Department of Astronomy

567 Sears Library Building
Phone 216-368-3728; Fax 216-368-5406
Heather L. Morrison, Chair
http://astronomy.case.edu

Facilities

The Department of Astronomy operates the Kitt Peak Station of the Warner & Swasey Observatory near Tucson, Arizona, home of the Burrell Schmidt telescope. This telescope is used for surveys and imaging with large format CCDs. A 9.5-inch refractor permanently mounted on the roof of the A.W. Smith Building is available for use by students. The department also houses a research and instruction computer laboratory including the Astronomy Beowulf computing cluster.

Faculty

R. Earle Luck, Ph.D. (University of Texas, Austin)
Worcester R. and Cornelia B. Warner Professor of Astronomy
J. Christopher Mihos, Ph.D. (University of Michigan)
Professor
Heather L. Morrison, Ph. D. (Australian National University)
Professor and Chair
Director of the Warner and Swasey Observatory
Idit Zehavi, Ph. D. (Hebrew University of Jerusalem)
Assistant Professor

Secondary Faculty

Lawrence M. Krauss, Ph.D. (Massachusetts Institute of Technology)
Ambrose Swasey Professor of Physics, Department of Physics
John E. Ruhl, Ph.D. (Princeton University)
Professor, Department of Physics
Glenn Starkman, Ph.D. (Stanford University)
Professor, Department of Physics

Undergraduate Programs

Two degrees in astronomy are offered, the Bachelor of Science degree and the Bachelor of Arts degree. The primary difference between the two degrees is that the B.A. degree allows somewhat more flexibility in choice of courses. Both the B.A. and B.S. degrees provide excellent preparation for graduate studies. There are also two minor programs in astronomy.

A broad and substantial background in physics and mathematics with introductory exposure to astronomy is emphasized in the astronomy curriculum. A faculty actively engaged in research provides first-rate instruction and opportunity for undergraduate involvement in research.

A bachelor's degree in astronomy is designed to prepare for graduate study in astronomy, but the holder of this undergraduate degree who seeks employment can fill the same jobs as physics and computer science majors.

Graduate Programs

The department offers graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in astronomy. Current research provides opportunities in optical observational astronomy and theoretical studies of galaxy formation and evolution. Prospective graduate students must submit scores on the Graduate Record Examination including the advanced physics test. Further information on the department's graduate programs, and details concerning financial aid, are available through the departmental office and/or website.

Bachelor of Arts Degree
Major in Astronomy

Freshman Year ..... (Credit Hours)

Fall

MATH 121 Calculus for Science & Engineering I .....(4)
  or MATH 123 Calculus I .....(4)
PHYS 121 General Physics I: Mechanics .....(4)
PHED 101 Physical Education Activities .....(0)
First Seminar .....(4)
Social Science I .....(3)
Total .....(15)

Spring

MATH 122 Calculus for Science & Engineering II .....(4)
  or MATH 124 Calculus II .....(4)
PHYS 122 General Physics II: Electricity and Magnetism .....(4)
PHED 102 Physical Education Activities .....(0)
ENGR 131 Elementary Computer Programming .....(3)
ASTR 151 Doing Astronomy* .....(1)
Social Science II .....(3)
Total .....(15)

* Suggested but Not Required For the Major

Sophomore Year

Fall

ASTR 221 Stars and Planets .....(3)
MATH 223 Calculus for Science & Engineering III .....(3)
  or MATH 227 Calculus III .....(3)
PHYS 221 General Physics III: Modern Physics .....(3)
University Seminar .....(3)
Total .....(15)

Spring

ASTR 222 Galaxies and Cosmology .....(3)
MATH 224 Elementary Differential Equations .....(3)
  or MATH 228 Differential Equations .....(3)
PHYS 250 Mathematical Physics & Computing .....(3)
PHYS 310 Classical Mechanics .....(3)
University Seminar .....(3)
Total .....(18)

Junior Year

Fall

ASTR 311 Stellar Physics .....(3)[a]
PHYS 313 Thermodynamics & Statistical Mechanics .....(3)
Arts & Humanities I .....(3)
Arts & Humanities II .....(3)
Technical Elective .....(3)
Total .....(15)

Spring
ASTR 328 Cosmology and the Structure of the Universe.....(3)[a]
PHYS 324 Electricity & Magnetism I.....(3)
PHYS 326 Contemporary Physical Optics.....(3)
Technical Elective.....(3)
Total .....(12)

Senior Year

Fall
ASTR 306 SAGES Departmental Seminar .....(3)[a]
ASTR 309 Seminar I.....(1)
PHYS 331 Quantum Mechanics I .....(3)
ASTR 351 SAGES Astronomy Capstone .....(1)[b]
Global and Cultural Diversity .....(3)
Total .....(11)

Spring
ASTR 310 Senior Seminar II .....(1)
ASTR 351 SAGES Astronomy Capstone .....(3)[b]
Total .....(4)

Total Hours In Core and Departmental Requirements: 104

Open Electives to be added as appropriate to bring the total number of hours to the minimum of 120 needed for graduation with a B.A.

Six hours of Mathematics and Natural Science (Physics) double counted towards SAGES Breadth Requirement and 1 required math course double counted towards SAGES Quantitative Reasoning requirement.

Astronomy Hours:..... 18
Physics Hours:..... 29
Math Hours: 14
Technical Electives Hours:..... 6

Technical Electives are additional courses in astronomy, chemistry, mathematics, statistics, physics, or geology which satisfy interests of the student but also fall within the science / mathematics objectives of the major. For a complete list of approved technical electives see advisor.

Minors in Astronomy
For non-physical science majors: ASTR 221, 222; PHYS 115, 116, and 1 of the following: (ASTR 306, 311, 323, 328).
For physical science majors: ASTR 221, 222, and 3 of the following: (ASTR 306, 311, 323, 328).

Approved Technical Electives - B. A. In Astronomy (This is not an exhaustive list):

CHEM 107 Properties and Structure of Matter I
CHEM 108 Properties and Structure of Matter II
PHYS 204 Advanced Instrumentation Lab
PHYS 316 Introduction to Nuclear and Particle Physics
PHYS 325 E&M II

PHYS 332 QM II

a. 300 level Astronomy Courses: 3 of the following 4 are required: (ASTR 306, 311, 323, 328)
b. A SAGES Capstone Experience is required of all students. The Astronomy BA does *not* require the Astronomy Capstone but only that a Capstone be taken. The number of hours shown assumes the Astronomy Capstone with 1 hour in the Senior Fall Semester and 3 hours in the Senior Spring Semester. If another Capstone is taken the number of hours may be different.

Bachelor of Science in Astronomy Degree

Freshman Year.....(Class-Lab-Credit Hours)

Fall

MATH 121 Calculus for Science & Engineering I ..... (4-0-4)
or MATH 123 Calculus I ..... (4-0-4)
PHYS 121 General Physics I - Mechanics ..... (4-0-4)[a]
PHED 101 Physical Education Activities ..... (0-3-0)
First Seminar ..... (4-0-4)
Social Science I ..... (3-0-3)
Total: 15-3-15

Spring

MATH 122 Calculus for Science & Engineering II ..... (4-0-4)
or MATH 124 Calculus II ..... (4-0-4)
PHYS 122 General Physics II: Electricity
& Magnetism ..... (4-0-4)[a]
PHED 102 Physical Education Activities ..... (0-3-0)
ENGR 131 Elementary Computer Programming ..... (3-0-3)
ASTR 151 Doing Astronomy[*] ..... (1-0-1)
Arts & Humanities I ..... (3-0-3)
Total: 15-3-15

[*] Suggested but Not Required For the Major

Sophomore Year

Fall

ASTR 221 Stars and Planets ..... (3-0-3)
MATH 223 Calculus for Science & Engineering III ..... (3-0-3)
or MATH 227 Calculus III ..... (3-0-3)
PHYS 221 General Physics III: Modern Physics ..... (3-0-3)[a]
PHYS 203 Laboratory Physics ..... (2-4-4)
University Seminar ..... (3-0-3)
Total: 14-4-19

Spring

ASTR 222 Galaxies and Cosmology ..... (3-0-3)
MATH 224 Elementary Differential Equations ..... (3-0-3)
or MATH 228 Differential Equations ..... (3-0-3)
PHYS 204 Advanced Instrumentation Lab ..... (1-4-4)
PHYS 250 Mathematical Physics & Computing ..... (3-0-3)
PHYS 310 Classical Mechanics ..... (3-0-3)
University Seminar ..... (3-0-3)
Total: 16-4-19

Junior Year

Fall

ASTR 311 Stellar Physics ..... (3-0-3)[b]
PHYS 313 Thermodynamics & Statistical Mechanics ..... (3-0-3)
Technical Elective ..... (3-0-3)
Arts & Humanities II ..... (3-0-3)

Science & Society ..... (3-0-3)
Total 15-0-15

Spring

ASTR 328 Cosmology and the Structure of the Universe ..... (3-0-3)[b]
PHYS 324 Electricity & Magnetism I ..... (3-0-3)
PHYS 326 Physical Optics ..... (3-0-3)
Arts & Humanities IV ..... (3-0-3)
Technical Elective ..... (3-0-3)
Total: 15-0-15

Senior Year

Fall

ASTR 306 SAGES Departmental Seminar ..... (3-0-3)[b]
ASTR 309 Senior Seminar I ..... (1-0-1)
PHYS 325 Electricity & Magnetism II ..... (3-0-3)
PHYS 331 Quantum Mechanics I ..... (3-0-3)
ASTR 351 SAGES Astronomy Capstone ..... (1-0-1)[c]
Technical Elective ..... (3-0-3)
Global and Cultural Diversity ..... (3-0-3)
Total: 17-0-17

Spring

ASTR 310 Senior Seminar II ..... (1-0-1)
ASTR 323 The Local Universe ..... (3-0-3)[b]
PHYS 332 Quantum Mechanics II ..... (3-0-3)
ASTR 351 SAGES Astronomy Capstone ..... (3-0-3)[c]
Social Science II ..... (3-0-3)
Technical Elective ..... (3-0-3)
Total: 16-0-16

Total Hours Required for Graduation: 122

Six hours of Mathematics and Natural Science (Physics) double counted towards SAGES Breadth Requirement and 1 required math course double counted towards SAGES Quantitative Reasoning requirement.

Astronomy Hours: 20
Physics Hours: 43
Math Hours: 14
Technical Electives Hours 12

Technical Electives are additional courses in astronomy, chemistry, mathematics, statistics, physics, or geology which satisfy interests of the student but also fall within the science/mathematics objectives of the major. For a complete list of approved technical electives see advisor.

Approved Technical Electives - B. S. In Astronomy (This is not an exhaustive list)

GEOL 345 Planetary Materials
MATH 201 Introduction to Linear Algebra
MATH 345 Introduction to Applied Mathematics

PHYS 316 Introduction to Nuclear and Particle Physics
PHYS 349 Methods of Mathematical Physics I
PHYS 350 Methods of Mathematical Physics II

Minors in Astronomy
For non-physical science majors: ASTR 221, 222; PHYS 115, 116; and 1 of the following: ASTR 306, 311, 323, or 328.
For physical science majors: ASTR 221, 222, and 3 of the following ASTR 306, 311, 323, or 328.

a. Selected students may be invited to take PHYS 123, 124, 223 in place of 121, 122, 221.
b. Courses taught every other year only.
c. A SAGES Capstone Experience is required of all students. The Astronomy BS does *not* require the Astronomy Capstone but only that a Capstone be taken. The number of hours shown assumes the Astronomy Capstone with 1 hour in the Senior Fall Semester and 3 hours in the Senior Spring Semester. If another Capstone is taken the number of hours may be different.