4
PHYS 1125	Physics of Color and Sound	3
PHYS 1325	Physics of Color and Sound Lab	1
PHYS 2211 & PHYS 2311	Principles of Physics I and Principles of Physics I Lab	4
PHYS 2212 & PHYS 2312	Principles of Physics II and Principles of Physics II Lab	4
Core IMPACTS Area : Social Sciences		**6**
Select one Behavioral Science course		
ECON 2105	Principles of Macroeconomics	
ECON 2106	Principles of Microeconomics	
PHIL 2030	Moral Philosophy	
PSYC 1101	Introduction to General Psychology	
SOCI 1101	Introduction to Sociology	
Select one World Cultures course		3
ANTH 1107	Discovering Archaeology	
ANTH 1105	Cultural Anthropology	
ANTH 2105	Ancient World Civilizations	
ANTH 2136	Language and Culture	
ENGL 2136	Language and Culture	
GEOG 1101	World Regional Geography	
HIST 1111	World History to 1500	
HIST 1112	World History since 1500	
ITDS 1156	Understanding Non-Western Cultures	
Core IMPACTS Total Hours		**42**
Health and Wellness		**3**
KINS 1106	Lifetime Wellness	2
or PHED 1205	Concepts of Fitness	
Select one of the following		1
Any PEDS course		
MUSC 1206	Body Mapping (Music Majors Only)	

[1] The hours applied in the Institutional Priorities; Mathematics & Quantitative Skills; and Technology, Mathematics, and Sciences areas must add to 18 credit hours.

[2] ITDS 1145 Comparative Arts, though listed under both Fine Arts and Humanities, may be taken only once.

[3] At least 4 of the credit hours in this area must be in a lab science course.

Major Requirements

Code	Title	Credit Hours
Core Requirements		
Complete the core requirements for this program		45
Core Total		45
Field of Study Requirements		
Minimum grade of C is required		
ASTR 1105	Descriptive Astronomy: The Solar System	3
ATSC 1112	Understanding the Weather	3
ENVS 1205K	Sustainability and the Environment	4
GEOL 1121	Introductory Geoscience I: Physical Geology ("C" or better required in each course)	3
GEOL 1121L	Introductory Geoscience I: Physical Geology Lab ("C" or better required in each course)	1
Select one of the following sequences:		4
Sequence 1:		
PHYS 1111	Introductory Physics I	
PHYS 1311	Introductory Physics I Lab	
Sequence 2:		
PHYS 2211	Principles of Physics I	
PHYS 2311	Principles of Physics I Lab	
Field of Study Requirements Total		18
Required for the Major		
Minimum grade of C is required		
ASTR 1106	Descriptive Astronomy: Stars and Galaxies	3
ASTR 1305	Descriptive Astronomy Lab	1
ASTR 3105	Physics, Chemistry, and Geology of the Solar System	3
ASTR 3115	Introduction to Astrophysics	3
ASTR 3205	Observational Techniques for Astrophysics	4
ENGR 2165	Thermodynamics	3
GEOL 3201	Mineralogy and Petrology I	4
Select one of the following PHYS sequences:		4
Sequence 1:		
PHYS 1112	Introductory Physics II	
PHYS 1312	Introductory Physics II Lab	
Sequence 2:		
PHYS 2212	Principles of Physics II	

PHYS 2312	Principles of Physics II Lab	
PHYS 3100	Waves and Optics	3
PHYS 3200	Twentieth Century Physics	4
PHYS 4100	Survey of Quantum Mechanics	3
Required for the Major Total		35
Major Electives		
Select at least 25 credits in Program Electives		25
ATSC 5117U	Global and Climate Change	
MATH 1132	Calculus with Analytic Geometry II (if not taken in Area D)	
ATSC 5116U	Meteorology	
ASTR 4899	Undergraduate Research in Astronomy	
ASTR 5555U	Special Topics in Astronomy and Astrophysics	
ASTR 4960	Astronomy Senior Thesis	
ANTH 5226U	Culture and Environment	
BIOL 3215K	Cell Biology	
BIOL 3216K	Genetics	
DATA 3111	Data Mining I	
DATA 3112	Data Mining II	
GEOL 3201	Mineralogy and Petrology I	
GEOL 4201	Mineralogy and Petrology II	
GEOL 3201	Mineralogy and Petrology I	
GEOL 3265	Stratigraphy and Basin Analysis	
GEOL 3275	Mapping and Field Geology	
GEOL 4275	Structural Geology	
GEOL 4795	Senior Geology Seminar	
GEOL 5115U	Geochemistry	
GEOL 5135U	Oceanography	
GEOL 5258U	Field Methods in the Earth and Environmental Sciences	
GEOL 5165U	Hydrology	
GEOL 5215U	Geomorphology	
GEOL 5555U	Selected Topics in Geology	
ISCI 5555U	Contemporary Topics in Science	
MATH 3107	Differential Equations	
MATH 5175U	Mathematical Statistics	
PHYS 4899	Undergraduate Research in Physics	
STAT 3127	Statistical Computing	
UTCH 3215	Research Methods	
The following courses may be taken in Major Electives provided the required minimum of 39 upper level credit hours has been met:		
ATSC 1112L	Understanding the Weather Lab	
BIOL 1215K	Introductory Biology	
CHEM 2115	Quantitative Chemical Analysis	
CHEM 2315	Quantitative Chemical Analysis Lab	
CPSC 1301K	Computer Science I	
CPSC 1302K	Computer Science II	
DATA 1501	Introduction to Data Science	
ENGR 2206	Digital Logic	
ENGR 2217	Robotics Engineering Design	
GEOG 2215	Introduction to the Geographic Information Systems	
MATH 2115	Introduction to Linear Algebra	
MATH 2135	Calculus with Analytic Geometry 3	
PHYS 1125	Physics of Color and Sound	
PHYS 1325	Physics of Color and Sound Lab	
STAT 1401	Elementary Statistics	
Other PHYS, GEOL, ENVS, ASTR, ATSC, CHEM, ENGR, CPSC or MATH courses may be used toward Major Electives requirements as approved by the student's advisor.		
Major Electives Total		25
Total Credit Hours		**123**

Program Map

Course	Title	Credit Hours
First Year		
Fall		
ENGL 1101	English Composition I (minimum grade of C)	3
MATH 1113	Pre-Calculus (minimum grade of C) [1]	4
CHEM 1211	Principles of Chemistry I (minimum grade of C)	3
CHEM 1211L	Principles of Chemistry I Lab (minimum grade of C)	1
ASTR 1105	Descriptive Astronomy: The Solar System (minimum grade of C)	3
ASTR 1305	Descriptive Astronomy Lab (minimum grade of C)	1
	Credit Hours	**15**
Spring		
ENGL 1102	English Composition II (minimum grade of C)	3
MATH 1131	Calculus with Analytic Geometry I (minimum grade of C)	4
CHEM 1212	Principles of Chemistry II	3
CHEM 1212L	Principles of Chemistry II Lab	1
ASTR 1106	Descriptive Astronomy: Stars and Galaxies (minimum grade of C)	3
Area B2	ITDS 1779 (2), LEAD 1705 (2), PERS 1506 (1; may be repeated with different topic), PERS 1507 (2)	1
	Credit Hours	**15**
Second Year		
Fall		
Area F Lab Science	ATSC 1112, ENVS 1105, ENVS 1205K, GEOL 1110, GEOL 1122 or BIOL 1215K (minimum grade of C)	3-4
GEOL 1121	Introductory Geoscience I: Physical Geology (minimum grade of C)	3
GEOL 1121L	Introductory Geoscience I: Physical Geology Lab (minimum grade of C)	1
Area B1	COMM 1110 Public Speaking or foreign language 1001, 1002, 2001, 2002	3
MATH 1132	Calculus with Analytic Geometry II [2]	4
	Credit Hours	**14-15**

Spring		
PHYS 2211	Principles of Physics I (minimum grade of C)	3
PHYS 2311	Principles of Physics I Lab (minimum grade of C)	1
HIST 2111 or HIST 2112	U. S. History to 1865 or U. S. History since 1865	3
AREA C	Fine Arts	3
AREA E	Behavioral Science	3
KINS 1106 or PHED 1205	Lifetime Wellness or Concepts of Fitness	2
	Credit Hours	**15**
Third Year		
Fall		
PHYS 2212	Principles of Physics II (minimum grade of C)	3
PHYS 2312	Principles of Physics II Lab (minimum grade of C)	1
ASTR 3105	Physics, Chemistry, and Geology of the Solar System (minimum grade of C) [4]	3
Area E	World Cultures	3
AREA H	Program Electives	3-4
PEDS Physical Education		1
	Credit Hours	**14-15**
Spring		
GEOL 3201	Mineralogy and Petrology I (minimum grade of C) [3]	4
PHYS 3100	Waves and Optics (minimum grade of C) [4]	3
ASTR 3115	Introduction to Astrophysics (minimum grade of C) [4]	3
ENGR 2165	Thermodynamics (minimum grade of C)	3
AREA H	Program Electives	3-4
	Credit Hours	**16-17**
Fourth Year		
Fall		
PHYS 3200	Twentieth Century Physics (minimum grade of C) [4]	4
AREA C	Humanities	3
POLS 1101	American Government	3
AREA H	Program Electives	6-8
	Credit Hours	**16-18**
Spring		
PHYS 4100	Survey of Quantum Mechanics (minimum grade of C) [4]	3
ASTR 3205	Observational Techniques for Astrophysics (minimum grade of C) [4]	4
AREA H	Program Electives [5]	6-8
	Credit Hours	**13-15**
	Total Credit Hours	**123**

1 MATH 1113 Pre-Calculus can be replaced by MATH 1131 Calculus with Analytic Geometry I if placement tests allow.

2 MATH 1132 Calculus with Analytic Geometry II can be replaced by other area H if already taken.

3 GEOL 3201 Mineralogy and Petrology I is taught every 3 semesters. If not taken in this semester, it will not be offered again until Fall 2026.

4 The Area G courses ASTR 3105, ASTR 3115, ASTR 3205, PHYS 3100, PHYS 3200, and PHYS 4100 are each taught every 4 semesters. These courses should be taken at the earliest opportunity to avoid graduation delays.

5 May take additional Area H Program Electives if needed.

- Area H Program Electives must total to 26 hours, which is 22 hours plus MATH 1132 Calculus with Analytic Geometry II, or 26 hours if MATH 1132 Calculus with Analytic Geometry II is applied to Area D.

Admission Requirements

Students are presumed to enter the program with the equivalent of MATH 1111 College Algebra. Students without that background may need to take additional classes to meet course prerequisites.

Additional Program Requirements

There are no program specific academic regulations.