

B.S. in Space Physics

The B.S. in Space Physics engages students in the scientific side of space exploration through studies of the Earth-sun environment, atmospheric sciences, aurorae, planetary sciences, space weather, laboratory plasma physics, stellar and high-energy astrophysics, gravitational physics, exoplanets and exotic propulsion.

Space Physics students have access to campus-specific research areas such as the Laser Interferometer Gravitational-Wave Observatory (LIGO) at the Prescott Campus and the Ritchey-Chrétien reflecting telescope at the Daytona Beach Campus. Graduates of the program are prepared to work in applied research careers as contributors in the growing field of space exploration.

At the **Daytona Beach Campus**, the B.S. in Space Physics emphasizes the physics of the solar-terrestrial and distant-space environments. Students learn to study magnetic and astrophysical phenomena that occur in outer space, in the upper atmospheres of planets and on the sun.

The university houses one of the largest university-based research telescopes in the southeastern United States: a 1-meter Ritchey-Chrétien reflecting telescope. Adjacent to the telescope is a helioscope used to observe solar activity, providing students with hands-on experience using ground-based instruments to study space phenomena.

At the **Prescott Campus**, the B.S. in Space Physics allows students to explore fundamental forces in nature through the study of astrophysics, relativity and gravitation, as well as atomic, nuclear and elementary particle systems. Students are immersed in designing experiments and building equipment for physics research. Students have access to laboratories for studying optics, exotic propulsion and cosmic rays, including the Laser Interferometer Gravitational-Wave Observatory (LIGO) and the Prescott Observatory Complex.

Program-Level Student Learning Outcomes

Students will:

- Communicate effectively with a broad range of audiences by writing reports/papers and making oral presentations.
- Use appropriate research methods to conduct experiments.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- Apply knowledge of mathematics and science to solve problems in modern space physics and related scientific areas.
- Acquire information about new scientific problems and techniques for their solution, using appropriate learning strategies.
- Identify, formulate, and solve scientific problems through the construction of physical models.

Daytona Beach Program Requirements

General Education Requirements	39
Core Requirements	51
Area of Concentration	15
Electives	15
Total Credits	120

Program Details

The Bachelor of Science in Space Physics degree program requires 120 credit hours. A minimum cumulative grade point average of 2.0 is needed for all required ENGP and PHYS courses, including technical electives. The program may be completed in eight semesters, or four years, assuming appropriate background and full-time enrollment.

Students should be aware that several courses in each academic year may have prerequisites and/or corequisites. Check the course

descriptions in this catalog before registering for classes to ensure requisite sequencing. A grade of C or higher is required in PHYS 226, PHYS 227, PHYS 228 and MATH 241, MATH 242, MATH 243 to be in good standing in the program.

General Education Requirements

Communication	9
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	
Mathematics	8
MATH 241 Calculus and Analytical Geometry I *	
MATH 242 Calculus and Analytical Geometry II *	
Physical/Life Sciences	7
PHYS 226 Physics I *	
PHYS 226L Physics I Laboratory	
PHYS 227 Physics II *	
Total Credits	39

* A grade of C or higher is required.

Core Requirements

ENGP 101 Introduction to Engineering Physics and Space Physics	1
or UNIV 101 College Success	
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
CHEM 110 General Chemistry I	3
CHEM 110L General Chemistry 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
ENGP 330 Electro-Optical Engineering	3
ASTR 492 Senior Astrophysics Project	3
PHYS 400L Senior Physics Laboratory I	3
PHYS 415 Thermodynamics and Statistical Mechanics	3
ENGP 432 Applied Quantum Mechanics	3
ENGP 323 Engineering Electricity and Magnetism	3
Total Credits	51

** A grade of C or higher is required.

Area of Concentration

Space Weather

ASTR 420 Planetary Interiors, Surfaces, and Atmospheres	3
ENGP 311 Spaceflight Dynamics	3
PHYS 230 Introduction to Space Weather	3
PHYS 410 Space Physics I	3

PHYS 411	Space Physics II	3
Total Credits		15

Electives

Technical Electives	6
Any MATH, ENGP, ASTR, or PHYS Upper Level	
Open Electives	9
Total Credits	15

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
ENGP 101 - Introduction to Engineering Physics and Space Physics	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
COMM 221 - Technical Communication, 222 - Business Communication, or 223 - Intelligence Communication	3
ENGR 115 - Introduction to Computing for Engineers	3
MATH 243 - Calculus and Analytical Geometry III	4
PHYS 228 - Physics III	3
PHYS 230 - Introduction to Space Weather	3
Semester Hours	16

Requirements	Credits
MATH 345 - Differential Equations and Matrix Methods	4
PHYS 227 - Physics II	3
PHYS 228L - Physics III Laboratory	1
Humanities/Social Sciences - Lower or Upper Level	3
Open Elective	3
Semester Hours	14

Total Credits

Total Hours for All Requirements: 30

Year Three

Requirements	Credits
ENGP 311 - Spaceflight Dynamics	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
Open Elective	3
Semester Hours	16

Requirements	Credits
ASTR 420 - Planetary Interiors, Surfaces, and Atmospheres	3
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	15

Total Credits

Total Hours for All Requirements: 31

Year Four

Requirements	Credits
ENGP 330 - Electro-Optical Engineering	3
ENGP 323 - Engineering Electricity and Magnetism	3
ENGP 432 - Applied Quantum Mechanics	3
PHYS 410 - Space Physics I	3
Technical Elective	3
Semester Hours	15

Requirements	Credits
PHYS 411 - Space Physics II	3
PHYS 400L - Senior Physics Laboratory I	3
PHYS 405 - Atomic Nuclear Physics	3
ASTR 492 - Senior Astrophysics Project	3
Technical Elective	3
Semester Hours	15

Total Credits

Total Hours for All Requirements: 30

Prescott Program Requirements

General Education Requirements	39
Core Requirements	53
Area of Concentration	12
Technical Electives	9

Open Electives	7
Total Credits	120

Program Details

The Bachelor of Science in Space Physics program requires successful completion of a minimum of 120 credit hours. The program may be completed in eight semesters, or four years, assuming appropriate background and full-time enrollment. Students pursuing this undergraduate degree must earn a minimum cumulative grade point average (CGPA) of 2.00 for all work completed at the University. In addition, a minimum GPA of 2.0 for all ASTR and PHYS courses is required. The program includes a two-course senior research thesis sequence as part of the degree requirements. The courses necessary to earn this degree are listed below.

Students should be aware that many courses have prerequisites and/or corequisites. To support success in advanced coursework, students are strongly encouraged to earn a grade of C or better in all prerequisite courses. Students may not pursue both the Bachelor of Science in Space Physics and the Bachelor of Science in Astronomy; however, the first three semesters of both programs share a common curriculum, allowing students to transfer between programs during that period without loss of credit.

General Education Requirements

Communication	9
Humanities - Lower Level	3
Social Sciences - Lower Level	3
Humanities/Social Science - Lower or Upper Level	3
Humanities/Social Science - Upper Level	3
Computer Science/Information Technology	3
ENGR 115 Introduction to Computing for Engineers or CPSC 118 Fundamentals of Computer Programming	
Mathematics	8
MATH 241 Calculus and Analytical Geometry I	
MATH 242 Calculus and Analytical Geometry II	
Physical/Life Sciences	7
PHYS 226 Physics I	
PHYS 226L Physics I Laboratory	
PHYS 227 Physics II	
Total Credits	39

Core Requirements

ENGP 101 Introduction to Engineering Physics and Space Physics or UNIV 101 College Success	1
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
CHEM 110 General Chemistry I	3
CHEM 110L General Chemistry I Laboratory	1
PHYS 228 Physics III	3
PHYS 227L Physics II Laboratory	2
PHYS 303 Modern Physics	3
PHYS 303P Modern Physics Laboratory	2
PHYS 320 Classical Mechanics I	3
PHYS 405 Atomic Nuclear Physics	3
PHYS 380L Optics Laboratory	3
PHYS 490 Senior Thesis I	3
PHYS 491 Senior Thesis II	3

PHYS 415 Thermodynamics and Statistical Mechanics	3
PHYS 350 Quantum Mechanics	3
PHYS 330 Electricity and Magnetism I	3
Total Credits	53

Area of Concentration

Deep Space

ASTR 204 General Astronomy	3
ASTR 222 Intermediate Astronomy	3
MATH 335 Introduction to Linear and Abstract Algebra	3
PHYS 232 Computational Methods in the Physical Sciences	3
Total Credits	12

Technical Electives

Choose Three of the Following:	9
ASTR 332 Techniques of Observational Astronomy	
ASTR 340 Astrophysics I	
ASTR 341 High Energy Astrophysics	
ASTR 408 Astrophysics II	
MATH 412 Probability and Statistics	
MATH 435 Linear and Abstract Algebra II	
MATH 443 Complex Variables	
PHYS 322 Classical Mechanics II	
PHYS 331 Electricity and Magnetism II	
PHYS 412 Particle Physics and Cosmology I	
PHYS 413 Particle Physics and Cosmology II	
PHYS 435 Solid State Theory	
WEAX 322 Space Weather	
WEAX 390 Atmospheric Physics	
WEAX 420 Advanced Atmospheric Thermodynamics	
Total Credits	9

Open Electives

Open Electives	7
Total Credits	7

Suggested Plan of Study

Year One

Requirements	Credits
PHYS 226 - Physics I	3
PHYS 226L - Physics I Laboratory	1
MATH 241 - Calculus and Analytical Geometry I	4
CHEM 110 - General Chemistry I	3
CHEM 110L - General Chemistry I Laboratory	1
COMM 122 - English Composition	3
UNIV 101 - College Success	1
Semester Hours	16

Requirements	Credits
PHYS 227 - Physics II	3
PHYS 227L - Physics II Laboratory	2
ASTR 204 - General Astronomy	3
MATH 242 - Calculus and Analytical Geometry II	4

CPSC 118 - Fundamentals of Computer Programming or ENGR 115 - Introduction to Computing for Engineers	3
Semester Hours	15

Total Credits

Total Hours for All Requirements: 31

Year Two

Requirements	Credits
PHYS 228 - Physics III	3
PHYS 232 - Computational Methods in the Physical Sciences	3
ASTR 222 - Intermediate Astronomy	3
MATH 243 - Calculus and Analytical Geometry III	4
Humanities - Lower Level	3
Semester Hours	16

Requirements	Credits
PHYS 303 - Modern Physics	3
PHYS 303P - Modern Physics Laboratory	2
MATH 335 - Introduction to Linear and Abstract Algebra	3
MATH 345 - Differential Equations and Matrix Methods	4
Communication	3
Semester Hours	15

Total Credits

Total Hours for All Requirements: 31

Year Three

Requirements	Credits
PHYS 320 - Classical Mechanics I	3
PHYS 330 - Electricity and Magnetism I	3
MATH 441 - Mathematical Methods for Engineering and Physics I	3
Technical Elective	3
Social Sciences - Lower Level	3
Semester Hours	15

Requirements	Credits
PHYS 350 - Quantum Mechanics	3
PHYS 380L - Optics Laboratory	3
MATH 442 - Mathematical Methods for Engineering and Physics II	3
Technical Elective	3
Communication	3
Semester Hours	15

Total Credits

Total Hours for All Requirements: 30

Year Four

Requirements	Credits
PHYS 405 - Atomic Nuclear Physics	3
PHYS 490 - Senior Thesis I	3
Huamnities - Upper Level	3

Social Sciences - Upper Level	3
Open Electives	4
Semester Hours	16

Requirements	Credits
PHYS 415 - Thermodynamics and Statistical Mechanics	3
PHYS 491 - Senior Thesis II	3
Technical Elective	3
Open Electives	3
Semester Hours	12

Total Credits

Total Hours for All Requirements: 28