



Twin Cities Campus

Astrophysics B.A.

Astrophysics, Minnesota Institute for

College of Liberal Arts

- Program Type: Baccalaureate
- Requirements for this program are current for Spring 2019
- Required credits to graduate with this degree: 120
- Required credits within the major: 72 to 75
- Degree: Bachelor of Arts

The program in astrophysics develops the skills necessary to tackle complex and ill-defined problems within the physical sciences and prepares students for careers in several broad areas. The program is aimed primarily for students interested in secondary education in the physical sciences, science policy, and science and technical writing. The program can also prepare students for graduate study in astrophysics.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

Students must complete 7 courses before admission to the program.

For information about University of Minnesota admission requirements, visit the [Office of Admissions website](#).

Required prerequisites

Mathematics

Take exactly 3 course(s) totaling exactly 12 credit(s) from the following:

Calculus I

- [MATH 1271](#) - Calculus I [MATH] (4.0 cr)
- or [MATH 1371](#) - CSE Calculus I [MATH] (4.0 cr)
- or [MATH 1571H](#) - Honors Calculus I [MATH] (4.0 cr)

Calculus II

- [MATH 1272](#) - Calculus II (4.0 cr)
- or [MATH 1372](#) - CSE Calculus II (4.0 cr)
- or [MATH 1572H](#) - Honors Calculus II (4.0 cr)

Linear Algebra

- [MATH 2243](#) - Linear Algebra and Differential Equations (4.0 cr)
- or [MATH 2373](#) - CSE Linear Algebra and Differential Equations (4.0 cr)
- or [MATH 2574H](#) - Honors Calculus IV (4.0 cr)

Physics

Take exactly 4 course(s) totaling exactly 16 credit(s) from the following:

Physics I

- [PHYS 1301W](#) - Introductory Physics for Science and Engineering I [PHYS, WI] (4.0 cr)
- or [PHYS 1401V](#) - Honors Physics I [PHYS, WI] (4.0 cr)
- or [PHYS 1501V](#) *{Inactive}* [PHYS, WI] (4.0 cr)

Physics II

- [PHYS 1302W](#) - Introductory Physics for Science and Engineering II [PHYS, WI] (4.0 cr)
- or [PHYS 1402V](#) - Honors Physics II [PHYS, WI] (4.0 cr)
- or [PHYS 1502V](#) *{Inactive}* [PHYS, WI] (4.0 cr)

Thermodynamics

- [PHYS 2201](#) - Introductory Thermodynamics and Statistical Physics (4.0 cr)

Physics III

- [PHYS 2503](#) - Physics III: Intro to Waves, Optics, and Special Relativity (4.0 cr)
- or [PHYS 2503H](#) - Honors Physics III (4.0 cr)

General Requirements

All students are required to complete general University and college requirements including writing and liberal education courses. For more information about University-wide requirements, see the [liberal education requirements](#). Required courses for the major or minor in



which a student receives a D grade (with or without plus or minus) do not count toward the major or minor (including transfer courses).

Program Requirements

Students are required to take 4 semester(s) of any second language.

CLA BA degrees require 18 upper division (3xxx-level or higher) credits outside the major designator. These credits must be taken in designators different from the major designator and cannot include courses that are cross-listed with the major designator. The major designator for the Astrophysics BA is AST.

AST 1011H is recommended but it does not count towards the Astrophysics BA.

At least 16 upper-division credits in the major must be taken at the University of Minnesota - Twin Cities campus.

Students may earn no more than one undergraduate degree from the Astrophysics program: a BA or a BS or a minor.

All incoming CLA freshmen must complete the First-Year Experience course sequence.

Multivariable Calculus

Take exactly 1 course(s) totaling exactly 4 credit(s) from the following:

- [MATH 2263](#) - Multivariable Calculus (4.0 cr)
- or [MATH 2374](#) - CSE Multivariable Calculus and Vector Analysis (4.0 cr)
- or [MATH 2573H](#) - Honors Calculus III (4.0 cr)

Core Astrophysics Courses

Take exactly 3 course(s) totaling exactly 12 credit(s) from the following:

- [AST 2001](#) - Fundamental Astrophysics (4.0 cr)
- [AST 4001](#) - Astrophysics I (4.0 cr)
- [AST 4002](#) - Astrophysics II (4.0 cr)

Core Physics Courses

Take exactly 5 course(s) totaling exactly 18 credit(s) from the following:

- [PHYS 2601](#) - Quantum Physics (4.0 cr)
- [PHYS 3041](#) - Mathematical Methods for Physicists (3.0 cr)
- [PHYS 3605W](#) - Modern Physics Laboratory [WI] (3.0 cr)
- [PHYS 4001](#) - Analytical Mechanics (4.0 cr)
- [PHYS 4002](#) - Electricity and Magnetism (4.0 cr)

Technical Electives

Any AST 4xxx, 5xxx, or its cross-list that is not counting towards a different major requirement may count as a technical elective. When choosing technical electives, students work with the departmental advisor to choose an area of emphasis. The available areas of emphasis are professional, computational, industry, and secondary education. Other technical electives may be approved by the departmental advisor.

Take 8 or more credit(s) from the following:

- [AST 4031](#) - Interpretation and Analysis of Astrophysical Data (4.0 cr)
- [AST 5012](#) - The Interstellar Medium (4.0 cr)
- [AST 5031](#) - Interpretation and Analysis of Astrophysical Data (4.0 cr)
- [AST 5201](#) - Methods of Experimental Astrophysics (4.0 cr)
- [PHYS 4051](#) - Methods of Experimental Physics I (5.0 cr)
- [PHYS 4101](#) - Quantum Mechanics (4.0 cr)
- [PHYS 4303](#) - Electrodynamics and Waves (3.0 cr)
- [PHYS 4511](#) - Introduction to Nuclear and Particle Physics (3.0 cr)
- [PHYS 4611](#) - Introduction to Space Physics (3.0 cr)
- [PHYS 4621](#) - Introduction to Plasma Physics (3.0 cr)
- [AST 4041](#) - Computational Methods in the Physical Sciences (4.0 cr)
- or [PHYS 4041](#) - Computational Methods in the Physical Sciences (4.0 cr)
- [AST 5022](#) - Relativity, Cosmology, and the Universe (4.0 cr)
- or [PHYS 5022](#) - Relativity, Cosmology, and the Universe (4.0 cr)

Directed Studies

Take no more than 1 course(s) from the following:

- [AST 4993](#) - Directed Studies (1.0 - 5.0 cr)
- [AST 4299H](#) - Senior Honors Astrophysics Research Seminar (1.0 cr)

Capstone

This requirement can be met with directed research in astrophysics or a project tailored to the specific area of interest. The astrophysics capstone is carried out under the supervision of faculty member. The student is responsible for identifying and contacting



the advisor. The topics, scope of the project, as well as the specifics of the final write-up are to be decided in close consultation with the faculty advisor.

Take exactly 1 course(s) totaling 2 - 4 credit(s) from the following:

Students who double major within CLA and choose to complete the capstone requirement in their other major are still required to take the Astrophysics BA capstone.

- [AST 4994W](#) - Directed Research [WI] (2.0 - 5.0 cr)

Upper Division Writing Intensive within the major

Students are required to take one upper division writing intensive course within the major. If that requirement has not been satisfied within the core major requirements, students must choose one course from the following list. Some of these courses may also fulfill other major requirements.

Take 0 - 1 course(s) from the following:

- [AST 4994W](#) - Directed Research [WI] (2.0 - 5.0 cr)
- [PHYS 3605W](#) - Modern Physics Laboratory [WI] (3.0 cr)