

B.S. in Astronomy and Astrophysics

The Bachelor of Science in Astronomy and Astrophysics provides a strong foundation in astronomy and physics, preparing you for a wide range of careers in space science. Through a combination of theoretical coursework and hands-on laboratory experiences, you will develop the skills needed to explore and analyze the universe effectively.

As an Embry-Riddle student, you will also benefit from connections to prestigious research initiatives, including the Hubble Space Telescope, the Kepler Mission, the Transiting Exoplanet Survey Satellite (TESS), and the James Webb Space Telescope. These opportunities offer invaluable, real-world research experience that enhances your academic journey.

At the **Daytona Beach Campus**, the Bachelor of Science in Astronomy and Astrophysics builds students' foundation in mathematics and physics while providing opportunities to establish themselves in the field. Housed in the Department of Physical Sciences within the College of Arts & Sciences, students have the opportunity to engage with the Southeastern Association for Research in Astronomy (SARA). This collaboration provides students with nearly constant access to telescopes that can observe about 90% of the night sky.

In this program, students will work in advanced facilities, including a one-meter telescope, the largest research telescope at a university in the southeastern U.S. Students will also have access to state-of-the-art labs, such as the Laboratory for Exosphere and Near Space Environment Studies (LENSES). The resources available in this program ensure students are well-prepared for careers or further education in fields like space exploration and planetary science.

Program-Level Student Learning Outcomes

Students will:

- Communicate astronomical results to astronomers and non-astronomers using varied methods including giving talks, writing technical reports, and writing papers for publication.
- Describe the current state of knowledge regarding the astronomical and physical universe.
- Make professional and ethical decisions.
- Apply data derived from conducted experiments and prevailing models in astronomy to real systems using current techniques.
- Apply mathematics, science, and contemporary issues to solve scientific problems.
- Operate astronomical telescopes and detectors to obtain scientific data on astronomical objects.

Daytona Beach Program Requirements

General Education Requirements	38
Core Requirements	70
Technical Electives	6
Open Electives	6
Total Credits	120

Program Details

The Bachelor of Science in Astronomy and Astrophysics degree program requires 120 credit hours. The program may be completed in eight semesters, or four years, assuming appropriate background and full-time enrollment. The courses necessary to earn this degree are listed below.

A minimum cumulative grade point average of 2.0 is needed for all required ASTR, CHEM, ENGP, and PHYS courses, including technical electives. A grade of C or better is required in MATH 241/242/243 and

PHYS 226/227/228 as a prerequisite for entry into all subsequent ASTR, PHYS, and ENGP courses. Additionally, BSAA students must attain an average GPA of 2.3 or higher in three fundamental physics courses (PHYS 226/227/228) prior to PHYS 303. Failure to satisfy the above requirements will prevent the student from continuing in the program.

General Education Requirements

Communication	9
COMM 122 English Composition	
Humanities - Lower Level	3
Social Sciences - Lower Level	3
Humanities/Social Sciences - Lower or Upper Level	3
Humanities/Social Sciences - Upper Level	3
Computer Science/Information Technology	3
ENGR 115 Introduction to Computing for Engineers	
or CPSC 223Scientific Programming in C	
Mathematics	8
MATH 241 Calculus and Analytical Geometry I	
MATH 242 Calculus and Analytical Geometry II	
Physical/Life Sciences	6
PHYS 226 Physics I	
PHYS 227 Physics II	
Total Credits	38

Core Requirements

Astronomy and Astrophysics

ASTR 101	Current Topics in Astrophysics	1
ASTR 316	Introductory Astronomy and Astrophysics I	3
ASTR 317	Introductory Astronomy and Astrophysics II	3
ASTR 318L	Introductory Astrophysics Laboratory	1
ASTR 345	Astrophysics and Space Science Seminar	2
ASTR 401	Stellar Astrophysics	3
ASTR 425	Observational Astronomy	3
Choose Two of the Following:		6
ASTR 402	Interstellar Medium and Galaxies	
ASTR 403	Cosmology and the Structure of the Universe	
ASTR 420	Planetary Interiors, Surfaces, and Atmospheres	
ASTR 422	Solar System Dynamics	
ASTR 430L	Astronomical Optics and Instrumentation Laboratory	
Choose One of the Following:		3
ASTR 492	Senior Astrophysics Project	
Technical Elective		
Total Credits		25

Mathematics

MATH 243	Calculus and Analytical Geometry III	4
MATH 345	Differential Equations and Matrix Methods	4
MATH 441	Mathematical Methods for Engineering and Physics I	3
MATH 442	Mathematical Methods for Engineering and Physics II	3
Total Credits		14

Physical Science

CHEM 110	General Chemistry I	3
CHEM 110L	General Chemistry I Laboratory	1
PHYS 226L	Physics I Laboratory	1
PHYS 228	Physics III	3
PHYS 228L	Physics III Laboratory	1

PHYS 303	Modern Physics	3
PHYS 303L	Modern Physics Laboratory	1
PHYS 320	Classical Mechanics I	3
PHYS 405	Atomic Nuclear Physics	3
Total Credits		19

Engineering

ENGP 323	Engineering Electricity and Magnetism	3
ENGP 330	Electro-Optical Engineering	3
ENGP 432	Applied Quantum Mechanics	3
PHYS 415	Thermodynamics and Statistical Mechanics	3
Total Credits		12

Technical Electives

300-400 Level:	6
ASTR/AERO/CESC/CIVE/CPSC/DSCI/ELEC/ENGR/ENGP/ESCI/ MATH/MECH/PHYS/SFTW	
Total Credits	6

Open Electives

Open Electives	6
Total Credits	6

Suggested Plan of Study

Year One

Requirements	Credits
COMM 122 - English Composition	3
MATH 241 - Calculus and Analytical Geometry I	4
CHEM 110 - General Chemistry I	3
CHEM 110L - General Chemistry I Laboratory	1
ASTR 101 - Current Topics in Astrophysics	1
Social Sciences - Lower Level	3
Semester Hours	15

Requirements	Credits
MATH 242 - Calculus and Analytical Geometry II	4
PHYS 226 - Physics I	3
PHYS 226L - Physics I Laboratory	1
COMM 219 - Speech	3
Humanities - Lower Level	3
Semester Hours	14

Total Credits

Total Hours for All Requirements: 29

Year Two

Requirements	Credits
ASTR 316 - Introductory Astronomy and Astrophysics I	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 228 - Physics III	3
ENGR 115 - Introduction to Computing for Engineers or CPSC 223 - Scientific Programming in C	3

COMM 221 - Technical Communication, 222 - Business Communication, or 223 - Intelligence Communication	3
Semester Hours	16

Requirements	Credits
ASTR 317 - Introductory Astronomy and Astrophysics II	3
MATH 345 - Differential Equations and Matrix Methods	4
PHYS 227 - Physics II	3
ASTR 318L - Introductory Astrophysics Laboratory	1
PHYS 228L - Physics III Laboratory	1
Humanities/Social Sciences - Lower or Upper Level	3
Semester Hours	15

Total Credits

Total Hours for All Requirements: 31

Year Three

Requirements	Credits
ASTR 401 - Stellar Astrophysics	3
MATH 441 - Mathematical Methods for Engineering and Physics I	3
PHYS 303 - Modern Physics	3
PHYS 303L - Modern Physics Laboratory	1
Humanities/Social Sciences - Upper Level	3
Technical Elective	3
Semester Hours	16

Requirements	Credits
ASTR 345 - Astrophysics and Space Science Seminar	2
MATH 442 - Mathematical Methods for Engineering and Physics II	3
PHYS 320 - Classical Mechanics I	3
PHYS 415 - Thermodynamics and Statistical Mechanics	3
Open Elective	3
Semester Hours	14

Total Credits

Total Hours for All Requirements: 30

Year Four

Requirements	Credits
ENGP 330 - Electro-Optical Engineering	3
ENGP 323 - Engineering Electricity and Magnetism	3
ENGP 432 - Applied Quantum Mechanics	3
Astronomy & Astrophysics ASTR 400-Level Course	3
Open Elective	3
Semester Hours	15

Requirements	Credits
ASTR 425 - Observational Astronomy	3
PHYS 405 - Atomic Nuclear Physics	3
ASTR 492 - Senior Astrophysics Project (or Technical Elective)	3
Astronomy & Astrophysics ASTR 400-Level Course	3
Technical Elective	3
Semester Hours	15

Total Credits

Total Hours for All Requirements: 30