ASTRONOMY

The Wesleyan Astronomy Department provides outstanding opportunities for undergraduates who wish to major in this fascinating subject, either in preparation for graduate school or as an end in itself. Our unique program blends coursework with research opportunity and provides students access to professional-quality telescopes, instrumentation, and computers. A principal strength is our active research faculty who will work one-on-one with undergraduates employing state-of-the-art instrumentation and computers to investigate areas of current astronomical interest.

Our students go on to graduate programs, including the best in the country, or to a variety of rewarding careers in and out of science. Many of our students are co-authors on research papers based on work performed during their undergraduate careers. In addition, we offer a comprehensive range of coursework that will prepare students for a variety of directions in life, including graduate study.

FACULTY

William Herbst
BA, Princeton University; MAA, Wesleyan University; MSC, University of Toronto; PhD, University of Toronto
John Monroe Van Vleck Professor of Astronomy; Professor of Astronomy; Professor, Integrative Sciences

Meredith Hughes
BS, Yale University; PhD, Harvard University
Assistant Professor of Astronomy; Assistant Professor, Integrative Sciences

Edward C. Moran
BS, Pennsylvania State University; MA, Columbia University; MPHIL, Columbia University; PhD, Columbia University
Professor of Astronomy; Director, Van Vleck Observatory; Professor, Integrative Sciences

Seth Redfield
BM, New Eng Consv Music; BS, Tufts University; MS, University of Colorado Boulder; PhD, University of Colorado Boulder
Associate Professor of Astronomy; Chair, Astronomy Department; Associate Professor, Integrative Sciences

VISITING FACULTY

Roy E. Kilgard
BA, Valdosta St University; PHD, University of Leicester
Support Astronomer and Research Associate Professor of Astronomy

UNDERGRADUATE PROGRAM

DEPARTMENTAL ADVISING EXPERTS

William Herbst, Edward Moran, Seth Redfield

- Undergraduate Astronomy Major (catalog.wesleyan.edu/departments/astr/ugrd-astr)
and spectroscopy in a wide variety of applications. Data acquisition, image
processing, and data analysis methods will be discussed. In particular, students
will gain hands-on experience with the analysis of data obtained from both
ground- and satellite-based observatories. An introduction to the relevant
error analysis methods is included. Students will also become familiar with
the fundamental techniques that will be necessary when "big data" projects like
LSST come on line in the near future: database querying, metadata handling, and
modern programming techniques.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-ASTR
Identical With: ASTR522
Prereq: ASTR211

ASTR224 Exoplanets: Formation, Detection, and Characterization
Our ability to place the earth into a cosmic context dramatically improved in
the past decades with the discovery of planets around other stars (exoplanets).
The study of exoplanets has quickly become a dominant field in astronomy. This
course will focus on the fundamentals of exoplanet formation, detection, and
characterization (interiors and atmospheres) based on astronomical observables.
We will also discuss the assessment of habitability for Earth-like exoplanets and
the prospects for the detection of biosignatures.
Offering: Host
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-ASTR
Identical With: ASTR524
Prereq: (ASTR155 AND ASTR211)

ASTR231 Stellar Structure and Evolution
As the principal source of light in galaxies today and as drivers of chemical
evolution, stars play a critical role in the universe. It is important to understand
their structure and evolution. Fortunately, we have a fairly well-developed and
tested theory of stellar structure covering both their interiors and atmospheres.
In this course, we will provide an introduction to that theory and examine its key
results, including a basic description of how stars evolve.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-ASTR
Identical With: ASTR531
Prereq: (PHYS213 AND PHYS214 AND ASTR155 AND ASTR211)

ASTR232 Galaxies, Quasars, and Cosmology
This course introduces modern extragalactic astronomy, blending established
practices in the field and important recent discoveries. Three major themes
will be developed. First, the basics of Newtonian and relativistic cosmologies
will be discussed, including modern determinations of the Hubble Law and
the observations that have led to the currently favored cosmological model.
Next, the universe of galaxies will be investigated: their constituents, structure
and kinematics, and multiwavelength properties. Finally, the nature of galactic
nuclei will be explored, including the observational consequences of black-hole
accretion and the coordinated growth of galaxies and their central black holes.
Outstanding research questions related to the topics covered will be highlighted
throughout the course.
Offering: Host
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-ASTR
Identical With: ASTR532
Prereq: (ASTR155 AND ASTR211)
ASTR240 Radio Astronomy
This course will introduce students to the origins, theory, and practice of radio astronomy. It will cover theory of antennas and interferometers, as well as signal detection and measurement techniques. Particular emphasis will be placed on the theory and applications of Fourier transforms. A practical laboratory component will provide experience working with single-dish and interferometric data.
    Offering: Host
    Grading: A-F
    Credits: 1.00
    Gen Ed Area: NSM-ASTR
    Prereq: ASTR155

ASTR401 Individual Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT

ASTR402 Individual Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT

ASTR407 Senior Tutorial (downgraded thesis)
Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor. Only enrolled in through the Honors Coordinator.
    Offering: Host
    Grading: A-F

ASTR408 Senior Tutorial (downgraded thesis)
Downgraded Senior Thesis Tutorial - Project to be arranged in consultation with the tutor. Only enrolled in through the Honors Coordinator.
    Offering: Host
    Grading: A-F

ASTR409 Senior Thesis Tutorial
Topic to be arranged in consultation with tutor.
    Offering: Host
    Grading: OPT

ASTR410 Senior Thesis Tutorial
Topic to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT

ASTR411 Group Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT

ASTR412 Group Tutorial, Undergraduate
Topic to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT

ASTR421 Undergraduate Research, Science
Individual research projects for undergraduate students supervised by faculty members.
    Offering: Host
    Grading: OPT

ASTR422 Undergraduate Research, Science
Individual research projects for undergraduate students supervised by faculty members.
    Offering: Host
    Grading: OPT

ASTR423 Advanced Research Seminar, Undergraduate
Advanced research tutorial; project to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT

ASTR424 Advanced Research Seminar, Undergraduate
Advanced research tutorial; project to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT

ASTR430 Seminar on Astronomical Pedagogy
Methods for effectively teaching astronomy at all levels from general public outreach to college level will be discussed.
    Offering: Host
    Grading: Cr/U
    Credits: 0.25
    Gen Ed Area: NSM-ASTR
    Prereq: ASTR155 OR ASTR211

ASTR431 Research Discussion in Astronomy
Current research topics in astronomy will be presented and discussed by astronomy staff and students.
    Offering: Host
    Grading: Cr/U
    Credits: 0.25
    Gen Ed Area: NSM-ASTR
    Prereq: ASTR155 OR ASTR211

ASTR491 Teaching Apprentice Tutorial
The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.
    Offering: Host
    Grading: OPT

ASTR492 Teaching Apprentice Tutorial
The teaching apprentice program offers undergraduate students the opportunity to assist in teaching a faculty member's course for academic credit.
    Offering: Host
    Grading: OPT

ASTR500 Graduate Pedagogy
The elements of good teaching will be discussed and demonstrated through lectures, practice teaching sessions, and discussions of problems encountered in the actual teaching environment. The staff consists of faculty and experienced graduate students. An integral part of the course is a required one-day workshop BEFORE the first day of formal classes.

Training in pedagogy in the first semester of attendance is required for all incoming Wesleyan MA and PhD students who have not already fulfilled this requirement at Wesleyan. BA/MA students are not required to get training in pedagogy but may choose to do so.
    Offering: Crosslisting
    Grading: Cr/U
    Credits: 0.50
    Gen Ed Area: None
    Identical With: E&ESS500, CHEM500, BIOLO500, MB&B500, MUSC500, PHYS500, PSYC500, MATH500
    Prereq: None

ASTR501 Individual Tutorial for Graduates
Topic to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT

ASTR502 Individual Tutorial for Graduates
Topic to be arranged in consultation with the tutor.
    Offering: Host
    Grading: OPT
ASTR232 Modern Observational Techniques
This course reviews the practices of modern observational astronomy, focusing primarily on techniques employed in the optical and x-ray bands. Topics will include a description of the use of digital detectors for imaging, photometry, and spectroscopy in a wide variety of applications. Data acquisition, image processing, and data analysis methods will be discussed. In particular, students will gain hands-on experience with the analysis of data obtained from both ground- and satellite-based observatories. An introduction to the relevant error analysis methods is included. Students will also become familiar with the fundamental techniques that will be necessary when "big data" projects like LSST come on line in the near future: database querying, metadata handling, and modern programming techniques.
Offering: Crosslisting
Grading: A-F
Credits: 1.00
Gen Ed Area: NSM-ASTR
Identical With: ASTR222
Prereq: (ASTR155 AND ASTR211)

ASTR211 Galactic Astronomy
The fundamentals of astrophysics are applied to the galaxy and objects therein. Topics include the interstellar medium, stellar populations, galactic structure, formation, and evolution.
Offering: Crosslisting
Grading: A-F
Gen Ed Area: NSM-ASTR
Identical With: ASTR221
Prereq: (ASTR155 AND ASTR211)

ASTR504 Selected Topics, Graduate Sciences
Topic to be arranged in consultation with the tutor. A seminar primarily concerned with papers taken from current research publications designed for, and required of, graduate students.
Offering: Host
Grading: OPT

ASTR503 Selected Topics, Graduate Sciences
Topic to be arranged in consultation with the tutor. A seminar primarily concerned with papers taken from current research publications designed for, and required of, graduate students.
Offering: Host
Grading: OPT

ASTR521 Galactic Astronomy
The fundamentals of astrophysics are applied to the galaxy and objects therein. Topics include the interstellar medium, stellar populations, galactic structure, formation, and evolution.
Offering: Crosslisting
Grading: A-F
Gen Ed Area: NSM-ASTR
Identical With: ASTR221
Prereq: (ASTR155 AND ASTR211)

ASTR524 Exoplanets: Formation, Detection, and Characterization
Our ability to place the earth into a cosmic context dramatically improved in the past decades with the discovery of planets around other stars (exoplanets).
The study of exoplanets has quickly become a dominant field in astronomy. This course will focus on the fundamentals of exoplanet formation, detection, and characterization (interiors and atmospheres) based on astronomical observables.
We will also discuss the assessment of habitability for Earth-like exoplanets and the prospects for the detection of biosignatures.
Offering: Crosslisting
Grading: OPT
Credits: 1.00
Gen Ed Area: NSM-ASTR
Identical With: ASTR224
Prereq: (ASTR155 AND ASTR211)

ASTR532 Galaxies, Quasars, and Cosmology
Next, the universe of galaxies will be investigated: their constituents, structure and kinematics, and multiwavelength properties. Finally, the nature of galactic nuclei will be explored, including the observational consequences of black-hole accretion and the coordinated growth of galaxies and their central black holes. Outstanding research questions related to the topics covered will be highlighted throughout the course.

ASTR549 Advanced Research Seminar, Graduate
Advanced research tutorial; project to be arranged in consultation with the tutor.
Offering: Host
Grading: OPT

ASTR550 Advanced Research Seminar, Graduate
Advanced research tutorial; project to be arranged in consultation with the tutor.
Offering: Host
Grading: OPT

ASTR555 Planetary Science Seminar
This course will examine topics and methods in the interdisciplinary field of planetary science. Students will join several faculty members in the planetary science group to discuss the origin, evolution, and habitability of planets in this and other solar systems. This class is intended for graduate students who are pursuing or mean to pursue the planetary science concentration. Other graduate and undergraduate students may request admission to the course.
Offering: Crosslisting
Grading: Cr/U
Credits: 0.25
Gen Ed Area: NSM-ES
Identical With: E&ES555
Prereq: None

In this course, we will provide an introduction to that theory and examine its key results, including a basic description of how stars evolve.